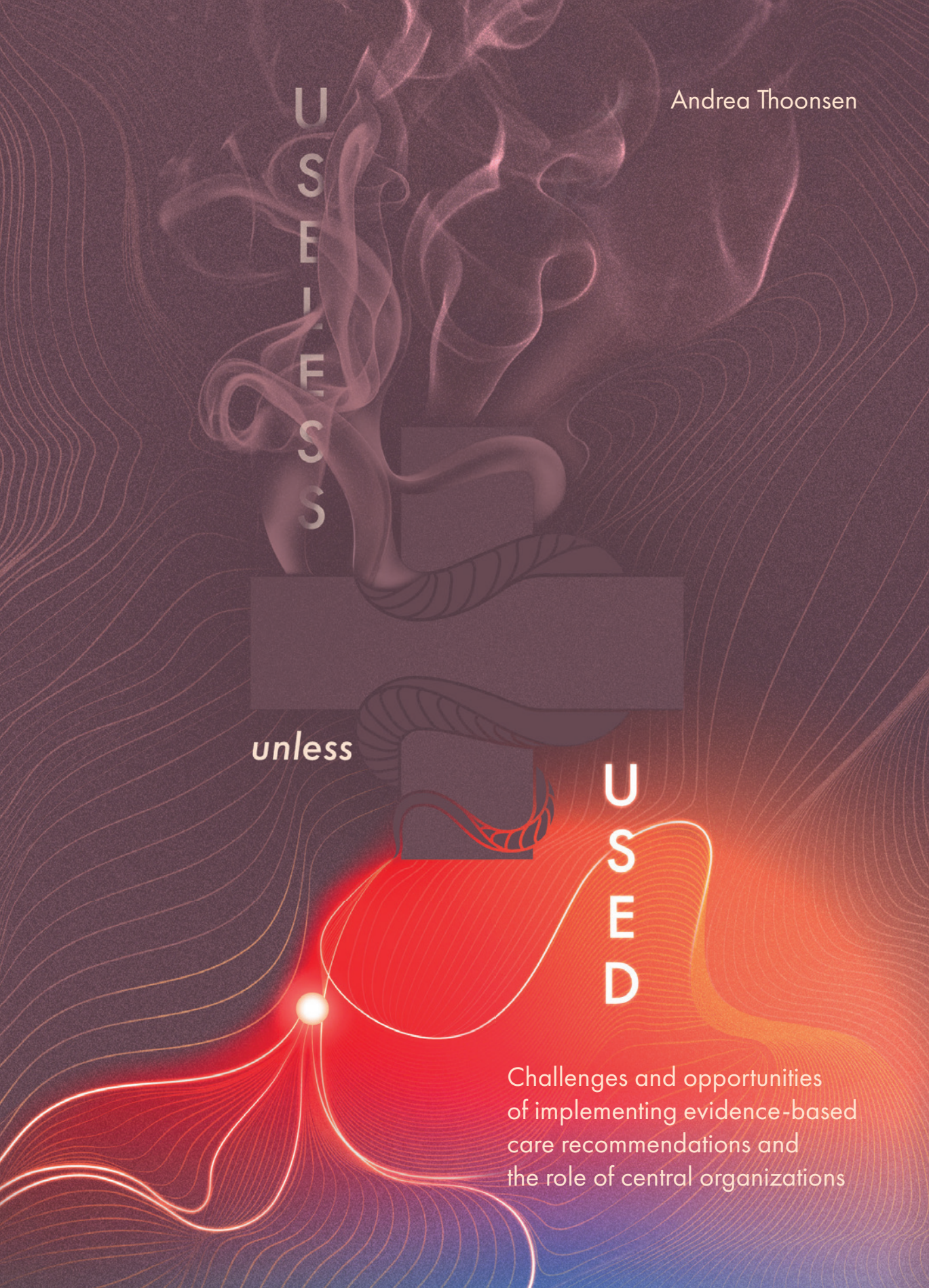

Andrea Thoonsen

Challenges and opportunities of implementing evidence-based care recommendations and the role of central organizations

USELESS UNLESS USED

Challenges and opportunities of implementing evidence-based care recommendations and the role of central organizations

Andrea Thoonsen

The research presented in this thesis was conducted at:

Amsterdam UMC, location VUmc, Department of Public and Occupational Health, Amsterdam Public Health research institute, Amsterdam, the Netherlands

Financial support for the research included in this thesis was provided by:

Academische Werkplaats Zorgpraktijk en Beleid, a partnership between Zorginstituut Nederland and Nederlandse Federatie voor Universitair Medisch Centra – consortium Kwaliteit van Zorg, the Netherlands

ISBN: 978-94-93278-99-8

Design and lay-out: Noura Amin and Off Page, Amsterdam

Printing: Off Page, Amsterdam

VRIJE UNIVERSITEIT

USELESS UNLESS USED

Challenges and opportunities of implementing evidence-based care recommendations and the role of central organizations

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad Doctor of Philosophy
aan de Vrije Universiteit Amsterdam,
op gezag van de rector magnificus
prof.dr. J.J.G. Geurts,
volgens besluit van de decaan
van de Faculteit der Geneeskunde
in het openbaar te verdedigen
op vrijdag 19 december 2025 om 9.45 uur
in de universiteit

door

Andrea Carmel Thoonsen
geboren te Nijmegen

Promotoren:	prof.dr. M.C. de Bruijne prof.dr. D.M.J. Delnoij
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General introduction

"We're excellent at developing guidelines and things – truly outstanding. But when it comes to implementation, we're terrible."

– Representative of a Dutch scientific organization, 2022

HEALTHCARE UNDER PRESSURE

While global potential to prevent, care and cure is greater than ever, delivery of inappropriate care remains widespread [1]. Ideally, health systems should provide high-quality care, that increases the likelihood of desired health outcomes for individuals and populations [2]. This care should be safe, effective, patient-centered, timely, equitable, integrated and efficient [3]. However, healthcare professionals often underuse proven, simple, cost-effective and high-value interventions, while overusing ineffective but familiar, lucrative or otherwise convenient low-value services [1]. Common examples of low-value care overuse include unwarranted imaging, pain-medication and invasive treatments for lower back pain and unnecessary prescribing of antibiotics, causing antibiotic resistance [4, 5]. Examples of underused high-value care include asthma misdiagnoses and subsequent unnecessary treatment due to limited spirometry use, and insufficient treatment of atrial fibrillation with oral anticoagulants, leading to a higher risk of stroke [6, 7].

In high-income countries, it is estimated that ~10-30% of care delivered is of low value [8-10]. Additionally, only around 60% of care is delivered in accordance with clinical guidelines [11-15]. In the European Union, it is estimated that as much as one-fifth of health care spending is wasteful [16]. In the United States alone, the annual estimated cost of waste ranges from $760 billion to $935 billion – approximately 25% of total health care spending [17]. This underscores not only the substantial scale of waste, misuse of limited resources, potential patient harm and negative environmental consequences – but also the significant potential for improvement.

As humans, we have the "*inherent tendency to seek out novelty and challenges, to extend and exercise one's capacity, to explore, and to learn*" [18]. Decision-makers in healthcare tend to seek the most cutting-edge innovations and the highest standard of care for each individual patient. Now, external factors are increasingly complicating this pursuit – not only driving the need for health system optimization, but also forcing difficult choices along the way.

Health systems face mounting pressure. In high-income countries this pressure is caused by multiple factors, including rising demand for healthcare services, ever more expensive treatment options, shortages of healthcare professionals and negative impacts of care on environmental health. Europeans experience demographic challenges of an ageing population: the proportion of people over age 65 in the EU is projected to increase from 21% in 2023 to 29% by 2050 [19]. Life expectancy at age 65 currently exceeds 20 years in the EU, but more than half of these years are expected to be impaired by chronic illnesses and disabilities [19]. In the US, launch prices for new prescription drugs increased exponentially by 20% per year from 2008 to 2021 [20]. The projected health care spending could reach 11.8% of gross domestic product (GDP) across OECD

countries by 2040, as opposed to 9.2% in 2022 [21]. Furthermore, EU countries had an estimated shortage of approximately 1.2 million doctors, nurses and midwives in 2022 [19]. Meanwhile, the healthcare sector is estimated to be responsible for approximately 5% of global greenhouse gas emissions [22]. As a result, the quality, accessibility and affordability of care are increasingly at risk and the sector itself harms humanity and the environment. Actions to improve and safeguard health systems are needed.

DECIDING WHAT WORKS FOR WHOM AND WHEN

To tackle waste and focus on the provision of high-value care, healthcare decision-makers have to determine what specific care is of proven value and what care is of low value. They need to determine what works for whom and under what circumstances to prevent overuse and underuse. More concretely, for each health intervention, they must search – or, if necessary, generate – scientific evidence about its health benefits, side effects and risks of care interventions. They must combine these findings with patients' needs, values, preferences and circumstances, and clinical expertise of healthcare professionals. Additionally, they must account for wider environmental and societal aspects, including the impact on patients' close family and friends, ethical, organizational and legal aspects, cost and environmental considerations [23]. Once these factors are understood, healthcare decision-makers must weigh the benefits and harms of alternative care options.

To complicate matters further, the distinction between high-value care and low-value care is not black and white: health services exist along an 'appropriate care continuum'. Most tests and treatments do not clearly fall into categories of low- or high-value care [24]. They occupy a more ambiguous grey zone – helping only a small subset of patients, offering limited benefits relative to their cost, or lacking clear evidence about whom they actually help and to what extent. Moreover, the overall value may also vary depending on the perspective taken, the stakeholders involved and the decision context [23].

Healthcare professionals, together with patients, are required to assess (a significant number of) these variables for any one medical decision. Given the exponential growth in scientific literature and the rapid evolution of care practices and alternative treatment options, keeping up with these developments has now surpassed human capacity [25]. To support healthcare decision-makers, information on care considerations should be readily available and presented in a format that is practical and actionable. In the current healthcare sphere, two ways of doing that is through providing recommendations through clinical practice guideline development and health technology assessment.

FROM RESEARCH TO POLICY THROUGH CLINICAL PRACTICE GUIDELINE DEVELOPMENT AND HEALTH TECHNOLOGY ASSESSMENT

Clinical practice guidelines and health technology assessment both play a critical role in bridging the gap between evidence and practice. Clinical practice guidelines are "*statements that include recommendations intended to optimize patient care. They are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options*" [26]. Coupled with clinical expertise of healthcare professionals and patients' needs, values, preferences and circumstances, guidelines' main purpose is generally to assist healthcare professionals in making evidence-informed medical decisions. Furthermore, they can serve as evidence-base to improve, monitor and evaluate the quality of care and to identify important research gaps. Guidelines typically offer recommendations for the care pathway of a specific condition. They are generally developed at the regional, national or continental level by professional, scientific and/or governmental organizations, often in collaboration with patients.

Health technology assessment (HTA) shares many similarities with guideline development, as both critically appraise the best available scientific evidence to formulate recommendations aimed at optimizing patient care [27]. However, HTA serves a slightly different purpose and target audience. Rather than providing comprehensive care recommendations for care pathways, HTA focuses on evaluating specific (new) health technologies in comparison to existing standards of care. More precisely, HTA is defined as *"a multidisciplinary process that uses explicit methods to determine the value of a health technology at different points in its lifecycle. The purpose is to inform decision-making in order to promote an equitable, efficient, and high-quality health system*" [23]. The term 'health technologies' encompasses a broad scala of interventions, such as pharmaceuticals, devices, programs, procedures, and organizational and managerial systems. The goal is to inform policymakers, payers and healthcare administrators in making decisions regarding reimbursement, procurement and, in some cases, clinical practice [28]. HTA recommendations are predominantly issued at the national level by governmental (regulatory) agencies, although HTA is also increasingly being conducted by hospital-based HTA units [29, 30].

In countries facing rising costs of healthcare, ageing populations, scarcity of health care resources and negative impacts of care on environmental health, guideline and HTA recommendations can be useful tools for steering and regulating the delivery of care [31-36]. Yet the value of these evidence-based care recommendations is not only determined by their rigorous development methodology, but also by the extent to which they are implemented in daily practice.

1

THE ROLE OF CENTRAL ORGANIZATIONS

In general, the primary responsibility for implementing recommendations is given to healthcare professionals. After all, they – together with patients – decide what tests and treatments will be done (or not done) in the consultation room. However, healthcare professionals' decisions and ability to act conform the care recommendations are influenced by various determinants and many stakeholders.

Alongside healthcare professionals, another key group of stakeholders is fundamental to recommendation development and plays an important role in their implementation. This group consists of diverse, centrally operating organizations that, as part of their tasks, develop guidelines or conduct HTA, authorize the forthcoming recommendations and/or support their use in clinical practice. This group includes scientific and professional organizations, knowledge institutes, patient organizations, governmental (regulatory) agencies, health insurers and other (inter)national or regional (umbrella) organizations. Examples of these organizations are the World Health Organization (WHO), the National Institute for Health and Care Excellence (NICE) and the European Society of Cardiology (ESC). They influence healthcare professionals' awareness, acceptability and applicability of care recommendations and their ability to carry out the recommendations [37-39]. Furthermore, they can actively stimulate local implementation by selecting, tailoring and applying dissemination and implementation strategies [39-43].

There is currently no universally accepted term to describe this group of organizations. Our research team invested significant time in exploring and debating potential overarching labels. Terms such as 'evidence synthesizers', 'initiators' and 'senders' were considered. In this thesis, we use 'central organizations' as a general descriptor. In chapter 2-5, we use (more widely recognized) terms that reflect the specific type of recommendation discussed or the specific role they play in these study contexts: we refer to the organizations as 'guideline organizations', 'HTA agencies' and 'stakeholder organizations'.

Previous studies found that central organizations often feel challenged with the implementation of their recommendations. Gagliardi [37] found that many of these organizations lack a clear implementation mandate and dedicated implementation resources. Instead, they usually delegate the task to local healthcare facilities and professionals. Furthermore, central organizations were found to have inconsistent approaches for choosing implementation strategies. Other studies, surveying central organizations globally, revealed that only a minority actively stimulated the implementation of their recommendations into practice [44, 45]. The implementation process is further complicated by the fact that these organizations operate from a distant, central aggregation level, aiming to reach a large and diverse group of end users.

IMPLEMENTATION OF RECOMMENDATIONS

The implementation of evidence-based care recommendations is complex, with significant opportunities for learning and improvement. In 2000, Balas & Boren estimated that translating research evidence into clinical practice takes on average 17 years [46]. This estimate has since been confirmed by subsequent studies [47, 48]. Moreover, Balas & Boren found that only about half of all evidence-based practices ever achieve widespread clinical adoption [46]. A more recent study from Khan et al. (2021) – though based on a limited set of interventions – suggests that the average time to implementation is now slightly shorter. This reduction – to an estimated 15 years – may be attributed to advances in our understanding of implementation processes and increased efforts to promote uptake [49]. Interestingly, Khan et al. also estimated that the time from guideline issuance to uptake ranges from -4 to 12 years, suggesting that some innovations may be adopted in practice even before central organizations' recommendations endorse their use. This highlights the complex and non-linear nature of the translational process through which evidence makes its way into clinical practice – whether via formal care recommendations or through alternative channels such as conferences, the media or participation in clinical studies. It also underscores the urgent need for continued learning and deeper understanding of the 'black box' of implementation processes, with the goal of narrowing the research-policy-practice gap.

It is important to recognize that just developing and publishing recommendations and expecting healthcare professionals and other end users to change their decisions and

- **Implementation** can be described as "*the planned process and systematic introduction of innovations and/or changes of proven value; the aim being that these are given a structural place in professional practice, in the functioning of organizations or in the health care structure*" [56]. Implementation can therefore refer to both an act or process and a state or outcome.

- **Dissemination** is defined as "*the active and targeted distribution of information and interventions to a specific public health or clinical practice audience via determined channels using planned strategies. The intent is to spread knowledge and the associated evidence-based interventions in order to enhance the adoption and the implementation of the information and/or intervention*" [57].

- **De-implementation** refers to "*reducing or stopping the use of low value care on a structural basis in a planned process*" [58].

Box 1. What are implementation, dissemination and de-implementation?

behavior, does not guarantee uptake or improvements in healthcare practice [13, 14, 50-55]. Many factors influence implementation success.

The leaky evidence pipeline

Before evidence-based care recommendations impact practice, they must 'survive' different implementation stages. These stages are illustrated by Glasziou & Haynes's (2005) 'leaky evidence pipeline' (although the process is in reality not linear) (Figure 1) [38]:

- Awareness of relevant, valid recommendations by the healthcare professional
- Acceptance of the recommendations by the healthcare professional
- Applicability to practice for the healthcare professionals' group of patients
- Ability to carry out the recommended care in that context (e.g. availability of resources)
- Acted on by the healthcare professional
- Agreed to by patients
- Adhered to by patients who need to follow the recommended regime

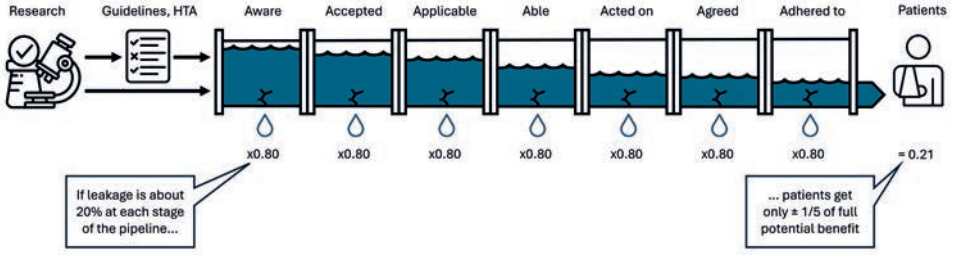

Figure 1. Leaks in the evidence pipeline from research to daily practice (based on Glasziou & Haynes (2005)).

Influential contextual determinants

Along the implementation process ('evidence pipeline'), parts of the recommendation can be lost in translation, resulting in less of the original evidence being sustainably implemented in practice. This 'leakage', or implementation failure, can occur when contextual factors act as powerful forces working against implementation in the real world. These factors may occur at all levels of care: from patient to the outer context of the health system.

To conceptualize and explain these barriers to implementation effectiveness, as well as facilitators that enable and promote progress, determinant frameworks can be used. These frameworks provide a base set of determinants, terminology, definitions and implementation theories by which the dynamic, complex context can be articulated [59, 60].

One such framework is the Consolidated Framework for Implementation Research (CFIR). It is among the most widely used and cited frameworks in implementation science [61]. The 2022 CFIR update incorporates user feedback and various recognized implementation theories, such as the COM-B constructs of the Behavior Change Wheel [62]. It contains 48 determinants – although this list is not exhaustive. These determinants are organized into five domains: 1) innovation (the recommendation being implemented), 2) inner setting (the setting in which the recommendation is implemented, e.g., healthcare facility), 3) outer setting (the environment in which the inner setting exists, e.g., the health system), 4) individuals (the roles and characteristics of individuals, e.g., healthcare professionals and central organization team members) and 5) implementation process (the activities and strategies used for implementation) [59].

Implementation planning approaches and implementation strategies

Over 25 years ago, Grol and Grimshaw (1999) argued that evidence-based practice must be complemented by evidence-based implementation [63]. Since then, the field of implementation science has made significant progress in understanding what makes implementation work.

Dissemination and implementation strategies (in this thesis often shortened to 'implementation strategies) are methods or techniques used to improve adoption, implementation, sustainment and scale-up of recommendations [64, 65]. These strategies range in complexity – from single-component approaches to multifaceted strategies that combine two or more discrete strategies [64]. They can target a wide range of stakeholders and contextual factors at multiple levels and stages of the implementation process [59]. For example, they may focus on patients, healthcare professionals, healthcare facilities, regulation, finance or a combination of these [66]. Examples of implementation strategies are audit and feedback, educational meetings, printed educational materials and computerized reminders.

Several taxonomies have been developed to describe and organize the types of strategies available. One commonly used in the context of care recommendations, more specifically guidelines, is the 'taxonomy of strategies for achieving guideline implementation and compliance' of Mazza et al. [66], which was later expanded by Gagliardi and Alhabib [67]. These taxonomies inform implementation strategy development and evaluation and foster a common language within the field [64].

After multiple unsuccessful attempts to replicate implementation strategies that had proven effective in earlier instances, we now know that there is no magic bullet in implementation [68, 69]. No single implementation strategy works universally across all types of recommendations and in all clinical settings. From a meta-review we know that

the median absolute effect sizes of various implementation strategies are relatively similar [32]. However, the wide variation in effects within each strategy category suggests that other factors are influencing outcomes. While multifaceted strategies seem intuitively more effective [68], the evidence for their superiority over single-component strategies remains mixed [70].

What does seem to be effective in implementation of recommendations, is to select and tailor implementation strategies based on three approaches. Strategies that are (1) created and executed in engagement with relevant stakeholders and (2) designed to address existing barriers are more likely to improve professional practice [42, 71, 72]. Thirdly, applying principles from implementation theories, models and frameworks (TMFs) to guide and shape these strategies can further enhance implementation outcomes [39, 73]. These implementation planning approaches emphasize that successful implementation does not depend on one-size-fits-all solutions, but on context-sensitive strategies grounded in evidence and collaboration.

RECOMMENDATIONS IN THE DUTCH HEALTH SYSTEM

The health system in the Netherlands presents an interesting case for studying the role of central organizations in implementation. The Dutch health system is consistently ranked high in international comparisons in terms of quality [74, 75]. It is highly structured and rule-based, with a strong focus on organization, efficiency and effectiveness [76, 77]. Naturally, this comes with high expectations – Dutch society expects that high-quality care is delivered safely and healthcare professionals and healthcare facilities adhere to applicable legislations.

However, inappropriate care is also a significant issue in the Netherlands. Estimates of waste from low-value care range from 9% to 32%, with large differences between and within sectors and types of treatments [78]. The estimated cost of waste accounts for 25% of total health care spending, although this figure also carries significant uncertainty, with estimates ranging from 3% to 49% [79]. This makes the Netherlands a valuable case for studying how central organizations can help improve the use of evidence-based care recommendations to reduce waste and support better quality care.

Guideline development

Guidelines form the backbone of Dutch quality policy, guiding healthcare practices and promoting evidence-based care. The Netherlands has a strong history in guideline development, beginning in 1982, and has since become a pioneer in this field. Today, guidelines are the cornerstone of quality policy in prevention, diagnosis, treatment and healthcare organization [80].

Guidelines are typically developed by multidisciplinary teams consisting of representatives from scientific and professional organizations, knowledge institutes and patient organizations. Examples of such organizations are the Nederlands Huisartsen Genootschap (Dutch College of General Practitioners, NHG), the Kennisinstituut van de Federatie Medisch Specialisten (Knowledge Institute of the Dutch Association of Medical Specialists, KIMS) and the Patiëntenfederatie Nederland (Netherlands Patients Federation, PFN). The primary target users are healthcare professionals who use guidelines for clinical decision-making.

As of 2024, there were approximately 2,200 guidelines for medical specialists, 350 for nurses, 140 for general practitioners and 50 for mental health professionals [81-84]. However, guidelines are also increasingly used by other organizations as tools for care regulation, procurement and reimbursement. For example, insurance companies use signs of guideline (non)compliance for contract negotiations [80, 85]. As such, guidelines serve multiple functions in the Dutch health system.

The development and implementation of guidelines is a complex, layered process, in which many stakeholders are involved. Felder et al. (2021) provide a comprehensive overview of the role of evidence/guidelines in the Dutch health system, the key stakeholders involved and the interactions between them (Figure 2).

Health technology assessment

Like guideline development, HTA has been an integral part of Dutch quality policy making for decades. Since at least the early 1980s, HTA has progressively evolved in the Netherlands in response to concerns about the rapid advancement of health technologies and their societal and economic impact, particularly in terms of cost [87, 88]. Today, HTA is used by various Dutch institutions, including hospitals. Zorginstituut Nederland (the National Health Care Institute) is the national, public HTA body. It uses HTA to advise the Minister van Volksgezondheid, Welzijn en Sport (Minister of Health, Welfare and Sport) on optimizing the content of the basic health insurance package [89]. This mandatory package, required for all Dutch citizens, covers a broad range of (essential) healthcare interventions of which the costs are reimbursed by health insurers. Currently, reimbursement decisions based on HTA in the Netherlands mainly – though not exclusively – focus on (outpatient) pharmaceuticals [90]. The National Health Care Institute conducts several dozen HTAs each year. In 2019, for example, it carried out 35 assessments [91]. The Dutch government aims to expand the systematic application of HTA to other areas of healthcare to further refine and enhance the basic health insurance package [90].

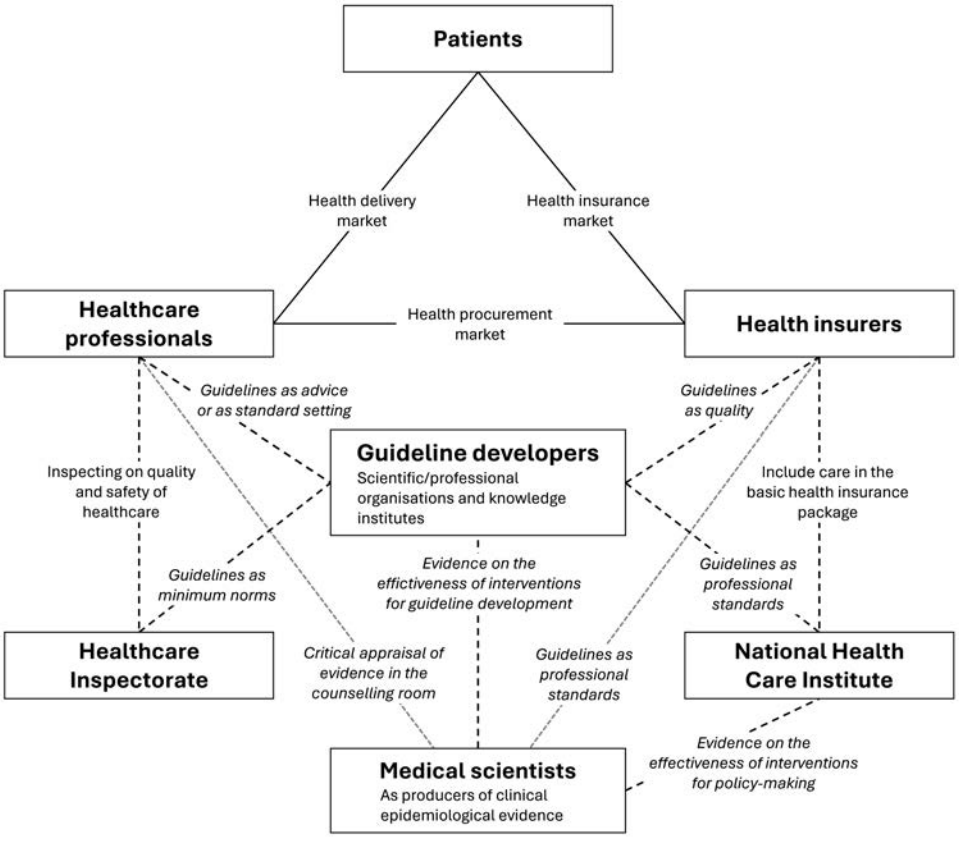

Figure 2. The Dutch health system and the role of evidence/guidelines therein (adapted from [86]).

WHAT ROLE CAN CENTRAL ORGANIZATIONS PLAY IN THE IMPLEMENTATION OF RECOMMENDATIONS?

The number of Dutch recommendations continues to grow, yet research indicates that their implementation in local policy and practice is unpredictable, slow, complex and suboptimal [4, 92-96]. Consequently, the quality of patient care may stay behind and valuable healthcare resources may be wasted. Despite this, limited research – both in the Netherlands and globally – has explored how central organizations can effectively accelerate the implementation of recommendations [37, 45]. It is not clear how Dutch central organizations actually fulfill their implementation roles in practice and which determinants they perceive as influencing successful implementation. Examining their perspectives, approaches and experiences could help identify opportunities for improvement and generate valuable lessons. The findings could inform the development of enhanced implementation policies and practical guidance, ultimately strengthening national implementation efforts. In turn, this may lay the groundwork for more successful

implementation in local healthcare settings, with the ultimate goal of improving patient outcomes.

AIM OF THIS THESIS

The aim of this thesis was to examine the role of central organizations in the implementation of evidence-based care recommendations to advise on how to optimize their implementation efforts and ultimately improve patient health outcomes. The specific research objectives of this thesis are:

- To gain insight into how central organizations can stimulate the implementation of recommendations in healthcare.
- To explore the determinants that central organizations perceive as influencing the implementation of recommendations.

CONTEXT OF THIS THESIS – THE ACADEMIC COLLABORATION ON CARE PRACTICE AND POLICY

This project is part of the 'Academische Werkplaats Zorgpraktijk en Beleid' (Academic Collaboration on Care Practice and Policy), a partnership between Zorginstituut Nederland (the National Health Care Institute) and the Nederlandse Federatie voor Universitair Medisch Centra – consortium Kwaliteit van Zorg (Netherlands Federation of University medical centers – Quality of Care Consortium). These two central organizations work to bridge the gap between healthcare policy and practice, aiming to support a sustainable health system for the future. While the research in this thesis explores the pathway from policy to practice, focusing on the perspective of central organizations, the research by Floris Weller [97, 98], also part of this Academic Collaboration, takes the opposite approach. His work centers on the perspective of healthcare professionals – specifically medical specialists – examining the sources from which they derive their knowledge and the role that recommendations play in the medical decision-making process. A third project within this collaborative initiative, led by Vera de Weerdt [99, 100], concentrates on enhancing the effectiveness of a specific strategy for implementing recommendations: audit and feedback. Together, these three projects seek to identify ways to strengthen the connection between policy and clinical practice, ultimately aiming to improve the quality of care.

1

OUTLINE OF THIS THESIS

To answer the research questions, this thesis begins with an exploration of international theory before focusing on Dutch practice. **Chapter 2** presents a systematic review of the existing international literature on the role and efforts of central guideline organizations in implementing guidelines. It outlines the strategies these organizations use to promote guideline implementation in hospital care, the outcomes of their efforts and the barriers and facilitators they encounter. The focus then shifts to the Dutch context. In **Chapter 3**, we examine, by means of a qualitative study, how Dutch central organizations plan, execute, monitor and evaluate dissemination and implementation of guidelines. **Chapter 4** explores the barriers and facilitators these organizations perceive during the implementation process. The final study, presented in **Chapter 5**, offers a detailed ethnographic analysis of a Dutch central organization (an HTA agency) and its efforts to implement asthma appropriate care recommendations. Finally, **Chapter 6** offers a general discussion of the findings and methodology, and outlines implications for research, policy and practice.

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2

Stimulating implementation of clinical practice guidelines in hospital care from a central guideline organization perspective: a systematic review

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Published in Health Policy. 2024. 148:105135.

ABSTRACT

Background

The uptake of guidelines in care is inconsistent. This review focuses on guideline implementation strategies used by guideline organizations (governmental agencies, scientific/professional societies and other umbrella organizations), experienced implementation barriers and facilitators and impact of their implementation efforts.

Methods

We searched PUBMED, EMBASE and CINAHL and conducted snowballing. Eligibility criteria included guidelines focused on hospital care and OECD countries. Study quality was assessed using the Mixed Methods Appraisal Tool. We used framework analysis, narrative synthesis and summary statistics.

Results

Twenty-six articles were included. Sixty-two implementation strategies were reported, used in different combinations and ranged between 1 and 16 strategies per initiative. Most frequently reported strategies were educational session(s) and implementation supporting materials. The most commonly reported barrier and facilitator were respectively insufficient healthcare professionals' time and resources; and guideline's credibility, evidence base and relevance. Eighty-five percent of initiatives that measured impact achieved improvements in adoption, knowledge, behavior and/or clinical outcomes. No clear optimal approach for improving guideline uptake and impact was found. However, we found indications that employing multiple active implementation strategies and involving external organizations and hospital staff were associated with improvements.

Conclusion

Guideline organizations employ diverse implementation strategies and encounter multiple barriers and facilitators. Our study uncovered potential effective implementation practices. However, further research is needed on effective tailoring of implementation approaches to increase uptake and impact of guidelines.

BACKGROUND

Clinical practice guidelines are considered crucial means of improving the delivery of patient care [1]. The Institute of Medicine defined guidelines as "*statements that include recommendations intended to optimize patient care. They are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options*" [2]. Guidelines can serve different purposes. Coupled with clinical expertise of healthcare professionals and patients' circumstances, values and preferences, guidelines assist in evidence-informed clinical decision making. Furthermore, they facilitate the monitoring and evaluation of quality of care and help to identify important research gaps. Guidelines have the potential to reduce unwanted practice variation and inequality of treatment, and to support the delivery of appropriate care: no more and no less than necessary [2]. In countries facing rising costs of healthcare, ageing populations, scarcity of health care resources and negative impacts of care on environmental health, guidelines can be useful tools for managing and governing the delivery of care [3-5].

The value of guidelines is not only determined by their rigorous development methodology, but also by the extent to which they are used in daily practice [6, 7]. However, guidelines often do not find their way into local policy and practice, resulting in suboptimal patient care and wasted resources [8-13].

Guideline implementation is a complex process [14-16]. Currently, the primary responsibility for implementing guidelines and adapting clinical practice and organizational structures accordingly rests with end users, such as healthcare facilities and healthcare professionals. Existing reviews on the implementation of guidelines mainly concentrate on these locally deployed implementation initiatives at the (single) healthcare facility or professional level [17-19]. It is important to recognize that just providing guidelines and expecting end users to implement them does not guarantee uptake or improvements in healthcare practice [1, 8-13]. To foster meaningful change, additional proactive steps may be required.

There is another important actor at the forefront of the guideline implementation process that plays an important role in the implementation of guidelines: guideline organizations. This term broadly encompasses a diverse group of centrally operating (inter)national organizations that, as part of their tasks, develop, authorize and/or support the use of guidelines in clinical practice. Examples of guideline organizations are governmental agencies (i.e., the National Institute for Health and Care Excellence (NICE)), scientific/professional organizations (i.e., the American College of Physicians (ACP)) and other central umbrella organizations (i.e., the World Health Organization (WHO)). These organizations have the most substantial knowledge of the guidelines' content. They influence factors such as the target users' awareness, accessibility, understanding, acceptability and applicability of guidelines [20-22]. Furthermore, guideline organizations can actively stimulate local

implementation by using tailored dissemination and implementation strategies to address barriers to guideline implementation and optimize facilitators [22-24].

However, previous studies found that guideline organizations may feel challenged with the task of implementation. Gagliardi (2012) [20] found that many guideline organizations lack a clear implementation mandate and dedicated implementation resources. Instead, they usually delegate the task to local healthcare facilities and professionals. Furthermore, guideline organizations were found to have inconsistent approaches for choosing implementation strategies [20]. Other studies, surveying guideline organizations globally, revealed that only a small number of organizations actively stimulated the implementation of their guidelines into practice [25, 26]. Additionally, guideline organizations operate from a distant, central aggregation level, targeting a large group of end users, which makes the implementation process complex.

Given the prevailing challenges with inconsistent guideline uptake, suboptimal care provision and the existing knowledge gap, healthcare policy and practice may benefit from research into the implementation approaches of guideline organizations. Eventually, this research could inform optimal implementation efforts employed at the central level, which could provide a basis for effective implementation and use of guidelines at the local level.

To get an overview of existing scientific studies that describe and evaluate the implementation approaches of guideline organizations, this study aimed to examine their strategies to stimulate guideline implementation, as well as the barriers and facilitators they encounter. Additionally, we aimed to assess the impact of their implementation efforts. We chose to concentrate on guidelines produced for the highly regulated and complex setting of hospital care. Even though hospital care settings differ globally, such as in the provision of rehabilitation services (which may occur in hospitals or separate facilities) [27], we believe that the organization and practice composition in primary care varies even more, particularly when it comes to organizational scale [28]. Therefore, this review focused on the more universally recognizable setting of hospital care.

The following research questions were investigated:

- What strategies do guideline organizations use to stimulate implementation of guidelines in hospital care?
- What barriers and facilitators influence the implementation process?
- Do the implementation strategies lead to positive impact on guideline adoption, patient or healthcare professional knowledge, attitudes, beliefs, behavior or clinical outcomes? (effectiveness)

METHODS

A systematic review with narrative synthesis was conducted to identify studies that examined the approach of guideline organizations in stimulating implementation of guidelines in hospital care. The review was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Synthesis Without Meta-analysis (SWiM) reporting items (Appendix 1) [29, 30]. The protocol for the review was pre-registered in PROSPERO (2020: CRD42020205882).

Eligibility criteria

Studies were eligible if their primary aim was to examine the approach of guideline organizations in stimulating implementation of guidelines in local hospital care. Studies were included if they clearly described the guideline organization(s) (government, governmental agency, scientific/professional society) and their centrally driven implementation strategies.

Studies were eligible if the guidelines' topic included, but was not limited to care in the hospital setting (secondary/tertiary healthcare setting, hospital inpatient, outpatient, emergency). Furthermore, this review is limited to OECD countries.

Full-text papers published in English, French, Spanish, German or Dutch (languages in which at least one of the team members was proficient) were included. If the full-text version of a paper was unavailable, it was requested from the authors. In terms of study design, we only included empirical primary research papers. Editorial letters, conference abstracts and study protocols were excluded. Quantitative, qualitative and mixed method studies were included. The timeframe of this review was 1992 up to August 17th 2022, as in 1992 the term "evidence-based medicine" was formally introduced [31]. Appendix 2 details the inclusion and exclusion criteria.

Search strategy

PubMed, CINAHL and Embase were systematically searched. For validation of the search strategy, sequential scoping searches were conducted to test the sensitivity and specificity of the search terms. The search was conducted by a medical information specialist (LS). Search terms included controlled terms (MeSH in PubMed, CINAHL Headings and Emtree in Embase) as well as free text terms. The following terms were used (including synonyms and closely related words) as index terms or free text words: 1) 'clinical practice guideline', and 2) 'implementation' (main terms), and 3) 'adherence' (additional terms for implementation), and 4) 'barriers' or 'facilitators' or 'strategy', and 5) 'evidence-based practice'. The full search strategy is provided in Appendix 2. Reference lists of included papers and literature reviews were hand searched to identify additional papers that met the inclusion criteria (snowballing).

Study selection

Search results were managed using EndNote X9 (Clarivate[tm]). Systematic screening was conducted using Rayyan (Qatar Computing Research Institute) [32]. Both programs were used for removing duplicates. To align study selection decisions, reviewers conducted a calibration exercise, in which they reviewed at least 20 articles independently and discussed their decisions.

The systematic screening was conducted in three phases. During the initial selection phase, five reviewers (AT, TS, GW, MdB and SvS) examined the titles (and abstracts) and excluded those studies which clearly did not meet the inclusion criteria. In the second phase, the titles and abstracts of the remaining studies were more thoroughly screened against the eligibility criteria by two independent reviewers (AT, TS, GW, MdB, SvS). In the third phase, full texts were obtained and independently assessed by two reviewers (AT and TS, GW, MdB, SvS or HM), who noted reasons for exclusion. Disagreements were resolved through discussion or by additional assessment of a third reviewer (MdB, DD, IvB).

Quality assessment

We used the Mixed Methods Appraisal Tool (MMAT, V. 2018) to assess the methodological quality and risk of bias of the studies that met the inclusion criteria [33]. MMAT is a validated tool to appraise studies with a variety of study designs [34]. The tool consists of specific questions tailored to five categories of studies: qualitative research, randomized controlled trials, non-randomized studies, quantitative descriptive studies, and mixed methods studies. Each study was assessed independently by two researchers (AT, HM, MÇ) using the appropriate design-specific methodological checklist and scored on five core quality items. After completing the checklist, an overall quality appraisal score was calculated to provide a measure (ranging from 0% (none of the criteria are met) to 100% (all criteria are met)) of the quality of each study. Again, in the case of discrepancies in the quality assessment, reviewers reached consensus through discussion. Study quality was not used as an exclusion criterion because we opted to be overly inclusive and provide a thorough overview of the approach of guideline organizations in stimulating implementation of guidelines.

Data selection, analysis and synthesis

Data from included studies were extracted and analyzed by one researcher (AT). For verification, double checks and consensus discussions were performed by other members of the research team (SvS, HM, MdB, DD and IvB). We used a qualitative design for data analysis. The included articles were coded by hand, using both deductive and inductive coding. To identify patterns across the included studies, variables were systematically collected and tabulated in a data extraction template (Excel®). This template was jointly developed by the authors and continuously updated in an iterative process.

The following variables were extracted: study characteristics (country, objective(s), design, methods), guideline organization(s), targeted guideline users, setting, guideline topic, implementation planning approaches, implementation strategies, implementation period, barriers and facilitators and implementation impact. We also considered whether the recommendations in the guidelines pertained to de-implementation of low value care or implementation of appropriate care. The nature of the recommendation can influence the implementation approach, the barriers and facilitators involved, and the eventual implementation outcome [35, 36].

We used framework analysis [37] to analyze the implementation planning approaches, implementation strategies, implementation barriers and facilitators and implementation impact. Various theoretical constructs were used to guide the analysis. Firstly, previous research indicates that selecting and tailoring implementation strategies based on stakeholder engagement (e.g., patients, healthcare professionals), pre-identified barriers, and implementation theories, models, and frameworks (TMFs) can enhance guideline implementation and uptake [18, 22-24, 38]. Therefore, we specifically explored these three specific implementation planning approaches, in addition to other planning approaches used by guideline organizations.

Secondly, implementation strategies were classified according to the 'taxonomy of strategies for achieving guideline implementation and compliance' of Mazza et al. (2013) [39], that was expanded by Gagliardi and Alhabib (2015) [40]. In this taxonomy, implementation strategies are classified into five domains: professional, patient/consumer, financial, organizational and regulatory.

Thirdly, the Consolidated Framework for Implementation Research (CFIR) [41] was employed to categorize the barriers and facilitators to guideline implementation. The CFIR framework organizes barriers and facilitators into five domains: intervention characteristics, outer setting, inner setting, characteristics of individuals and process.

Lastly, to investigate the relation between the implementation approaches and reported impacts in included studies, AT extracted outcome data using data extraction and analysis methods based on the review by Peters et al. (2022) [18]. The outcomes of the included studies were categorized into seven outcome measures: 1) patient outcomes (e.g., number of ventilator-associated pneumonia cases), 2) patient knowledge, attitudes, beliefs (e.g., guideline awareness), 3) patient behavior (e.g., treatment discussion with a healthcare professional), 4) healthcare professional knowledge, attitudes, beliefs (e.g., guideline awareness) 5) healthcare professional behavior (e.g., radiographic ordering rate), 6) institutional/health system outcomes (e.g., length of hospital stay or reduced mortality), and 7) adoption of guideline (e.g., revision of existing hospital protocols based

on guideline). Outcome measures related to patient outcomes and institutional/health system outcomes are also referred to as clinical outcomes in this study.

Given the diverse study designs and outcome measures, we followed the approach of Peters et al. (2022) [18] and described impact according to three categories: positive impact – referring to studies that demonstrated improvements in all outcome indicators reported; mixed impact – studies that achieved improvements in some but not all outcome indicators reported; and no impact – studies that did not show improvement in any reported outcome indicators.

Upon examining the initial results, it became evident that it would be challenging to determine whether specific or combined implementation strategies appeared to be effective in achieving a positive impact, given the wide variety of implementation strategies, study designs and outcome measures. In response, we extracted and further analyzed the studies that exhibited significant positive impact for patients – studies that demonstrated a positive or mixed impact in clinical outcomes – as well as those that did not demonstrate any significant change in their outcome measures. We aimed to identify any discernible patterns in specific implementation approaches that either contributed to the observed positive impact or led to no discernible change.

We decided to use 'narrative' synthesis and summary statistics to describe the data, because of the heterogeneity in study designs and outcomes measured. Narrative synthesis is a validated approach to analyze and compare studies [42]. It relies primarily on the use of words to summarize, explain and 'tell the story' of the findings from the included studies [43].

RESULTS

Search results

The literature searches yielded 13,292 records. After the removal of duplicates, this number was reduced to 9,287 records (Figure 1 and Appendix 2). We excluded 8,538 clearly irrelevant records in the first selection phase and double screened 749 records in the second phase. In the third phase, 255 full-text articles were assessed and 239 articles were excluded due to a variety of reasons described in the PRISMA flow diagram, such as the absence of a formal guideline. Ten articles were added through snowballing. As a result, 26 studies were eligible for review.

Quality assessment

Quality assessment scores using the MMAT ranged from 0% (zero criteria met) to 100% (five criteria met). The mean score was 2.8 out of 5 criteria. Two studies scored 0% on

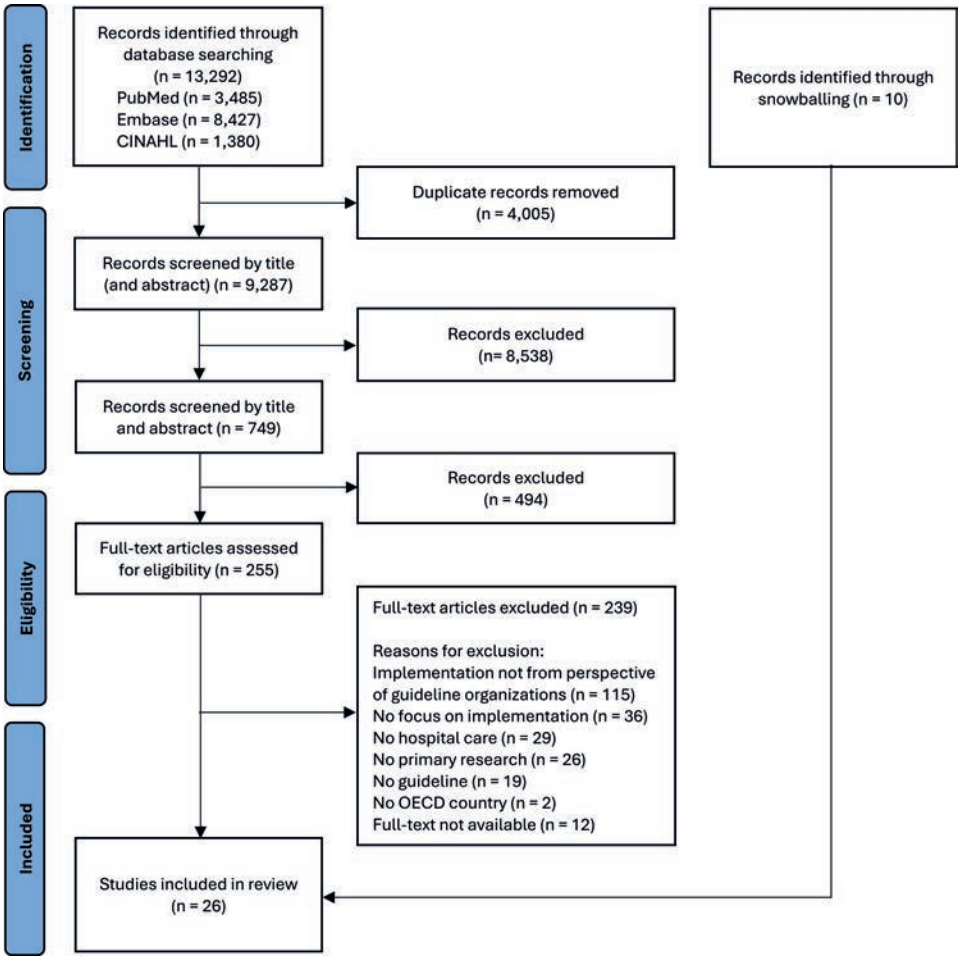

Figure 1. PRISMA flow diagram of search results.

the criteria, six studies scored 20%, three studies scored 40%, three studies scored 60%, eight studies scored 80% and four studies scored 100%. The quality assessment for each study is presented in Appendix 3.

Characteristics of included studies

Of the 26 included studies, most studies were conducted in the USA (9, 34.6%), followed by Canada (7, 26.9%). We included four studies (15.4%) in which different (inter)national guideline organizations were interviewed or the implementation initiative concerned an international guideline. Regarding study designs, most studies involved a before-and-after study (11, 42.3%), qualitative study (4, 15.4%) or time series study (4, 15.4%). With respect to study objectives, most studies focused on measuring the progress

and impact of guideline implementation strategies (17, 65.4%), followed by studies reporting on implementation approaches (6, 23.1%) and studies comparing the effect of different implementation strategies (3, 11.5%), e.g., conventional versus advanced implementation strategies. Fifty percent (13) of the studies described implementation initiatives involving multiple guideline organizations. In 34.6% (9) of the studies, only one guideline organization supported implementation. Three studies (11.5%) described implementation of the same guideline, but in different areas. Initiatives targeted ≥4 hospitals (and sometimes included other end users such as general practices) and guidelines described a wide range of disease topics. Four studies (15.4%) concerned guideline recommendations targeting implementation of appropriate care. One study (3.8%) addressed guidelines containing recommendations for both implementing appropriate care and de-implementing low-value care. One study (3.8%) focused on

Table 1. Characteristics of included studies

Study, country	Objective	Study design, methods
Gagliardi (2012) [20] Finland, Australia, UK, USA, Canada, Netherlands, New Zealand, Global (WHO)	Learn about the implementation capacity and activities of representatives from guideline development agencies, and solicit their recommendations for improving implementation capacity or for alternative approaches by which to promote guideline use	Qualitative, interviews
Morgan et al. (2013) [44] Estonia, France, Germany, Ireland, Italy, Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, UK	Assess countries in Europe in terms of their progress in implementation of the 4th Joint Societies Task Force guidelines	Qualitative, interviews (and questionnaires)
Palmer et al. (2018) [45] Canada	Explore the processes through which quality-based procedures were implemented in hospitals and how these processes could be supported and enhanced in the future	Qualitative, interviews

de-implementation of low-value care. Twenty studies (76.9%) did not specify whether their guideline recommendations concerned implementation of appropriate care or de-implementation of low-value care (Table 1).

Implementation planning approaches and implementation strategies

Included studies reported different planning approaches to select and tailor implementation strategies. Sixteen studies (61.5%) reported in total seven different implementation planning approaches. The most commonly reported implementation approaches were 1) use of theories, models and frameworks (ten studies, 38.5%), 2) stakeholder engagement (six studies, 23.1%), and 3) pre-identification of barriers and facilitators (five studies, 19.2%). Ten studies (38.5%) did not describe implementation planning approaches. An overview of the implementation planning approaches is provided in Table 2.

Guideline organization(s)	**Targeted guideline users/setting | guideline topic | guideline recommendation involves implementation of appropriate care or de-implementation of low value care**
30 representatives of guideline development agencies: 12 from governmental agencies (including the WHO) and 18 from professional societies	*Targeted guideline users/setting not specified* Variety of disciplines (i.e. anesthesiology, cardiology, neurology, nursing, psychiatry, radiology, urology) and clinical indications (i.e. cancer, hypertension, osteoporosis, stroke, etc.) *Implementation/de-implementation not specified*
Guideline developer: 4th Joint Task Force of the ESC together with 9 cardiovascular disease prevention societies and invited experts. National guideline organizations: 4 national coordinators, 9 cardiac societies, 11 heart foundations, 8 health ministries, 3 health service agencies/inspectorates	*Targeted guideline users/setting not specified* ESC guideline on cardiovascular disease prevention in clinical practice *Implementation/de-implementation not specified*
12 policy designers: provincial government, together with provincial advisor organization on quality of healthcare, disease-oriented agencies and technical expert advisory panels including leading clinicians, scientists and patients. 11 adoption supporters: individuals in external organizations supporting QBP adoption and hospital implementers	22 hospital implementers from 5 hospitals Primary hip and knee replacement, cataract, chronic kidney disease, chronic obstructive pulmonary disease, congestive heart failure, stroke, non-cardiac vascular surgery, systemic chemotherapy, gastrointestinal endoscopy, hip fracture, pneumonia, tonsillectomy, neonatal jaundice *Implementation/de-implementation not specified*

Table 1. (continued)

Study, country	Objective	Study design, methods
Higuchi et al. (2013) [46] Canada	Examine the activities and resource implications for the initial cohort of healthcare facilities involved in the introduction of multiple nursing guidelines as part of the RNAO BPSO initiative	Qualitative, content analysis of narrative data
Jain et al. (2006) [47] Canada	Compare the effectiveness of active to passive dissemination of the Canadian clinical practice guidelines for nutrition support for the mechanically ventilated critically ill adult patient	Cluster-randomized trial with a cross-sectional outcome assessment, survey
Hayes et al. (2002) [48] USA	Compare the effect of written feedback alone with that of feedback accompanied by other quality improvement strategies on improvements in the management of Medicare inpatients with congestive heart failure	Randomized controlled trial, medical record data and interviews
Levy et al. (2010) [49] 30 countries in Europe, North America, South America	Describe the Surviving Sepsis Campaign, its implementation, and reports its impact on process improvement and patient outcomes	Observational time series study, patient data
Cooney et al. (2004) [50] Australia	Evaluate the immediate impact of national evidence-based guidelines about colorectal cancer on Australian surgeons' self-reported practice and their deficits in awareness of scientific evidence underpinning clinical management practices	Observational uncontrolled before-and-after study, surveys

Guideline organization(s)	Targeted guideline users/setting | guideline topic | guideline recommendation involves implementation of appropriate care or de-implementation of low value care
RNAO	7 healthcare facilities, including 4 hospitals Variety of practice areas in nursing (i.e. pain, pressure ulcers, client-centered care, establishing therapeutic relationships, etc.) *Implementation/de-implementation not specified*
Canadian Critical Care Practice Guidelines Committee, i.e. Canadian Critical Care Society, Dietitians of Canada, Canadian Association of Critical Care Nurses, Nestle Canada	58 intensive care units Nutrition support for the mechanically ventilated critically ill adult patient *Implementation/de-implementation not specified*
Guideline developers: Agency for Healthcare Research and Quality, ACC and the American Heart Association. Guideline implementers: Kerr L. White Institute for Health Services Research, Colorado Foundation for Medical Care, Medicare Quality Improvement Organization (Qualidigm), Georgia Medical Care Foundation and Oklahoma Foundation for Medical Quality	32 hospitals Congestive heart failure *Implementation/de-implementation not specified*
European Society of Intensive Care Medicine, the International Sepsis Forum, and the Society of Critical Care Medicine	165 hospitals Management of severe sepsis and septic shock *Implementation/de-implementation not specified*
Guideline developer: Australian National Health and Medical Research Council. Guideline implementation initiator: National Cancer Control Initiative	114 surgeons Colorectal cancer *Implementation/de-implementation not specified*

Table 1. (continued)

Study, country	Objective	Study design, methods
Eriksen et al. (2017) [51] Sweden	Present the 'Wise List' (formulary of essential medicines for primary and specialized care in Stockholm Healthcare Region) and assess adherence to the recommendations over a 15-year period	Retrospective time series study, prescription data
Berenholtz et al. (2011) [52] USA	Evaluate the impact of a multifaceted intervention on compliance with evidence-based therapies and on VAP rates	Uncontrolled before-and-after study, patient data
DePalo et al. (2010) [53] USA	Outline the development and implementation of the Rhode Island ICU Collaborative and report on the reductions in CLABSI and VAP	Uncontrolled before-and-after study, patient data
Holroyd et al. (2004) [54] Canada	Determine the effectiveness in reducing extremity radiography use of various implementation strategies for the dissemination of the Ottawa Ankle Rules	Quasi-experimental controlled trial using a time-series approach of sequential controlled interventions, medical record data
Slattery et al. (2015) [55] Australia	Assess the impact of a multi-component practice-change intervention on the provision of smoking cessation care to nicotine-dependent smokers across a network of Australian hospitals	Interrupted time series study, medical record data
Tabbers et al. (2010) [56] Netherlands	Investigate fluid prescribing behavior at guideline development, after guideline development and after active implementation and identify potential barriers and facilitators for guideline implementation	Observational uncontrolled before-and-after study, surveys, pharmaceutical data and medical record data

Guideline organization(s)	Targeted guideline users/setting | guideline topic | guideline recommendation involves implementation of appropriate care or de-implementation of low value care
Stockholm Drug and Therapeutics Committee	All outpatient care in the Stockholm Healthcare Region, including 7 emergency hospitals Formulary of recommended core medicines (between 175 and 212 substances) for 24 therapeutic areas Both implementation and de-implementation
Johns Hopkins University Quality and Safety Research Group, Keystone Center for Patient Safety and Quality, founded by Michigan Health and Hospital Association	112 intensive care units from 72 hospitals VAP *Implementation/de-implementation not specified*
Rhode Island Quality Institute, Quality Partners of Rhode Island and the Hospital Association of Rhode Island	23 intensive care units from 11 acute care hospitals CLABSI and VAP *Implementation/de-implementation not specified*
Alberta Medical Association	4 hospitals Ottawa Ankle Rules *Implementation/de-implementation not specified*
Health district organization	8 hospitals Smoking cessation Implementation
Dutch Pediatric Society	Heads of pediatric and neonatal intensive care units First-choice fluid for resuscitation in hypovolemia Implementation

Table 1. (continued)

Study, country	Objective	Study design, methods
Mehta et al. (2002) [57] USA	Measure the effects of a quality improvement project on adherence to evidence-based therapies for patients with acute myocardial infarction	Observational controlled before-and-after study, medical record data
Mehta et al. (2004) [58] USA	Evaluate if by focusing on process changes and tool use rather than key indicator rates, the use of evidence-based therapies in patients with acute myocardial infarction would increase	Uncontrolled before-and-after study, medical record data
Eagle et al. (2005) [59] USA	Assess the impact of the ACC's Guidelines Applied in Practice for acute myocardial infarction	Uncontrolled before-and-after study, medical record data
Kryworuchko et al. (2009) [25] Canada	Report how guidelines were developed, disseminated and evaluated in Canada between 1994 and 2005	Descriptive study, surveys
Burgers et al. (2003) [60] Australia, USA, Canada, Sweden, Denmark, Italy, Finland, England, Scotland, France, Germany, Netherlands, New Zealand	Describe the structures and working methods of current guideline programs in different countries throughout the world, covering the entire scope of guideline development, dissemination, implementation, and evaluation	Descriptive study, surveys
Davies et al. (2008) [61] Canada	Document the process of best practice guideline implementation by topic, to describe facilitators and barriers to implementation and to determine the impact of indicators related to process and patient outcomes	Mixed methods uncontrolled before-and-after study, medical record data and interviews

Guideline organization(s)	Targeted guideline users/setting | guideline topic | guideline recommendation involves implementation of appropriate care or de-implementation of low value care
ACC, Michigan Peer Review Organization, Greater Detroit Area Health Council	10 hospitals Acute myocardial infarction *Implementation/de-implementation not specified*
Michigan Peer Review Organization, Greater Flint Health Coalition, ACC	5 hospitals Acute myocardial infarction *Implementation/de-implementation not specified*
Michigan Peer Review Organization, Medicare Quality Improvement Organization for Michigan, local health coalitions, ACC	33 hospitals Acute myocardial infarction *Implementation/de-implementation not specified*
96 guideline developers: national professional organizations (e.g. Canadian Medical Association), para-government (e.g. Cancer Care Ontario), government (e.g. Health Canada) or provincial licensing bodies (e.g. College of Physicians and Surgeons of Manitoba)	*Targeted guideline users/setting not specified* *Guideline topics not specified* *Implementation/de-implementation not specified*
9 professional societies (e.g. Scottish Intercollegiate Guidelines Network), 6 governmental agencies (e.g. National Health and Medical Research Council), 2 national/ central but not governmental (New Zealand Guidelines Group), 1 academic institution (Centre for Health Services Research of University of Newcastle-upon-Tyne)	Specified per program (i.e. physicians, nurses, patients, healthcare facilities, hospitals) *Guideline topics not specified* *Implementation/de-implementation not specified*
RNAO	11 healthcare facilities including 4 acute care teaching hospitals, 2 community hospitals, 1 chronic care hospital and 1 mental health teaching hospital Nursing: asthma, breastfeeding, delirium-dementia-depression, foot complications in diabetes, smoking cessation and venous leg ulcers *Implementation/de-implementation not specified*

Table 1. (continued)

Study, country	Objective	Study design, methods
Urquhart et al. (2019) [62] Canada	Describe the intrinsic elements known to influence guideline use; identify the ways in which guidelines are implemented; and explore how guideline elements and contextual factors influence implementation and use	Mixed methods study, content analysis and interviews
Gupta et al. (2021) [63] USA	Evaluate the adoption, implementation, and reach of pediatric inpatient asthma pathways across a group of USA hospitals	Mixed methods study, medical record data, surveys and observations
McLaws et al. (2009) [64] Australia	Describe improvements in hand hygiene compliance after a statewide hand hygiene campaign conducted in New South Wales public hospitals	Observational uncontrolled before-and-after study, observations
Narayanaswami et al. (2015) [65] USA	Develop a dissemination strategy by adding social media-based dissemination methods to traditional methods for the Complementary and alternative medicine in multiple sclerosis guideline and evaluate whether the addition of social media outreach improves guideline awareness and knowledge, and affects implementation of those recommendations	Observational uncontrolled before-and-after study, surveys
Bhushan et al. (2016) [66] USA	Determine if Translating Evidence into Practice sessions were effective at enabling dermatologists to improve patient care	Observational uncontrolled before-and-after study, surveys

Guideline organization(s)	Targeted guideline users/setting | guideline topic | guideline recommendation involves implementation of appropriate care or de-implementation of low value care
Provincial cancer agency and a provincial cancer screening program	Oncologists/hematologists, nurse, psychosocial oncology team, manager Adult cancer *Implementation/de-implementation not specified*
American Academy of Pediatrics Value in Inpatient Pediatrics network	68 hospitals Asthma Implementation
Clinical Excellence Commission and New South Wales Department of Health	208 hospitals Hand hygiene compliance Implementation
American Academy of Neurology	Neurologists/neurology advanced practice provider with focus in MS practice, patients with MS/caregivers of patients with MS Complementary and alternative medicine in multiple sclerosis *Implementation/de-implementation not specified*
American Academy of Dermatology	Dermatologists Management of psoriasis and psoriatic arthritis *Implementation/de-implementation not specified*

Table 1. (continued)

Study, country	Objective	Study design, methods
Verkerk et al. (2022) [67] The Netherlands	Identify lessons for reducing low-value care by looking at the effects of 8 de-implementation projects, the barriers and facilitators that emerged and the experiences with the different components of the projects	Process evaluation, quantitative outcome data, qualitative analysis logbooks, reports and interviews

Abbreviations: ACC: American College of Cardiology, BPSO: Best Practice Spotlight Organization®, CLABSI: Central line-associated bloodstream infection, ESC: European Society of Cardiology, RNAO: Registered Nurses' Association of Ontario, VAP: ventilator-associated pneumonia

Overall, 62 different implementation strategies were reported. Not all implementation strategies reported in the studies fit in the modified taxonomy of Mazza et al. (2013) [39]. When strategies were not found in the modified taxonomy, they were classified and added. We also added a new domain, 'central', to the five existing domains, as we were not able to classify the implementation strategies that guideline organizations applied at the central aggregation level in the original taxonomy. Implementation initiatives described in the studies mostly used multifaceted rather than single implementation strategies: on average nine strategies per initiative were used (range 1 to 16 strategies). Combinations of active and passive implementation strategies were used. The most frequently reported implementation strategies were 1) educational session(s) (16 studies, 61.5%), 2) provision of additional implementation supporting materials (15 studies, 57.7%), and 3) website publications (14 studies, 53.8%). A complete overview of the implementation strategies reported can be found in Appendix 4.

Implementation barriers

Eighteen studies (69.2%) reported in total 72 implementation barriers. Guideline organizations experienced implementation barriers in all five domains of the CFIR taxonomy [41]. Barriers related to governance and commercial interests could not be classified using the original CFIR taxonomy and were therefore added to the outer setting domain. The most frequently reported barrier was insufficient healthcare professionals' time and resources (six studies, 23.1%). The second most frequently reported barriers were lack of belief in effectiveness of guideline; staff's resistance and lack of buy-in; changes

Guideline organization(s)	Targeted guideline users/setting | guideline topic | guideline recommendation involves implementation of appropriate care or de-implementation of low value care
Netherlands Federation of University Medical Centers, funded by the Dutch Ministry of Health, Welfare and Sport. Advisory board: representatives of the Dutch National Health Care Institute, Dutch College of General Practitioners, Dutch Association of Medical Specialists, Health Insurers Netherlands, Netherlands Patients Federation, Dutch professional association of nurses and caregivers, Citrien Fund	40 hospitals Various topics: surveillance CT scans for patients cured of lymphoma, knee arthroscopies and MRIs for orthopedic patients >50 years, intravenous and urinary catheters, diagnostic laboratory tests, surveillance visits for patients cured for basal cell carcinoma, upper gastrointestinal endoscopies for dyspeptic patients De-implementation

in appointed hospital implementation staff; and staff's resistance to using components of implementation supporting material (four studies, 15.4%). Eight studies (30.8%) did not report any implementation barriers. A comprehensive overview of the reported implementation barriers can be found in Appendix 5.

Implementation facilitators

Sixteen studies (61.5%) reported in total 42 implementation facilitators. Guideline organizations experienced implementation facilitators in all five domains of the CFIR taxonomy [41]. Most implementation facilitators were related to the inner setting and process domains. The most frequently mentioned facilitators concerned 1) Guideline's (perceived) credibility, evidence base and relevance to practice, and 2) Engagement of hospital CEOs, managers and administration increases resources and support for implementation. Ten studies (38.5%) did not report any implementation facilitators. A comprehensive overview of the reported implementation facilitators, classified according to CFIR [41], can be found in Appendix 6.

Impact on adoption, knowledge, behavior and clinical outcomes

The implementation outcomes measured by included studies are shown in Table 3. Most studies (14, 53.8%) reported more than one outcome measure. Overall, the majority of studies (17, 65.3%) showed mixed results (improvement in some but not all outcome indicators) in at least one of their outcome measures. Seven studies (26.9%) achieved positive results in at least one of their outcome measures, with two studies reporting

Table 2. Implementation planning approaches used in included studies.

Implementation planning approaches	Studies	Total studies n, (%)
Theories, models, frameworks used (e.g. plan-do-study-act cycle, Grol & Wensing Implementation of Change model, Rogers' innovation-decision process, principles of social marketing, RE-AIM)	Higuchi et al. (2013) [46], Jain et al. (2006) [47], Eriksen et al. (2017) [51], Berenholtz et al. (2011) [52], Mehta et al. (2002) [57], Mehta et al. (2004) [58], Eagle et al. (2005) [59], Davies et al. (2008) [61], Gupta et al. (2021) [63], Verkerk et al. (2022) [67]	10 (38.5%)
Stakeholder engagement (e.g. patients, healthcare professionals)	Cooney et al. (2004) [50], Berenholtz et al. (2011) [52], DePalo et al. (2010) [53], Tabbers et al. (2010) [56], Gupta et al. (2021) [63], Verkerk et al. (2022) [67]	6 (23.1%)
Barriers (and facilitators) pre-identified	Tabbers et al. (2010) [56], Mehta et al. (2004) [58], Eagle et al. (2005) [59], Davies et al. (2008) [61], Verkerk et al. (2022) [67]	5 (19.2%)
Replication/adaption of successful similar project	DePalo et al. (2010) [53], Mehta et al. (2004) [58], Eagle et al. (2005) [59]	3 (11.5%)
Based on effective implementation strategies from other scientific studies	Jain et al. (2006) [47], Slattery et al. (2015) [55]	2 (7.7%)
Based on advice from guideline developer	Morgan et al. (2013) [44]	1 (3.8%)
Based on guideline characteristics	Gagliardi (2012) [20]	1 (3.8%)

Ten studies (38.5%) did not describe implementation planning approaches: Palmer et al. (2018) [45], Hayes et al. (2002) [48], Levy et al. (2010) [49], Holroyd et al. (2004) [54], Kryworuchko et al. (2009) [25], Burgers et al. (2003) [60], Urquhart et al. (2019) [62], McLaws et al. (2009) [64], Narayanaswami et al. (2015) [65] and Bhushan et al. (2016) [66].

achieving positive results in all of their outcome measures [52, 56]. Three studies reported negative effects in one or two of their outcome indicators, but showed overall mixed impact or no change in their outcome measures [50, 61, 67]. The most frequently reported impact was healthcare professionals' behavior (e.g., radiographic ordering rate) (18, 69.2%). Seven studies (26.9%) did not measure adoption, knowledge, behavior or clinical outcomes.

Studies with mixed/positive impact in clinical outcomes and studies with no significant change

Given the diverse combinations and extensive range of implementation strategies and the vast array of study designs and outcome measures in included studies, it became apparent that determining the effectiveness of particular or bundled implementation strategies in producing positive impact was not feasible. Therefore, we extracted and further analyzed the studies that exhibited significant positive impact for patients (as indicated by positive or mixed impact in clinical outcome measures), as well as those that did not demonstrate any significant change in their outcome measures. An overview of the six studies with mixed/positive impact and the three without significant change can be found in Table 4.

Upon analyzing patterns among these studies, it was observed that the number of implementation strategies applied in the studies with mixed/positive impact exceeded the overall average of nine strategies, whereas the studies without significant change reported three to nine strategies. Two exceptions were found, namely the mixed/positive studies of DePalo et al. (2010) [53] and the passive dissemination arm in the study of Jain et al. (2006) [47], that reported eight and one strategy respectively. All mixed/positive impact studies, except the passive dissemination arm in the study of Jain et al. (2006) [47], used combinations of active and passive implementation strategies. On the other hand, all studies without significant change employed passive implementation strategies. There was some overlap in specific implementation strategies. Educational session(s) and provision of implementation supporting materials were reported by five of the mixed/positive impact studies. However, these strategies were among the most commonly reported overall and they were also employed in all studies without significant change. We did find that the strategies 'provide/request protocol' and 'inform/involve management in implementation' were not reported by the studies without significant change and were less commonly used in the entire review, but were reported by four of the mixed/positive impact studies.

Among the mixed/positive impact studies, ten out of thirty reported facilitators related to support from (indirectly) involved internal hospital colleagues/departments (such as administration and management) or external organizations. None of the studies without significant change referred to such facilitators. We could not find patterns in reported implementation planning approaches, barriers or implementation periods.

Table 3. Outcome measures and type of impact reported in included studies.

Target group	Outcome measures	
		Positive (all reported outcome indicators improved)
Patients	Patient outcomes (e.g., number of ventilator-associated pneumonia cases)	Berenholtz et al. (2011) [52]
	Knowledge, attitudes, beliefs (e.g., guideline awareness)	
	Behavior (e.g., discuss use of treatment with health professional)	
Healthcare professionals	Knowledge, attitudes, beliefs (e.g., guideline awareness)	Tabbers et al. (2010) [56]
	Behavior (e.g., radiographic ordering rate)	Levy et al. (2010) [49], Berenholtz et al. (2011) [52], DePalo et al. (2010) [53], Tabbers et al. (2010) [56]
	Institutional/health system outcomes (e.g., length of hospital stay or reduced mortality)	Levy et al. (2010) [49]
Hospitals	Adoption of guideline (e.g., revision of existing hospital protocols based on guideline)	Hayes et al. (2002) [48], Eagle et al. (2005) [59], Mehta et al. (2004) [58]
	Total studies (n, %)*	7 (26.9%)

This table is based on the study of Peters et al. (2022) [18]. Seven studies (26.9%) did not describe any of above outcome measures and were excluded from this analysis: Gagliardi (2012) [20], Morgan et al. (2013) [44], Palmer et al. (2018) [45], Higuchi et al. (2013) [46], Kryworuchko et al. (2009) [25], Burgers et al. (2003) [60], and Urquhart et al. (2019) [62]
* Percentages do not add up to 100% as several studies measure more than one type of outcome measure.

	Type of impact reported in included study | Studies	
	Mixed (some reported outcome indicators improved)	**No change (no outcome indicators improved)**
	Levy et al. (2010) [49], Eagle et al. (2005) [59], DePalo et al. (2010) [53], Davies et al. (2008) [61], Jain et al. (2006) [47], Verkerk et al. (2022) [67]	
	Narayanaswami et al. (2015) [65]	
		Narayanaswami et al. (2015) [65]
	Cooney et al. (2004) [50], Narayanaswami et al. (2015) [65], Bhushan et al. (2016) [66]	
	Jain et al. (2006) [47], Hayes et al. (2002) [48], Eriksen et al. (2017) [51], Slattery et al. (2015) [55], Mehta et al. (2002) [57], Mehta et al. (2004) [58], Eagle et al. (2005) [59], Davies et al. (2008) [61], Gupta et al. (2021) [63], McLaws et al. (2009) [64], Bhushan et al. (2016) [66], Verkerk et al. (2022) [67]	Holroyd et al. (2004) [54], Narayanaswami et al. (2015) [65]
	Eagle et al. (2005) [59]	Jain et al. (2006) [47], Gupta et al. (2021) [63], Verkerk et al. (2022) [67]
	Mehta et al. (2002) [57], Gupta et al. (2021) [63]	
	17 (65.3%)	5 (19.2%)

Table 4. Studies with mixed/positive impact in clinical outcomes and studies without significant change

Study	Outcomes	Implementation planning approaches, implementation period and implementation strategies
Studies that showed mixed/positive impact for patients		
Levy et al. (2010) [49]	I/HS: 1/1 outcome indicators improved sig. (100%) P: 3/4 outcome indicators improved sig. (75%) HPB: 6/6 outcome indicators improved sig. (100%)	*Implementation planning approach not specified* 24 months Total 15 implementation strategies Posters, pocket cards, newsletter, website publication, educational session(s), education material, data application for audit & feedback, champions, create network of champions, implementation supporting materials, workshop about implementation, coaching/consultation about implementation, tool to allow teams to collaborate across sites, provide/request protocol, use of evidence-base tools to enhance quality of guideline
Eagle et al. (2005) [59]	I/HS: 5/7 outcome indicators improved sig. (71.4%) P: 1/7 outcome indicators improved sig. (14.3%) HPB: 10/15 outcome indicators improved sig. (66.7%) AoG: 6/6 outcome indicators improved sig. (100%)	Implementation planning approaches: TMFs used, replication/adaption of successful similar project, barriers pre-identified 4 months Total 10 implementation strategies pocket cards, presenting guideline at meetings, educational session(s), provide feedback on organization outcomes, champions, implementation supporting material, patient version, recruit local implementation team, inform/involve management in implementation, request improvement plan

	Barriers	Facilitators
	No barriers reported	*No facilitators reported*
	Total 8 barriers Insufficient healthcare professionals' time and resources, healthcare professionals' lack of guideline knowledge, staff's resistance to using implementation supporting material, staff's refusal to do 'cookbook medicine', staff's resistance and lack of buy-in, late provision of implementation supports to hospitals, lack of skilled implementation staff, lack of knowledge because not all staff attended education sessions	Total 14 facilitators Use already existing meeting structures, healthcare professionals' willingness to work together, organizational readiness, engagement of hospital CEOs, managers and administration increases resources and support for implementation, health professional interaction and development multidisciplinary teams, collaborative and motivated implementation team, community stakeholder involvement, healthcare professional implementation leadership, opinion leaders assisted in identifying barriers and implementation, opinion leaders external visibility, champions' project ownership, supportive external quality improvement agencies, effective implementation supporting material, perceived valid hospital-specific feedback

Table 4. (continued)

Study	Outcomes	Implementation planning approaches, implementation period and implementation strategies
Berenholtz et al. (2011) [52]	P: 2/2 outcome indicators improved sig. (100%) HPB: 5/5 outcome indicators improved sig. (100%)	Implementation planning approaches: TMFs used, stakeholder engagement 33 months Total 16 implementation strategies Website publication, academic detailing, educational session(s), education material, provide feedback on guideline compliance, provide feedback on patient outcomes, provide feedback on organization outcomes, suggest indicators/provide feedback data, implementation supporting material, coaching/consultation about implementation, workshop on safety culture/communication/teamwork, financial incentive for compliance (hospital), recruit local implementation team, inform/involve management in implementation, request commitment statement of management, provide/request protocol
DePalo et al. (2010) [53]	P: 1/2 outcome indicators improved sig. (50%) HPB: 1/1 outcome indicators improved sig. (100%)	Implementation planning approaches: replication/adaptation of successful similar project, stakeholder engagement 30 months Total 8 implementation strategies educational session(s), provide feedback on patient outcomes, champions, financial incentive for compliance (hospital), recruit local implementation team, tool to allow teams to collaborate across sites, inform/involve management in implementation, request commitment statement of management

Barriers	Facilitators
Total 2 barriers Hard to reach all staff at hospitals, more resources and less barriers if leaders were more structurally engaged	Total 6 facilitators Guideline's (perceived) credibility, evidence base and relevance to practice, insurer supports and gives incentives for guideline implementation, efforts to improve culture/communication/teamwork, distinct improvement teams were in it together, engagement of hospital CEOs, managers and administration increases resources and support for implementation, perceived valid hospital-specific feedback
No barriers reported	Total 2 facilitators Strong infrastructure of collaborative external organizations to support guideline implementation, searching support from congressmen

Table 4. (continued)

Study	Outcomes	Implementation planning approaches, implementation period and implementation strategies
Davies et al. (2008) [61]	P/HPB [a]: 47/132 outcome indicators improved sig. (35.6%)	Implementation planning approaches: barriers and facilitators pre-identified, TMFs used 12 months Total 10 implementation strategies presenting guideline at meetings, educational session(s), education material, implementation supporting material, coaching/consultation about implementation, tool to allow teams to collaborate across sites, inform/involve management in implementation, request improvement plan, provide/request protocol, assign best practice organization
Jain et al. (2006) [47]	Active dissemination arm: I/HS: 0/3 outcome indicators improved sig. (0%) P: 3/3 outcome indicators improved sig. (100%) HPB: 3/12 outcome indicators improved sig. (25%) Passive dissemination arm: I/HS: 0/3 outcome indicators improved sig. (0%) P: 0/3 outcome indicators improved sig. (0%) HPB: 3/12 outcome indicators improved sig. (25%)	Implementation planning approaches: TMFs used, based on effective implementation strategies from other scientific studies 12 months Active dissemination strategies: total 13 strategies Mass mailing, posters, pocket cards, website publication, train-the-trainer implementation strategy, provide feedback on patient outcomes, suggest indicators/provide feedback data, champions, implementation supporting material, coaching/consultation about implementation, request improvement plan, provide/request protocol, guideline pilot testing Passive dissemination strategies: total 1 strategy mass mailing

	Barriers	Facilitators
	Total 13 barriers Patients refuse care, additional costs for patients, patient motivation, lack of support from colleagues, timing of project/lost momentum, competing priorities/competitive demands, lack of management support, insufficient healthcare professionals' time and resources, lack of belief in effectiveness guideline, professional's lack of confidence/skill to execute guideline, staff's resistance and lack of buy-in, changes in appointed hospital implementation staff, Less suitable champions chosen as they left the job	Total 8 facilitators Involvement of multiple stakeholders, teamwork and collaboration, engagement of hospital CEOs, managers and administration increases resources and support for implementation, staff replacement time to attend educational sessions, availability of medical supplies to comply to guidelines, supportive external quality improvement agencies, effective education sessions/materials, support/consultation from guideline organization
	Total 2 barriers High costs for implementation strategies versus unclear efficacy, less suitable champions chosen as they were not nominated by local peers	*No facilitators reported*

Table 4. (continued)

Study	Outcomes	Implementation planning approaches, implementation period and implementation strategies
Studies without significant change in impact outcomes		
Verkerk et al. (2022) [67] (project 2)	HPB: 0/1 outcome indicators improved sig. (0%)	Implementation planning approaches: stakeholder engagement, barriers and facilitators pre-identified, TMFs used 12 months Total 3 implementation strategies educational session(s), patient information form, conference presentation
Verkerk et al. (2022) [67] (project 3)	HPB: 0/2 outcome indicators improved sig. (0%)	Implementation planning approaches: stakeholder engagement, barriers and facilitators pre-identified, TMFs used 8 months Total 4 implementation strategies educational session(s), patient information form, champions, provide feedback on guideline compliance
Holroyd et al. (2004) [54]	Active dissemination arm: HPB: 0/3 outcome indicators improved sig. (0%) Passive dissemination arm: HPB: 0/1 outcome indicators improved sig. (0%)	*Implementation planning approach not specified* 19 months Active dissemination arm: total 9 strategies Mass mailing, posters, pocket cards, newsletter, website publication, academic detailing, educational session(s), provide feedback on guideline compliance, opinion leader Passive dissemination arm: total 6 strategies Mass mailing, posters, pocket cards, newsletter, website publication, educational session(s)

Abbreviations: I/HS: institutional/health system outcomes, P: patient outcomes, HPB: healthcare professional behavior, AoG: adoption of guideline, sig.: statistically significant, TMF: theory/model/framework.

[a] The article does not specify which outcomes are patient and which outcomes are healthcare professional behavioral outcomes.

	Barriers	Facilitators
	Total 4 barriers Hard to reach all staff at hospitals, staff's resistance to using components of implementation supporting material, patients' expectations challenge implementation, fear of reduced revenue	Total 2 facilitators Effective education sessions, healthcare professional interaction
	Total 9 barriers Hard to reach all staff at hospitals, staff's resistance to using components of implementation supporting material, less suitable champions chosen as they left the job or did not work closely with end users, lack of belief in effectiveness of guideline, staff's resistance and lack of buy-in, uncertain applicability of evidence to patient subpopulation, fear of reduced revenue, expectations of patient (environment) challenge implementation, conflicts between different guidelines/protocols on same topic	Total 2 facilitators Effective education sessions, knowledge of potential harm, benefit and costs
	Total 5 barriers Practice setting was not preconditioned to change, practice pressure from overcrowding, fear of litigation, fear of going against patients' expectations/wishes, old habits and routines	Total 1 facilitator Guideline's (perceived) credibility and evidence base

DISCUSSION

This review examined centrally driven initiatives by guideline organizations aimed at stimulating local implementation. This is distinct from existing reviews on guideline implementation, which primarily concentrate on locally driven implementation initiatives at the individual healthcare facility or healthcare professional level [17-19]. This review shows the implementation planning approaches and implementation strategies that guideline organizations used at the central level, explored the implementation barriers and facilitators they encountered and assessed the impact of these central efforts. Twenty-six studies published between 1992 and August 2022 describing multi-hospital implementation initiatives were analyzed in this review.

With respect to implementation planning approaches, guideline organizations were found to have inconsistent approaches for choosing implementation strategies, which is in line with previous research [20]. Thirty-nine percent of studies used theories, models or frameworks, 23% reported engaging patients or healthcare professionals in the planning process and 19% of studies pre-identified barriers (and facilitators) to implementation. These are all implementation planning approaches of which it is known that they can promote uptake and impact of guidelines through selection and tailoring implementation strategies [18, 22-24, 38]. In 39% of the studies analyzed, the basis for the decisions made regarding the implementation strategies remained unclear. Moreover, even when implementation planning approaches were mentioned, the way in which these approaches were applied and informed the design of their specific implementation strategies was often not made explicit. Questions rise about how and why guideline organizations choose their implementation strategies and the extent to which the available knowledge on optimizing guideline implementation and uptake is effectively integrated into the decision-making processes of guideline organizations. In the recent review of Peters et al. (2022) [18], it was observed that efforts to select and tailor guideline implementation strategies were more informed by implementation planning approaches compared to their earlier review in 2015 [40]. This could be attributed to greater awareness of the accumulated research on the optimization of implementation efforts [24]. However, further inquiry is needed to determine how the knowledge utilization of guideline implementation methods by guideline organizations can be improved.

With respect to implementation strategies, a large number of different strategies were employed: 62 in total. There were also large differences in the number of strategies per implementation project (mean 9 strategies, range 1 to 16 strategies) and in reported combinations of strategies. The most frequent strategies were educational session(s), provision of additional implementation supporting materials and website publication(s). Previous reviews on guideline implementation did not solely focus on the role of guideline

organizations, but also included local hospital implementation initiatives. These reviews also found large differences in types, numbers and combinations of implementation strategies employed [17-19]. Common implementation strategies reported by these reviews included education meetings/training, feedback to professionals on compliance, educational materials and information/communication technology (including standing orders, reminders and decision support systems). The last-mentioned implementation strategy may be regarded as less suitable for utilization by guideline organizations, as it concerns the internal organization of hospital care, which is a challenging aspect to influence for external guideline organizations.

We also described and categorized barriers and facilitators to implementation success. Seventy-two barriers and 42 facilitators were reported. The most common reported barrier was insufficient healthcare professionals' time and resources; and the most frequently mentioned facilitator was guideline's (perceived) credibility, evidence base and relevance to practice. These are both well-known factors related to guideline end users that could influence implementation [17, 68].

With respect to impact, 85% of the implementation initiatives reported in the nineteen studies that examined impact achieved improvements in one or more reported outcomes, most often in healthcare professionals' behavior. Our in-depth analysis of studies reporting mixed/positive impact in clinical outcomes, as well as those showing no significant change, revealed a potential relationship. Active implementation strategies, particularly the strategies 'provide/request protocol' and 'inform/involve management in implementation', as well as the presence of facilitators associated with support from (indirectly) involved internal hospital colleagues/departments or external organizations, were prevalent features among the studies reporting mixed/positive impact, while being less frequent or absent in studies without significant change. These findings are in line with other studies suggesting that (indirectly) involved external and internal stakeholders play an important role in facilitating implementation. They have the ability to change local context and culture, by providing necessary resources, support and leadership [17, 69, 70]. Guideline organizations may benefit from recognizing and anticipating on these strategies and facilitators in their own setting in order to enhance the likelihood of successful implementation. However, since we were unable to conduct a comprehensive quantitative meta-analysis and could only include a limited number of studies in our in-depth impact analysis, it is important to be cautious about the generalizability of these results. Additionally, it is crucial to always consider the specific context or situation in which implementation will occur, taking into account the local barriers and facilitators that may influence the process.

Another finding from our analysis of mixed/positive impact studies and those without significant change, was that mixed/positive impact studies employed on average more strategies, but that using one strategy can be associated with improvements too. Multiple other reviews have shown positive outcomes from employing multi-faceted strategies, while also demonstrating that single strategies can achieve improvements [18, 40, 71]. We were unable to identify the underlying factors that determine when the use of a single strategy is sufficiently effective. Therefore, further research is necessary to obtain a better understanding of how to prioritize implementation barriers, facilitators and strategies in specific situations. Such prioritization would streamline the implementation planning and execution process, ultimately enhancing efficiency and reducing the resource burden on guideline organizations seeking to promote the uptake and impact of their guidelines.

Both the Mazza et al. (2013) [39] taxonomy, extended by Gagliardi and Alhabib (2015) [40] and CFIR [41] were expanded as the strategies and barriers that were found in our review did not fit the existing constructs. We also added a new, central domain to the five existing domains of the implementation strategy taxonomy of Mazza et al. (2013) [39]. The impact and scope of guideline organizations is different than with locally driven organizational implementation, therefore different implementation strategies, barriers and facilitators play a role. The original taxonomy and framework may be more suitable to local, implementation-focused internal hospital initiatives, rather than our centrally driven multi-hospital initiatives that also include dissemination strategies.

Regarding publication bias, we were unable to perform a meta-analysis due to the heterogeneity of the included studies, and traditional methods for assessing publication bias (e.g., Egger's Test) could not be used. Nevertheless, we did not strongly suspect publication bias, as our comprehensive search yielded studies with positive, mixed and no changes in outcomes [72]. We acknowledge that by exclusively including empirical scientific studies, we likely missed valuable grey literature (implementation plans, approaches and evaluation reports) on implementation initiatives from guideline organizations. However, we deliberately chose to focus on peer-reviewed publications because we were interested to explore what is known about our topic in this type of (potentially more objective) literature. For future research, it would be interesting to delve into grey literature and study implementation documents from guideline organizations, such as individual scientific associations, the WHO, NICE and Choosing Wisely, to gain insights beyond the context of funded research.

During the analysis, we observed that several studies did not report on important items, such as whether the guideline recommendations involved implementation of appropriate care or de-implementation of low-value care, implementation planning approaches, encountered barriers and facilitators and a reflection/evaluation on the working ingredients

of the used implementation approaches. These aspects are crucial for understanding the underlying implementation mechanisms. We recommend researchers to adopt a more comprehensive research approach, combining both quantitative implementation impact measurements with qualitative in-depth examinations of guideline organizations' implementation planning approaches, implementation strategies, and encountered barriers and facilitators. Process evaluation, as conducted by Verkerk et al. (2022) [67], could be an appropriate research design. Moreover, we emphasize the significance of adhering to the Standards for Reporting Implementation Studies (StaRI) [73], the Proctor et al. (2013) [74] recommendations for reporting implementation strategies and/or the TIDieR guidelines [75] for researchers studying and reporting guideline implementation. We also suggest adding an item to the StaRI checklist, which reflects whether the 'intervention' being implemented involves appropriate care implementation or de-implementation of low-value care. By following these recommendations in future research, we can better identify effective implementation approaches that guideline organizations could use.

Strengths and limitations

A major strength of this review is its comprehensive approach, which covers multiple critical aspects of the implementation process, from planning and executing implementation, to examining barriers and facilitators, to evaluating impact. This provides a comprehensive overview of the potential working mechanisms of implementation, rather than isolating specific aspects. Another strength of our study is the comprehensive literature search strategy we employed, which included both a broad search and snowballing technique to identify additional relevant articles. However, a potential limitation is that the snowballing method resulted in a considerable number of additional articles. This highlights the diverse terminology used in the field of implementation science, which makes accurate searching complex. Furthermore, we conducted a quality appraisal of the included studies and identified several studies as low quality. We deliberately chose not to use study quality as an exclusion criterion, as we aimed to provide an extensive overview of the available evidence. However, as a consequence, our findings should be interpreted with caution. To address these limitations, future research could be more rigorous in terms of terminology and quality criteria for inclusion. Lastly, it is important to acknowledge that studies that reported improvements in all outcome indicators do not necessarily show significantly more positive effects than those that achieved improvements in only some of the reported outcome indicators. The same goes for studies measuring improvements in patient outcomes compared to behavior outcomes.

Conclusion

The development and implementation of guidelines is intended to facilitate translation of research into policy and practice and improve patient care. Guideline organizations play an important role in disseminating and implementing guidelines in hospital care. Despite

the varied types, numbers, and combinations of dissemination and implementation strategies reported, this review could not reveal a clear optimal approach for guideline organizations to follow in order to improve guideline uptake and impact. We did find indications that employing multiple active implementation strategies, particularly the implementation strategies 'provide/request protocol' and 'inform/involve management in implementation', as well as the presence of facilitators associated with support from (indirectly) involved internal hospital colleagues/departments or external organizations may be associated with improvements. However, these findings should be interpreted with caution due to the inclusion of low-quality studies and the absence of statistical pooling. Thus, future research is needed on effective tailoring implementation barriers, facilitators and strategies, to increase the uptake and impact of guidelines.

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3

The role of guideline organizations in nationwide guideline implementation: a qualitative study

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Published in Health Research Policy and Systems. 2024. 22(1):174.

ABSTRACT

Background

Research indicates suboptimal uptake and impact of clinical practice guidelines in Dutch healthcare. Dutch guideline organizations, i.e. guideline developers, governmental agencies, health insurers and other national organizations, develop, authorize and/or support the use of guidelines in Dutch clinical practice. These organizations influence the end users' awareness, accessibility, understanding, acceptability and applicability of guidelines and, therefore, play a crucial role in guideline implementation. This study explores how they plan, execute, monitor and evaluate guideline dissemination and implementation.

Methods

Utilizing a qualitative design, we conducted semi-structured interviews with 35 participants from 24 guideline organizations. We conducted framework analysis, using theories on guideline implementation planning, the 'taxonomy of strategies for achieving guideline implementation and compliance' and the principles of logic models to analyze the data.

Results

Most guideline organizations made limited use of implementation planning approaches that are known to enhance guideline uptake and impact. These approaches include pre-identifying implementation barriers, engaging stakeholders and applying implementation theories, models and frameworks to select and tailor implementation strategies. Instead, they primarily relied on a standard set of predominantly dissemination and occasional implementation strategies known to be practical in terms of ease, cost and time. Commonly used implementation strategies included distributing, advertising and presenting guideline materials, along with providing additional implementation supporting materials. Regarding monitoring and evaluation methods, few organizations assessed the process, outcome or impact of guideline implementation. Those that did primarily relied on clinical peer review and benchmark information for their assessments.

Conclusions

While Dutch guideline organizations recognized and endorsed the importance of implementation, this did not consistently translate into tailored implementation actions. Most guideline organizations did not have an integrated, structural and well-thought-out plan for implementation. The lack of regular, structured monitoring and evaluation raised uncertainties about the effectiveness of implementation in supporting end users and improving patient outcomes. Suggested follow-up research and practice enhancements could strengthen central-level implementation efforts, fostering more effective local implementation and, ultimately, improved health outcomes.

BACKGROUND

Clinical practice guidelines are vital tools for optimizing patient care [1]. They provide recommendations based on a systematic review of the available scientific evidence and an evaluation of the benefits and harms of alternative care options [1]. These guidelines help healthcare professionals and patients in making informed medical decisions by promoting interventions of proven benefit (appropriate care) and discouraging ineffective or potentially harmful practices (low-value care) [2, 3]. Guidelines have shown the potential to support appropriate care delivery and reduce treatment inequality [3, 4]. They serve as valuable tools in managing healthcare challenges such as rising expenditures, population ageing, constrained resource availability and its negative environmental impact [3-5].

In the Netherlands, guidelines have formed the backbone of quality policies concerning prevention, diagnosis, treatment and healthcare organization for years [6]. Since the start of the development of Dutch guidelines in 1982, they not only offer substantive guidance for delivering patient care, but also for education, clinical peer review, local protocols and quality systems, initiatives and registrations [6, 7]. Guidelines are also increasingly used by governmental agencies and health insurers to enhance cost-effectiveness, regulate the quality of care and establish financing agreements [6].

The value of guidelines depends not only on the quality and accuracy of their recommendations but also on their successful implementation in clinical practice [8, 9]. Dutch law expects healthcare facilities and professionals to act in accordance with established guidelines, though justifiable deviations are possible [10]. Hence, the primary responsibility for implementing these guidelines and reshaping clinical practice and organizational structures rests with them.

As of 2024, approximately 2,200 guidelines were available for medical specialists, 350 for nurses, 140 for general practitioners and 50 for mental health professionals [11-14]. These numbers continue to increase, while research indicates that their implementation in local policy and practice is unpredictable, slow, complex and suboptimal [15-20]. Consequently, the quality of patient care may stay behind and valuable healthcare resources may be wasted. It is important to recognize that just publishing guidelines and expecting healthcare professionals and facilities to implement them does not guarantee uptake or improvements in practice [21].

Beyond healthcare professionals and facilities, which are the primary guideline end users, other important players fulfil a vital role in guideline implementation: guideline organizations. This broadly conceived term refers to a diverse group of centrally operating national organizations that, as part of their responsibilities, are tasked with developing guidelines, authorizing them and/or supporting their use in Dutch clinical

practice. The group includes scientific/professional organizations, patient organizations, governmental agencies, health insurers and other national (umbrella) organizations. Examples of Dutch guideline organizations are the Dutch College of General Practitioners (NHG) and the National Health Care Institute (ZIN). These organizations can influence the end users' awareness, accessibility, understanding, acceptability and applicability of guidelines [22-24]. They can stimulate implementation by end users in local clinical practice through using tailored dissemination and implementation strategies, addressing implementation barriers and optimizing facilitators [24-26].

The optimal approach for guideline organizations to accelerate the implementation process has received limited attention in research [22, 27, 28]. The envisioned roles and responsibilities of guideline organizations in implementation are briefly outlined in the Dutch 'guideline for guidelines' – the AQUA guideline [29]. This document provides recommendations for the development, revision and implementation of Dutch guidelines. It emphasizes raising guideline awareness and addressing national barriers where possible and suggests several implementation planning, execution, monitoring and evaluation approaches [29].

It is unclear how guideline organizations actually approach their implementation role in practice. Examining their approaches could help identify points of improvement. This could facilitate the development of enhanced guideline implementation policies and practical guidance, strengthening implementation efforts at the national level. This can serve as a foundation for more effective implementation at the local, healthcare professional and facility level, ultimately improving health outcomes. Thus, the aim of this study is to explore how Dutch guideline organizations plan and execute dissemination and implementation strategies and how they monitor and evaluate the implementation process, outcomes and impact of their guidelines.

METHODS

The consolidated criteria for reporting qualitative research (COREQ) were used for reporting the methods and findings (see Appendix 7) [30].

Study design

We used a qualitative design with semi-structured interviews to gain in-depth insight into the implementation approaches of guideline organizations.

The current study is part of a larger qualitative interview project, in which we also investigated implementation barriers and facilitators encountered by Dutch guideline organizations. The results pertaining these aspects are addressed elsewhere [31].

Participants

Guideline organizations were eligible if they were scientific/professional organizations, knowledge institutes, governmental agencies, health insurers, patient organizations or other national (umbrella) organizations that developed guidelines, published them and/or actively supported their use in Dutch clinical practice. We recruited representatives from guideline organizations based on their insights into their organization's role or direct involvement in implementing guidelines. We used purposive sampling methods to recruit a broad sample of these representatives. We recruited potential participants through contact information from guideline organization websites and through contacts of the research team. Furthermore, representatives who were interviewed were asked if they knew additional representatives who could participate (snowball sampling). Participants were contacted via email or telephone. Before agreeing to participate, participants received information letters containing study background, privacy and informed consent information.

Data collection

Interviews, conducted between March and October 2023, were held via videoconference or in-person based on participant preference. Interviews were held in Dutch by one or two researchers (TB, AG, AT), who had a background in health policy studies, were trained in interviewing techniques and had interview experience. We used a semi-structured approach with an interview guide (Appendix 8) with primarily open-ended questions, while at the same time providing the possibility for a more in-depth exploration of certain topics. The interview guide was structured based on the aforementioned theoretical constructs and covered various aspects, including 1) implementation planning approaches, 2) dissemination and implementation strategies, 3) methods for implementation process, outcomes and impact monitoring and evaluation, and 4) more general inquiries, such as implementation barriers and facilitators and opportunities for improvement.

Each interview started with asking participants for permission to record for transcription. Written and verbal informed consent were obtained. Interviews ranged from 30-100 minutes and participants received an interview summary for member checking afterwards. Data collection continued until no new themes emerged, signifying data saturation.

Theories, taxonomies, models and frameworks

We used the AQUA guideline as a frame of reference to assess how actual implementation approaches aligned with the envisioned roles and activities. We also compared the implementation practices with established scientific theories and taxonomies on guideline implementation, using various theoretical constructs to guide the interviews and data analysis.

AQUA guideline – Dutch 'guideline for guidelines'

In the AQUA guideline [29], Dutch guideline experts have outlined how high-quality guidelines should be developed. The process follows three phases: preparation, development and finalization.

In the preparation phase, the guideline topic, purpose and target audience of the guideline are established. It involves forming a guideline committee, which includes relevant scientific and professional organizations, patient groups and methodological experts. The involved methodological experts should also have a basic understanding of implementation. Additional stakeholders, such as governmental agencies and health insurers, may also be invited to contribute.

The development phase begins with a problem analysis, in which the experienced challenges in healthcare (in terms of practice and organization of care) are identified. Based on the resulting key questions, the existing knowledge is systematically reviewed and presented in a transparent manner, preferably following the GRADE methodology [32, 33]. When developing the guideline recommendations, factors such as health benefits, side effects, safety, cost-effectiveness/budget impact and the preferences of patients and professionals should be considered, along with implementation barriers and facilitators. The acceptability and feasibility of the recommendations should also be taken into account. Additionally, guidelines should propose methods for monitoring and evaluating care, such as quality indicators. Implementation supporting materials, such as protocols, decision aids and educational materials, should also be made available to facilitate self-management and shared decision-making.

According to the AQUA guideline, the finalization of the guideline starts with a pre-publication commentary phase, in which end users and guideline organizations are consulted through written commentary rounds, surveys or pilot implementations to evaluate the content and applicability of the guideline. In the authorization phase, the guideline must be approved by all primary involved professional groups and patient organizations, before it officially becomes part of the professional standard. The guideline includes a maintenance procedure detailing responsibilities and timelines for updates. After publication, the guideline organizations involved should be committed to actively promoting the guideline's practical application. They should raise awareness of the guideline and, to their extent possible, address any national barriers to its implementation. If certain implementation preconditions need to be met first, a timeline and allocation of responsibilities should be specified, so that it is clear when implementation of the guideline can be expected. The AQUA guideline states that implementation should be carried out by healthcare facilities, professionals and other local stakeholders. The guideline should facilitate implementation by listing barriers and facilitators, as well as necessary

preconditions and recommendations for implementation. The AQUA guideline links to an implementation checklist [34] that supports the identification of potential barriers to effective implementation. Lastly, it recommends to document implementation strategies in an implementation plan.

Theories on implementation planning

In terms of implementation planning, previous research suggests that selecting and tailoring implementation strategies using three specific approaches can enhance the uptake and implementation of guidelines [24-26, 35, 36]. Dissemination and implementation strategies that are 1) aligned with stakeholder preferences and 2) designed to address existing barriers are more likely to improve professional practice [25, 26, 35]. Third, applying principles from implementation theories, models and frameworks (TMFs) to guide and shape these strategies can further enhance implementation outcomes [24]. In our investigation of implementation planning approaches, we, therefore, conducted an in-depth exploration of whether guideline organizations used pre-identified barriers, stakeholder engagement and implementation TMFs.

Classifying dissemination and implementation strategies

In our exploration of executed dissemination and implementation strategies, we applied the 'taxonomy of strategies for achieving guideline implementation and compliance' of Mazza et al. (2013) [37], later expanded by Gagliardi and Alhabib (2015) [38]. This taxonomy allowed us to examine strategies and classify them into five domains: professional, patient/consumer, financial, organizational and regulatory.

Classifying monitoring and evaluation methods

To systematically analyze the implementation monitoring and evaluation methods used by guideline organizations, we categorized these methods into three domains – process, outcomes and impact – based on the principles of logic models [39]. In this study, process monitoring and evaluation refers to methods used to assess implementation activities (outputs) and the actual use of guidelines. Outcome monitoring and evaluation involves methods for evaluating short- and medium-term outcomes, such as changes in end-user practice (behavior, knowledge and skills). Impact monitoring and evaluation refers to methods that assess long-term changes related to achieving desired goals, including improvements in health outcomes, system performance and societal benefits.

Data analysis and synthesis

All interviews were audio recorded and transcribed verbatim. Interview transcripts were analyzed using the principles of framework analysis [40]. Both deductive and inductive coding were used. For deductive coding, the researchers (AT, TB, AG) developed an initial codebook, based on the aforementioned theoretical constructs. In addition, open

coding was used to include interesting themes that emerged from the data. Throughout the coding process, the codebook was updated iteratively. Initially, two researchers (AT and either TB or AG) independently coded the first eight interviews to align coding. Subsequently, one researcher (TB, AG, or AT) coded the rest, cross-checked by a second researcher (AT or HM). The final coding tree is provided in Appendix 9. Coding was conducted using MAXQDA (version 2022).

We used in-text quotes (translated from Dutch) to highlight key themes or perspectives that were particularly representative, significant or illustrative or where interviewee voices added clarity or emphasis. In the results tables, we systematically provided quotes for all identified implementation planning, execution, monitoring and evaluation activities.

Ethical considerations

The Medical Ethics Committee of Amsterdam UMC reviewed the study protocol and decided that the study did not fall under the scope of the Dutch Medical Research Involving Human Subjects Act, since the participants were not subject to medical procedures nor required to follow rules of behavior [41]. Therefore, no further formal ethical approval was required (statement ID 2021-0417). As previously stated, all participants signed an informed consent form before the start of the interview and received an interview summary for member checking afterwards. The transcripts and audio recordings were stored and analyzed in accordance with the General Data Protection Regulation.

RESULTS

Participant characteristics

A total of 35 participants from 24 different guideline organizations were interviewed. An overview of the participants and their respective guideline organizations can be found in Table 1. To ensure participant confidentiality, they were categorized into four distinct groups: guideline developers (scientific/professional organizations and knowledge institutes), governmental agencies, health insurers and other national organizations. Findings are presented using these group terms, but when results apply to multiple groups, the broader term ‘guideline organizations’ is used. Eight participants held dual roles, such as simultaneously working at a scientific organization and a knowledge institute or serving as medical specialists while also being employed at a scientific organization.

Implementation planning approaches

Guideline organizations affirmed that the primary responsibility for implementing guidelines rests with healthcare professionals and facilities, who, in consultation with patients, determine clinical practices. Yet, they recognized that these guideline end users could not manage implementation alone and required support from guideline

Table 1. Interview participant characteristics

Categories of guideline organizations	Guideline organizations	Number of participants
Guideline developers (scientific/professional organizations and knowledge institutes)	Dutch Quality Alliance in Mental Health Care (Akwa GGZ)	1
	Netherlands Comprehensive Cancer Organisation (IKNL)	1
	Knowledge Institute of the Dutch Association of Medical Specialists (KIMS)	2
	Dutch College of General Practitioners (NHG)	1
	Dutch Society for Internal Medicine (NIV)	2
	Dutch Society of Physicians for Respiratory Diseases and Tuberculosis (NVALT)	1
	Dutch Geriatrics Society (NVKG)	1
	Dutch Society of Obstetrics and Gynaecology (NVOG)	2
	Netherlands Society of Cardiology (NVVC)	1
	Dutch Society for Surgery (NVvH)	1
	Netherlands Association of Nurses and Care Workers (V&VN)	2
	Netherlands Association of Sports Medicine (VSG)	2
Governmental agencies	Health and Youth Care Inspectorate (IGJ)	1
	Dutch Healthcare Authority (NZa)	1
	Ministry of Health, Welfare and Sport (VWS)	2
	National Health Care Institute (ZIN)	4
	Netherlands Organisation for Health Research and Development (ZonMw)	1
Health insurers	Health insurance company	1
	Health Insurers Netherlands (ZN)	1
Other national organizations	Netherlands Federation of University Medical Centres (NFU)	1
	Dutch Hospital Association (NVZ)	1
	Netherlands Patients Federation (PFN)	1
	Health Care Evaluation and Appropriate Use (ZE&GG)	2
	Independent Clinics Netherlands (ZKN)	2

organizations. Consequently, they facilitated implementation through various approaches and to varying extents.

Guideline developers were the most actively involved in implementation as they had ownership over the guidelines and contributed the majority of members to guideline committees. These committees, regularly assisted by an implementation advisor, also often handled the planning and development of dissemination and implementation strategies. Only a few guideline organizations had an additional, dedicated implementation team.

Guideline organizations employed diverse implementation planning approaches, selecting their dissemination and implementation strategies through various methods, and tailoring them to varying degrees. Table 2 provides an overview of the different implementation planning approaches along with exemplary quotes. Guideline organizations prioritized implementation strategies for urgent guideline topics, such as prevalent health issues, over comparatively 'smaller' guideline topics.

Most guideline organizations barely tailored their implementation strategies through pre-identifying barriers, engaging stakeholders or utilizing implementation TMFs. They often employed a standard set of implementation strategies that they had used before and that had proven to be practical in terms of ease, cost and time. Limited implementation funds, time constraints and insufficient implementation knowledge and motivation within guideline committees hindered strategy selection and tailoring:

"*There is substantial brainstorming about creating podcasts, webinars, micro-learning quizzes, all these methods to get guidelines to the user. ... However, this often depends heavily on the commitment of guideline committee members. Whether such ideas actually materialize depends on factors like budget and time availability. But very often, it seems like voluntary work from the committee members to engage in these extra activities.*" – Interviewee 18, guideline developer

Several guideline organizations pre-identified guideline-specific implementation barriers (and facilitators). However, they did not consider these insights in the next crucial step: selecting and tailoring their implementation strategies to effectively address these barriers. They primarily used two methods for pre-identifying barriers: implementation determinant analysis or integrating barrier pre-identification into the development of an implementation plan. Guideline committees commonly created these plans after formulating the guideline recommendations, outlining implementation timeline, expected cost effects, prerequisites, potential barriers, actions required for implementation and organizations responsible for those actions. However, guideline organizations stated that the quality of these implementation plans frequently fell short. Plans were hastily developed at the end of the guideline development process, with insufficient time allocated.

Furthermore, committee members frequently struggled with completing these plans, as they involved aspects of healthcare organization beyond their expertise. Occasionally, implementation plans were copied from previous guidelines. These issues resulted in very concise plans lacking specificity. Moreover, guideline organizations acknowledged a lack of adequate attention and action to the plans during the follow-up phase, encompassing the practical elaboration and execution of dissemination and implementation strategies:

"… *You're hitting the nail on the head because it's exactly what we're bothered with. What implementation plan did we write in the previous guideline? Oh, let's adjust the titles a bit. We rearrange a few words and voila, we've delivered the implementation plan. But the follow-up? None. And that's just a shame, really*." – Interviewee 21, guideline developer

Regarding stakeholder engagement, numerous stakeholders played various roles in the implementation planning. As previously mentioned, the guideline committee, mainly comprising relevant healthcare professionals and patients, actively engaged in developing the guideline and its implementation plan. Depending on the guideline's topic, other guideline organizations (e.g. governmental agencies, health insurers) were invited to contribute, either through mandated representation in the guideline committee or commenting on the content and applicability (e.g. organizational, financial or legal) of the guideline and its implementation plan in the pre-publication commentary phase. However, other guideline organizations did not consistently comment on the guidelines, for example due to limitations in their capacity to review the large number of guidelines:

"… *this task is so extensive that it's not feasible to respond to all guidelines as they are often thick stacks of paper. We try to prioritize the main issues.*" – Interviewee 25, health insurer

A small number of guideline organizations engaged stakeholders post-commentary and -publication. Some guideline developers sporadically evaluated needs or conducted pilot testing with healthcare professionals, patients and their relatives to identify implementation barriers or develop implementation strategies (e.g., implementation tools). Methods of engagement involved for example focus groups, surveys or interviews.

When asked about using implementation TMFs in the implementation planning phase, nearly all guideline organizations stated they did not explicitly use them. However, implementation TMFs could play an indirect role, as they were occasionally integrated into implementation guides and operational action plans that a few guideline organizations used. Within these instances, participants often cited the influence of the Grol and Wensing Implementation of Change model [42].

Table 2. Implementation planning approaches used by the guideline organizations

Implementation planning approach	Exemplary quotes
Pre-identification of barriers (and facilitators)	"… And then you can also pre-identify facilitating and hindering factors. As a [guideline organization], we strive to address the hindering factors at a more macro level." – Interviewee 1, other national organization
Development of implementation plans	"Then we have an implementation table that needs to be filled out. In it, you specify, for example, the timeline for implementation, the expected cost effects, implementation prerequisites, potential barriers, any actions that need to be taken for implementation, the assignment of responsibilities and the ability to include various comments." – Interviewee 10, guideline developer
Engagement of stakeholders (e.g. through commentary rounds, focus groups, surveys, interviews)	"Then we engage in discussions with potential users, asking them questions such as: what do you need? What works and what doesn't? We did that through interviews." – Interviewee 1, other national organization
Use of implementation TMFs (e.g. Grol & Wensing Implementation of Change model [42], MIDI model [43])	"We did use an implementation model by Grol & Wensing, to have some kind of evidence to support our approach. It is a framework that is commonly used." – Interviewee 12, other national organization
Stakeholder analysis (e.g. analysis of knowledge, attitude, behavior or power/interest matrix)	"So, based on all that information, you create a matrix with all the interests of all parties and you can take them into account during those meetings." – Interviewee 6, governmental agency
Guideline committee's motivations and preferences to conduct certain implementation strategies determine the final selection of strategies	"Well, one thing is whether a guideline committee member wants to do it. I think that's actually quite important. For example, if I look at a case involving educational materials, if no one feels inclined to create or write it, then it won't be made, because I'm not going to do it. I don't have the profound expertise." – Interviewee 15, guideline developer
The practicality of specific implementation strategies (e.g. ease of execution) and the availability of implementation resources (e.g. funding, time) determine the selection of specific implementation strategies	"We've been very practically addressing [implementation]. And for now, this seemed like the most low-hanging fruit, the easiest and the cheapest to do. But we didn't look further than that, no." – Interviewee 34, guideline developer

Table 2. (continued)

Implementation planning approach	Exemplary quotes
The selection of specific implementation strategies is made in collaboration with a marketing agency, implementation consultancy, communication advisor or educational specialist	"So, these are often, well, three to five [healthcare professionals] who, together with a marketing agency we collaborate with, sit down and essentially discuss what kind of implementation product it will be." – Interviewee 3, guideline developer
Replication/adaptation of (successful) implementation strategies of other guideline organizations/similar projects	"Well, what we actually did is we asked other guideline organizations for examples. And some really set up entire podcasts and others create some kind of poster and some send entire quizzes via email." – Interviewee 34, guideline developer
Guideline implementation pilottesting	"During the development phase or when your concept is ready, we aim to carry out a pilot implementation, during which we assess the feasibility and practicability of adhering to the recommendations." – Interviewee 3, guideline developer
No structured implementation planning approach (e.g. focus on doing instead of planning/selecting/tailoring)	"But at the end of the day you have to get started. … We learn the most by just starting." – Interviewee 6, governmental agency

Dissemination and implementation strategies

Guideline organizations used a large variety of different dissemination and implementation strategies as outlined in Table 3. Not all strategies mentioned by the interviewees fit the predefined strategies in the modified taxonomy of Mazza et al. (2013) [37]. These strategies were classified and added. Furthermore, we were unable to classify all implementation strategies within the existing five domains of the taxonomy. Several strategies were developed and applied by guideline organizations at the national level, aiming to change the practice of other guideline organizations (macro level) and/or healthcare facilities (meso level), rather than targeting groups or individual healthcare professionals. To account for these broader, system-level strategies, we introduced a new domain, 'central', in addition to the existing domains. While many strategies concentrated on the professional or central domain, fewer were identified in the patient, regulatory, or financial domain. Guideline organizations did not address strategies within the organizational domain.

As previously mentioned, strategies were primarily employed by guideline developers. They utilized multiple strategies, often focusing on dissemination. Common dissemination

Table 3. Dissemination and implementation strategies employed by the guideline organizations

Categories of implementation strategies (classified by Mazza et al. (2013), expanded by Gagliardi and Alhabib (2015))[a]	**Implementation strategy (details)**
1. Professional	
Distribute guideline materials	Distribute draft guideline to other guideline organizations and healthcare professionals for feedback on the content and applicability (e.g. organizational, financial or legal) of the guideline and its implementation plan (pre-publication commentary phase)
	Mass emailing final guideline
Provide feedback on compliance	Audit and feedback benchmark information for healthcare professionals and facilities (e.g. Transparency Calendar [44], Implementation Monitor [45], health insurer claims data)
Enable self-audit	Provide indicators to healthcare facilities for self-audit and feedback
Present guideline materials at meetings	Present guideline materials at meetings (e.g. conferences, annual meetings)
Educate groups about guideline intent/benefits	Education through workshops, webinars, e-learnings, micro-learning quizzes, instruction videos
Advertise guideline materials	Book publications, journal publications, newsletters, website publications, media releases/campaigns, social media releases, podcasts
	Submit guideline to database (e.g. Guideline Database [46], Register [47])
	Provide app with guideline content
	Publish drug formulary
Provide additional implementation supporting materials [b]	Implementation toolkit, patient pathways, visuals, conversation guides, sample presentations, clinical decision support tools, guideline summary/ factsheet, pocket cards, triage guide, infographics, practice manuals

Exemplary quotes
"When the guideline is nearly finished, you enter the commentary phase. [The guideline] is then communicated to the members via email and the website." – Interviewee 32, guideline developer
"As a standard practice when something new comes up, we include it in the newsletter and mass email." – Interviewee 30, guideline developer
"We've noticed that you can tempt hospitals the most by benchmark information, with which you demonstrate: here is where your hospital stands compared to other hospitals in the Netherlands." – interviewee 28, health insurer
"We also create indicators, primarily meant for self-assessment purposes only. It's about preventing them from being included solely in outcome-based financing." – Interviewee 2, guideline developer
"That also happens, you know, that the outcomes of such a study and the guideline are discussed at a congress" – Interviewee 30, guideline developer
"… Participants receive an email with questions focused on the core recommendations from the guidelines. That they work just a few minutes on enhancing their knowledge about the guideline." – Interviewee 3, guideline developer
"… We also have a newsletter, a magazine where occasional updates about new guidelines are included and a LinkedIn page." – Interviewee 22, guideline developer
"And that it's published on the guideline database. It's actually a kind of implementation tool, as specialists can look up what the recommendation is." – Interviewee 10, guideline developer
"We have an app called [app name] and in that app, there's also, for example, a summary and summary cards and it also includes a formulary." – Interviewee 15, guideline developer
"We also develop a formulary." – Interviewee 2, guideline developer
"So, we create summary cards for all guidelines, featuring core recommendations within a two-page summary." – Interviewee 29, guideline developer

Table 3. (continued)

Categories of implementation strategies (classified by Mazza et al. (2013), expanded by Gagliardi and Alhabib (2015))[a]	Implementation strategy (details)
Clinical peer review	Guideline developers conduct periodic clinical peer reviews of care departments (required for maintaining registration for certain healthcare professionals)
Recruit champions	Recruit champions who recommend, support and stimulate implementation
2. Patient/consumer	
Advertise guideline	Patient organization website publication
	Patient website publication (e.g. www.thuisarts.nl)
	Patient version of guideline/patient information form
3. Financial	
3.1 Healthcare professional	
Grant provided to support (research aimed at effective) implementation initiatives	Governmental agencies and health insurers provide grants to support (research aimed at effective) implementation initiatives
Change in reimbursement	Promote implementation by changing care reimbursement
Incentive applicable and available to the institution	Health insurers offer additional labor compensation to healthcare facilities for creating improvement plans
4. Regulatory	
Change in legislation or regulation	General Healthcare Agreements between guideline organizations mandate healthcare facilities to implement a certain percentage of the recommendations listed on the national implementation agenda
Change in licensing, credentialing or accreditation	Assign licensing, credentialing or accreditation to healthcare facilities or professionals that meet certain guideline criteria

Exemplary quotes
"… I know that within clinical peer review, questions are asked about whether and how guidelines have been implemented in daily practice." – Interviewee 21, guideline developer
"… That is often an expert in a specific field – these could be physicians, but also specialists or nurses – who possess substantial knowledge about a topic and are willing to take a stand to ensure that the field moves toward the recommended course of action." – Interviewee 1, national organization
"The patient organizations also publish, they also mention: a guideline has been updated. They explain what's new in a guideline." – Interviewee 27, national organization
"We've set up governance agreements. … That since 2016, for secondary care guidelines, patient information is always created and made available on Thuisarts." – Interviewee 27, national organization
"We want every guideline to have a summary. We actually see this as part of the implementation process. And it will contain patient information." – Interviewee 3, guideline developer
"… But scaling up to a broader, local, regional, or national level really requires a bit more and in these implementation projects, higher budgets or subsidies can be requested." – Interviewee 14, governmental agency
"Yeah, we don't take on the role of the executer, but we do try to encourage certain doing by removing the financial incentive." – Interviewee 25, health insurer
"You will receive some additional funding from the health insurers. However, you must, at the very least, create an improvement plan each year." – Interviewee 1, national organization
"… So of the topics listed on the implementation agenda since the start of the program, 80% must be implemented by the end of this year and all the current periodic topics must be implemented within two years." – Interviewee 1, national organization
"So it's a quality document or guideline, or however you want to refer to it and the Quality Committee checks it. We also make it public on our websites that healthcare facilities comply with it." – Interviewee 33, guideline developer

Table 3. (continued)

Categories of implementation strategies (classified by Mazza et al. (2013), expanded by Gagliardi and Alhabib (2015))[a]	**Implementation strategy (details)**
5. Central	
Ask guideline committee for an implementation plan	Guideline organizations ask guideline committees for an implementation plan
Provide education/support about implementation	Training implementation science practitioners, provide implementation coaching, provide network for implementation science practitioners
Share best implementation practices	Guideline organizations share examples of successful implementation/quality initiatives with guideline organizations and/or healthcare facilities
Collaborative implementation partnerships	Facilitate agreements and collaborative implementation partnerships between guideline organizations and/or healthcare facilities
National implementation agenda	Guideline organization releases national implementation agenda [48] containing guideline recommendations that healthcare facilities are obliged to implement
Quality discussions about guideline implementation	Health insurers conduct quality discussions with healthcare facilities about the implementation of certain guidelines
Request improvement plan	Health insurers ask healthcare facilities for improvement plan
Online collaboration platform	Online collaboration and knowledge-sharing platform for healthcare facilities, health insurers and policy advisors
Peer-learning sessions for healthcare facilities	Guideline organization organizes peer-learning sessions for distant healthcare facility quality employees

[a] Guideline organizations did not address dissemination and implementation strategies within the organizational domain or financial domain involving patients of the modified taxonomy of Mazza et al. (2013) [37]. Therefore, these categories were excluded from the Table.
[b] Implementation strategies that did not fit in the modified taxonomy of Mazza et al. (2013) [37] were classified and added in *italicized* text.

Exemplary quotes
"What we can do, for instance, in the assessment framework, is include a criterion: is there an implementation or a maintenance plan? So, we explicitly ask them in advance to consider what steps they will take to ensure that this will actually be used in practice." – Interviewee 24, governmental agency
"And the training from fellows to those experts, promoting the infrastructure, that's truly the strategy we're currently focusing on." – Interviewee 14, governmental agency
"During such meetings, you often try to share good examples of ongoing initiatives that can serve as inspiration for those stakeholders." – Interviewee 13, governmental agency
"[Scientific organization] has established [program], where they, together with GPs, encourage collaboration among regions, GPs and hospitals on several conditions." – Interviewee 33, guideline developer
"...Then we attempt to compile the guideline recommendations that have a solid scientific basis. We do this in what's called the implementation agenda. It's a central list of recommendations that all healthcare facilities in the Netherlands work on, where we also make agreements with health insurers." – Interviewee 1, national organization
"We engage in annual quality discussions with healthcare facilities, in which we assess how these facilities perform based on certain public quality information. If facilities diverge, we always ask: 'why are you deviating?'" – interviewee 28, health insurer
"On the implementation agenda there are numerous recommendations and hospitals are required to create a plan demonstrating their commitment to implementing those recommendations. We also monitor those plans. They need to submit these plans to their primary health insurer and the hospital's primary health insurer must then approve those plans." – interviewee 28, health insurer
"We have developed a collaboration platform..." – Interviewee 1, national organization
"… So we aim to stimulate knowledge exchange. We do this partly through peer-learning sessions and partly through a monthly catch-up session involving all hospitals." – Interviewee 1, national organization

strategies included 1) distributing draft guidelines to their members (healthcare professionals) and other guideline organizations for feedback in the pre-publication commentary phase, 2) advertising guideline materials (e.g. via guideline databases, journals, newsletters, websites, (social) media and patient websites), 3) presenting guideline materials (e.g. conferences and annual meetings), and 4) providing additional implementation supporting materials (e.g. summaries, infographics and pocket cards). A more active implementation strategy that was often employed by guideline developers was educating healthcare professionals about the guideline (e.g. through workshops).

Besides guideline developers, most guideline organizations primarily disseminated guideline materials passively (e.g. via email to end users) and/or worked on the prerequisites for implementation (e.g. providing implementation funding). A few indicated infrequent use of dissemination or implementation strategies, attributing this to limited capacity that required prioritizing tasks. Others felt their efforts did not add value or misaligned with their formal role:

"…*Where in the implementation process should [governmental agency] have a role? Because when it comes to ensuring implementation, I think we're positioned at the back, dealing with those [healthcare facilities and professionals] who lag behind. So [healthcare facilities and professionals] need to have the time to fall behind first. … In that phase of implementation, I believe we [governmental agency] simply have no role initially.*" – Interviewee 35, governmental agency

There were also examples of organizations that were more actively involved. For example, one national organization created a national implementation agenda containing well-substantiated guideline recommendations that healthcare facilities were obliged to implement. Furthermore, they aided healthcare facilities by sharing benchmark information, recruiting champions, offering a knowledge-sharing platform and organizing peer-learning sessions. Another example is that health insurers engaged in discussions with healthcare facilities regarding benchmark information indicating implementation of specific guidelines. If implementation fell short of the standards, they requested healthcare facilities to formulate and execute improvement plans. Moreover, they indicated promoting implementation by adjusting financial reimbursements for guideline-compliant care.

Process, outcome and impact monitoring and evaluation

Guideline organizations utilized diverse monitoring and evaluation methods regarding the implementation of guidelines (Table 4). They primarily focused on process and outcome assessments, measuring guideline use and changes in healthcare professionals and facilities' practice. Guideline developers mainly referred to clinical peer review visits as

their primary and often only formal evaluation method. These visits to care departments involved external healthcare professionals who assessed the care processes, including the implementation of guidelines, and provided improvement recommendations.

Besides clinical peer review, most guideline developers did not conduct additional formal monitoring and evaluation activities. Some occasionally measured guideline usage informally through member or healthcare facilities inquiries, or by tracking website/ document users. A few also developed audit and feedback indicators for members to use or commissioned external researchers to evaluate guideline utilization.

Besides guideline developers, a few other guideline organizations employed formal recurrent monitoring and evaluation methods. As previously stated, one national organization developed benchmark information using routinely collected health insurer claims data and self-reported data from healthcare facilities, to assess whether recommendations had been implemented. Health insurers also utilized the benchmark information and conducted additional evaluations based on their health insurer claims data. They discussed their analyses with healthcare facilities and requested improvement plans accordingly. Additionally, with the aid of several other guideline organizations and data from healthcare facilities, one governmental agency developed benchmark information based on certain guidelines ('Transparency Calendar'). Healthcare facilities could use this benchmark information to implement targeted improvements and governmental agencies used the data for regulation.

Another evaluation method used by a governmental agency was the 'Appropriate Care' program, which compared recommendations from existing guidelines with available scientific evidence and outcome data. Improvement commitments were then collaboratively developed with relevant guideline organizations, with the goal of enabling both guideline organizations and end users to enhance their guidelines, implementation strategies and clinical practice. Subsequent changes in outcome data were then monitored and reported.

A last evaluation method was conducted by another governmental agency, which collected outcome and impact data from the (local) guideline projects that they funded and reported this information to the Ministry of Health, Welfare and Sport (VWS).

Guideline organizations reported encountering several challenges in monitoring and evaluation. A commonly cited issue was the infrequency of assessments, such as those conducted through clinical peer reviews:

"*The downside of that instrument, in my opinion, is that it takes 5 years before all departments have been visited. … So it's not a very strong tool for implementing all*

Table 4. Implementation process, outcome and impact monitoring and evaluation methods employed by the guideline organizations

Implementation process, outcome and impact monitoring and evaluation methods
Implementation process monitoring and evaluation
Staff of guideline developer holds meetings to evaluate and discuss how implementation process improvements can be made
Reviewing user numbers of guideline materials (e.g. website visitors)
Surveying use of guideline during members' meeting
Gathering information on guideline utilization informally (calls, emails, conversations, focus groups)
Study exploring the utilization of guidelines in practice (e.g. through interviews with healthcare professionals)
Implementation outcomes monitoring and evaluation
Governmental agencies evaluate quality data (e.g. 'Transparency Calendar') and provide feedback to healthcare facilities on risk detection (audit and feedback)
National organization develops audit and feedback based on self-reported data from healthcare facilities and health insurer claims data
Guideline developer develops audit and feedback
Evaluation through clinical peer review
Impact monitoring and evaluation
Court of Audit evaluated both the potential and actual savings achieved by the Appropriate Care program

	Exemplary quotes
	"Well, in staff meetings, it's discussed how things went and how they can be improved. Especially focusing on how they can be improved." – Interviewee 19, guideline developer
	"… And then it was like: we're providing cases, but is anyone actually looking at them? So, the communications advisor inquired: how frequently are they clicked on? And then we knew, okay, we're doing it for a reason because it's being read." – Interviewee 15, guideline developer
	"Yes, we once used Mentimeter to measure the awareness of the [guidelines] and the guideline database. However, it appears that very few people are familiar with the guideline database and, in practice, hardly use it at all." – Interviewee 33, guideline developer
	"We simply asked. Actually, we called various hospitals and inquired." – Interviewee 34, guideline developer
	"Last year, we conducted a study on the utilization of guidelines in practice. ... We interviewed 60 teams and assessed the extent to which they still used guidelines." – Interviewee 29, guideline developer
	"Because we look at the Transparency Calendar and all available benchmark information, posing targeted questions based on that. That feedback on risk detection leads to improvement." – Interviewee 35, governmental agency
	"All healthcare facilities report their progress on these subjects. Thus, we can track how each hospital is performing regarding the implementation of these subjects. So, our central role is monitoring and intervening when we notice certain subjects lagging behind the intended pace." – Interviewee 1, national organization
	"So, then we reluctantly started making audit and feedback ourselves. For certain aspects of care, we conducted practice variation studies and repeated them to see what had changed." – Interviewee 32, guideline developer
	"During the clinical peer review visit, various norms and themes arise, but the implementation of guidelines and new knowledge is a topic that is indeed discussed during these visits. Yes." – Interviewee 22, guideline developer
	"… However, the Court of Audit has also evaluated this and they have actually said, 'You produce very nice, well-substantiated reports, but ultimately, not much happens with those recommendations.'" – Interviewee 23, governmental agency

Table 4. (continued)

Implementation process, outcome and impact monitoring and evaluation methods
Combination of implementation process, outcomes and/or impact monitoring
'Appropriate Care Program': governmental agency 1) compares existing guidelines and outcome data (e.g. health insurer claims data and GP data), 2) establishes improvement commitments, 3) monitors and evaluates outcome data, implementation activities of collaborating guideline organizations and their own and 4) sends monitor reports to guideline developers and Ministry of Health, Welfare and Sport (VWS)
Governmental agency collects outcomes and impact of the guideline projects that they funded (including cost-effectiveness research) and provides reports to the Ministry of Health, Welfare and Sport (VWS)
Health insurer monitors and evaluates through examining claims data (benchmark information), information from insured persons and assessing how healthcare facilities execute their improvement plans

guidelines, but it is a robust means to prompt departments to be aware of guidelines and their implementation." – Interviewee 32, guideline developer.

Determining the desired level of implementation was also perceived as difficult. Additionally, it was not always clear for guideline organizations whether the impracticality of the guidelines or the need for increased dissemination and implementation efforts was the issue. Another frequently mentioned challenge was the absence of a dedicated budget for monitoring and evaluation. Moreover, distinguishing whether improvements in care resulted from active guideline implementation or external factors – such as global initiatives, increased public awareness, or heightened media attention – remained difficult.

DISCUSSION

Amidst growing healthcare pressures from rising expenditures, population ageing, constrained staffing and environmental concerns, guidelines can be crucial tools for steering practices towards appropriate care – yet their impact hinges on implementation in practice. This study explored how Dutch guideline organizations plan, execute, monitor and evaluate their implementation efforts.

This qualitative study reveals that guideline organizations recognize and endorse the significance of implementation. Nevertheless, this recognition does not consistently translate into tailored implementation actions. In terms of implementation planning, opportunities exist for guideline organizations to tailor implementation strategies by

	Exemplary quotes
	"We do engage in annual monitoring: identifying which improvement commitments have been realized and which haven't. This focuses more on a proximal level, in which our stakeholders, for instance, raise certain topics or modify guidelines." – Interviewee 6, governmental agency
	"We can track these kinds of effects from [governmental agency] as well. We also demonstrate them to the Ministry of Health, Welfare and Sport (VWS). 'Look, the research we initially encouraged is indeed yielding the outcomes you desire.' That's about demonstrating the impact." – Interviewee 14, governmental agency
	"In those quality discussions you're reviewing those indicators. And then you ask for an explanation. And if that explanation is insufficient, you request an improvement plan and then you either check again after six months or a year. A year later, you'll have access to that quality information again. … And you simply ask the hospital: show us what you've done. Show us how you've improved." – interviewee 28, health insurer

pre-identifying barriers, engaging stakeholders and employing implementation TMFs – approaches known to enhance guideline uptake and impact [24, 25, 35, 36, 49]. However, these opportunities – such as developing the implementation plan based on guideline-specific barriers or providing input on the applicability of guidelines during the commentary round – are not always fully utilized. Even when employed, the subsequent step of selecting and tailoring implementation strategies based on the identified barriers, stakeholder insights or implementation TMF guidance is frequently neglected. This suggests that the ability to adapt guidelines and implementation efforts to different clinical and organizational contexts is not yet embedded in guideline organizations' processes [22, 50, 51].

This issue is not unique to the Netherlands. A recent review by the current authors [27], which included studies on guideline implementation in hospital care from countries such as the U.S., Australia and Canada, reported similar findings across guideline organizations worldwide. However, a separate review by Peters et al. [36], which looked at both implementation efforts of guideline organizations and local initiatives, found that efforts to select and tailor guideline implementation strategies were more informed by implementation planning approaches compared to their earlier 2015 review [38]. This positive shift may be due to increased awareness of the expanding research on optimizing implementation efforts [49].

Limited resources (time and funding) and a lack of implementation knowledge or motivation within the guideline organizations and guideline committees hinder effective

selection and tailoring of implementation strategies. These barriers also mirror resource, knowledge and motivational issues reported in previous studies on guideline organizations in other countries [22, 51]. For instance, Gagliardi's study on implementation approaches of international guideline developers found that most lacked funding for implementation. Even those organizations with a mandate to promote use of their guidelines lacked dedicated financial support [22]. This points to the need for stronger institutional support, resources and education around implementation processes to bridge the gap between guideline development and practical application.

We also found that Dutch guideline organizations employ a large variety of primarily dissemination strategies. Guideline developers predominantly aim their strategies at healthcare professionals, whereas other organizations (e.g. health insurers, government agencies) mainly target facilities. Guideline developers and patient organizations extend their strategies to patients. Commonly used strategies included distributing, advertising and presenting guideline materials, along with providing additional implementation supporting materials. These strategies are commonly found in other guideline implementation studies, reinforcing their widespread use [22, 36, 50, 52]. The reliance on these 'basic' dissemination strategies points to an underutilization of more interactive (e.g. training, audit and feedback) or tailored implementation strategies, which are generally more effective in promoting guideline adherence [4, 26]. Additionally, there is significant room for improvement in making Dutch guidelines more practical for clinical use. Weller et al. found that while Dutch medical specialists consider guidelines to be one of the most valuable information sources to update their knowledge, they are not used as the primary reference for medical decision-making during consultations [53]. Currently, it is not possible to quickly and accurately search them based on specific questions or patient characteristics [54]. Guideline organizations could improve usability by enhancing the search functionality of the central guideline and encouraging software providers to integrate guidelines into electronic patient records. Both strategies could potentially be further strengthened by incorporating artificial intelligence to generate guideline-based clinical recommendations [55]. In this way, the clinical applicability of guidelines is enhanced to better support medical decision-making.

We expanded the Mazza et al. (2013) taxonomy [37, 38], as not all implementation strategies that we found in our study fit the predefined strategies. We also added a new, central domain to the existing five. The scope and impact of guideline organizations differ from those of locally driven, healthcare facility-based implementation initiatives. As guideline organizations work to improve national guideline adherence, they often require broader, system-level strategies. The original taxonomy may be better suited for local, internal healthcare facility-focused initiatives rather than our nationally driven ones.

With respect to monitoring and evaluation methods, only a few guideline organizations assess the process, outcome or impact of guideline implementation. Guideline developers rely on informal methods (e.g. discussions with members) for process evaluation and clinical peer review or occasional one-time studies for outcome evaluation. The lack of regular and structured monitoring and evaluation often leave them uncertain about the effectiveness of their guidelines and implementation efforts in supporting end users and improving patient care.

Other guideline organizations (e.g. health insurers and governmental agencies) predominantly rely on benchmark information, primarily medical claims data from health insurers, for outcome and impact evaluation and audit and feedback. Audit and feedback generally yield small but potentially important improvements in practice [56, 57]. Furthermore, medical claims data are readily available and therefore reduce the administrative burden and cost of evaluations. However, using medical claims data for evaluation also comes with its limitations. The data are primarily collected for purposes other than outcome and impact evaluation and therefore may be less suitable [58]. Moreover, de Weerdt et al. (2021) found that healthcare professionals accept medical claims data only for certain clinical topics and under certain conditions [59]. Therefore, it should be used with caution.

Looking at the overall guideline process, it appears that greater emphasis is placed on developing guidelines rather than implementing them. While a few guideline organizations take a more systematic approach to implementation, exemplified by the establishment of dedicated implementation teams, these are exceptional cases. Generally, there seems to be a lack of a detailed, structured, mutually aligned step-by-step plan for guideline organizations regarding implementation. This is in contrast to the systematic and coordinated approach employed in guideline development [29]. Although a diverse range of different dissemination and implementation strategies is employed, implementation is often seen as an afterthought, not carefully considered early in the development process. For some guideline organizations it appears more as a formality than a fully integrated step to facilitate practice change. As a result, the potential impact of guidelines may not be fully realized.

We have identified both implications for follow-up research and practice. Further research into similarities and differences in how guideline organizations in other countries approach implementation, their allocation of roles and best practices can yield valuable lessons for optimizing implementation efforts. Furthermore, enhancing current implementation practices requires the allocation of dedicated time, resources and knowledge support. This enables the systematic completion of the entire cycle encompassing guideline implementation planning (which prioritizes pre-identifying

barriers, engaging stakeholders and utilizing implementation TMFs), as well as execution, monitoring and evaluation. Guideline organizations could hereby focus efforts on specific guideline recommendations backed by substantial evidence and with significant impact (e.g., affected patient numbers, illness severity, resource savings, or environmental considerations). We believe it would be helpful if this choice of impactful topics would be made in a process of national implementation agenda-setting, to be able to align stakeholders' efforts and to embed guideline implementation in broader policies aimed at improving quality and efficiency of care.

Furthermore, we have identified several suggestions for improvement of the AQUA guideline. The envisioned roles and responsibilities of each guideline organization (and local stakeholder) can be made more explicit. Moreover, the guideline does reference a useful implementation theory-based checklist for pre-identifying barriers. However, it lacks practical guidance on subsequent steps after barriers have been identified. For example, it does not provide direction on how to develop an effective implementation plan, utilize tools to select appropriate implementation strategies (e.g. the CFIR-ERIC matching tool [60]), engage stakeholders in tailoring these strategies, or where to find useful implementation TMFs. It would also be beneficial to gather best implementation practices from guideline organizations and compile an overview of existing national, regional and local structures, organizations, and initiatives for collaboration. This information could be included in an additional practical implementation manual, allowing guideline organizations to avoid reinventing the wheel. Nationwide guideline development and implementation involves extensive programs and significant resources. Making this process more efficient and effective can yield a substantial positive impact.

Strengths and limitations

A major strength of this study is its comprehensive approach, encompassing critical aspects of the implementation cycle, from planning to evaluation. This approach provides a thorough overview of implementation mechanisms, avoiding isolation of specific aspects. It offers a broad understanding of the variety of implementation planning, execution, monitoring and evaluation efforts undertaken by guideline organizations. However, to better direct improvement initiatives where they are most needed, quantitative data on the frequency of specific approaches would be useful, requiring additional quantitative research.

Another strength lies in the diverse range of participating guideline organizations. This diversity ensures representation of varied roles, perspectives, professions and specializations. However, it is important to note that the representatives participating in the study may have had a higher affinity for implementation, potentially leading to selection bias. We were not able to determine the exact impact this may have had on

the results. One possibility is that guideline organizations already actively engaged in implementation initiatives may have been more inclined to respond to the interview invitation. On the other hand, organizations that still had significant progress to make in implementation and faced implementation challenges may have also been motivated to participate. This could have resulted in either an overestimation or underestimation of nationwide implementation efforts.

While thematic saturation was achieved, the interviewed organizations may not fully represent the entire spectrum of guideline organizations and their guideline mplementation practices.

Lastly, the study benefited from the application of theories related to implementation planning, execution, monitoring and evaluation, as well as the validated taxonomy of Mazza et al. (2013) [37], to guide data collection and/or analysis.

CONCLUSION

Guideline organizations play a crucial role in facilitating the implementation of guidelines in practice. This study revealed that although Dutch guideline organizations acknowledged and endorsed the importance of implementation, implementation efforts often appeared unstructured, treated as a mere formality and an afterthought. Dissemination and implementation strategies were minimally selected and tailored based on implementation planning approaches that have previously demonstrated to optimize implementation efforts. Primarily dissemination and occasionally implementation strategies were used to improve guideline uptake and impact. Additionally, the lack of regular, structured monitoring and evaluation left uncertainties about the effectiveness of guidelines and implementation efforts in supporting end users and improving health outcomes. Suggested follow-up research and practice enhancements could strengthen central-level guideline implementation efforts, forming a basis for more effective implementation locally, ultimately benefiting patient care.

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4

Nationwide guideline implementation: a qualitative study of barriers and facilitators from the perspective of guideline organizations

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Published in BMC Health Services Research. 2025. 25(1), 150.

ABSTRACT

Background

Although the number of Dutch guidelines is growing, their uptake and impact in clinical practice lag behind. Dutch guideline organizations, including guideline developers, governmental agencies, health insurers and other national organizations, play a crucial role in developing, authorizing and/or supporting the use of guidelines. They influence end users' awareness, accessibility, understanding, acceptability and applicability of guidelines. In this study, we explored the barriers and facilitators that representatives of guideline organizations perceive in nationwide guideline implementation.

Methods

In this qualitative study, we conducted semi-structured interviews with 35 representatives of 24 different guideline organizations. We employed framework analysis, using the updated Consolidated Framework for Implementation Research (CFIR) and thematic analysis to guide our data analysis and synthesis.

Results

We found 45 different implementation barriers and 35 implementation facilitators. We identified seven overarching themes of interrelated barriers and facilitators that extended across the stakeholders involved and domains within the updated CFIR. These included 1) healthcare demand and resource availability, 2) implementation knowledge and expertise, 3) guideline characteristics: representation, evidence base and design, 4) partnerships and collaboration, 5) characteristics of guideline implementation planning, execution and evaluation strategies, 6) characteristics of healthcare professionals: need, capability, opportunity and motivation, and 7) legal and regulatory compliance.

Conclusions

We obtained valuable insights into the complex dynamics of barriers and facilitators perceived by guideline organizations in nationwide guideline implementation. Our findings help explain why healthcare professionals and healthcare facilities may (not), slowly or inconsistently adhere to guideline recommendations in practice. The identified barriers and facilitators provide guidance for policymakers to re-evaluate and improve nationwide quality and guideline implementation policies, to eventually improve clinical practice and health outcomes for patients.

BACKGROUND

Clinical practice guidelines are important means of optimizing patient care. Guidelines include recommendations informed by systematic reviews of the current scientific evidence and assessments of the benefits and harms of alternative care options [1]. They support healthcare professionals and patients in making informed medical decisions by promoting interventions of proven benefit (appropriate care) and discouraging ineffective or potentially harmful ones (low-value care) [2, 3]. Beyond guiding clinical practice, guidelines also support medical education, highlight important research gaps, and facilitate the monitoring and evaluation of care quality and cost-effectiveness [4]. In countries facing growing demand for healthcare, rising costs, healthcare resource shortages, and the environmental impact of healthcare practices, guidelines can play a crucial role in healthcare regulation [3, 5, 6]. As a source of readily available evidence, guidelines have shown the potential to improve the care process and patient outcomes, support appropriate care delivery and reduce treatment inequality [3, 6, 7].

The Netherlands is a pioneer in the development of guidelines. Since their initiation in 1982, Dutch guidelines have become the cornerstone of quality policy in prevention, diagnosis, treatment and healthcare organization [8]. As of 2024, there were approximately 2,200 guidelines for medical specialists, 350 for nurses, 140 for general practitioners and 50 for mental health professionals [9-12].

The value of guidelines depends not only on the quality of their recommendations, but also on their application in clinical practice [13, 14]. While deviations based on valid medical reasons and considering specific circumstances of individual patients are permitted, Dutch law expects healthcare professionals and healthcare facilities to follow guidelines [15]. Hence, the primary responsibility for implementing these guidelines and reshaping clinical practice and organizational structures rests with these guideline end users.

Alongside healthcare professionals and facilities, another key group of stakeholders is fundamental to guideline development and plays an important role in their implementation: guideline organizations. This term encompasses a diverse group of centrally operating national organizations that, as part of their tasks, develop guidelines, authorize them and/or support their use in clinical practice. In the Netherlands, these include scientific and professional organizations, patient organizations, governmental agencies, health insurers and other national (umbrella) organizations. Examples are the Dutch College of General Practitioners (NHG) and the Knowledge Institute of the Dutch Association of Medical Specialists (KIMS). They influence factors such as end users' awareness, accessibility, understanding, acceptability and applicability of guidelines [16-18]. Furthermore, they can actively stimulate local implementation by selecting, tailoring and applying dissemination and implementation strategies [13, 18-21].

Although the number of Dutch guidelines is growing, research shows that their implementation in local policy and practice can be unpredictable, slow and complex, potentially resulting in suboptimal patient care and wasted resources [22-27]. It is important to recognize that just developing and publishing guidelines and expecting healthcare professionals and facilities to implement them does not guarantee uptake or improvements in practice [28].

Various determinants can influence the implementation of guidelines. These determinants can occur at the micro, meso and macro level, including those of the guideline, healthcare professional, healthcare facility, guideline organization and external environment [29]. Identifying the determinants, that is, the barriers and facilitators, is an important first step in enabling effective selection and tailoring of strategies to improve guideline implementation [13, 19-21].

Barriers and facilitators to implementation experienced at the healthcare professional or facility level have been extensively studied nationally and internationally [30-35]. In contrast, influential determinants perceived by (Dutch) guideline organizations have received less attention [16, 36]. By examining the barriers and facilitators encountered at their level, we may uncover structural issues, nationwide trends, or new influential determinants. Furthermore, it enables the creation of well-informed national policies and activities regarding the development, implementation and evaluation of guidelines. Therefore, the aim of this study was to explore the barriers and facilitators that representatives of guideline organizations perceive in the implementation of guidelines.

METHODS

We used the consolidated criteria for reporting qualitative research (COREQ) for reporting the methods and findings (see Appendix 10) [37].

Study design

A qualitative design with semi-structured interviews was used to gain in-depth insight into the implementation barriers and facilitators perceived by representatives of guideline organizations.

The current study is part of a larger qualitative interview project that also investigates the role of Dutch guideline organizations in the implementation process, the specific implementation planning approaches they utilize, the implementation strategies they employ, and how they monitor and evaluate guideline implementation. Findings related to these aspects are reported elsewhere [38].

The Medical Ethics Review Committee of Amsterdam University Medical Centers approved the study protocol. They concluded that this study did not fall within the scope of the Dutch Medical Research Involving Human Subjects Act, as representatives were not subjected to medical procedures or specific behavioral rules [39]. Therefore, no additional formal ethical approval was required (statement ID 2021-0417).

Participants and sampling

The study population consisted of representatives of Dutch guideline organizations. We used purposive sampling methods to recruit a broad sample of these representatives [40]. Eligible guideline organizations were scientific/professional organizations, knowledge institutes, governmental agencies, health insurers, patient organizations and other national (umbrella) organizations that developed guidelines, published them and/or actively supported their use in clinical practice. Representatives were recruited based on their understanding of their organization's role or their own direct involvement in guideline implementation. We recruited potential participants through contact information obtained from guideline organization websites, contacts of the research team, as well as snowball sampling, where interviewed representatives recommended others [40]. Representatives were contacted via email or telephone. Prior to participation, they received an information letter containing study background, privacy information and informed consent information.

Data collection

Interviews, conducted between March and October 2023, were held via videoconference or in person, depending on representatives' preferences. Interviews were conducted by one or two researchers (TB, AG, AT), each with a background in health policy studies, completed training in interviewing techniques and prior interview experience. We employed a semi-structured approach using an interview guide (Appendix 8) with primarily open-ended questions, while also allowing for a more in-depth exploration of emerging topics. The guide included questions about perceived implementation barriers and facilitators. As mentioned under 'Study design', this study was part of a larger qualitative interview project. Therefore, the interview guide also covered questions related to implementation planning, execution, monitoring and evaluation activities as well as general inquiries, such as opportunities for improvement.

At the beginning of each interview, representatives were asked for permission to record the session for transcription purposes. We obtained written and verbal informed consent from each representative. Interviews lasted between 30 and 100 minutes, and representatives received an interview summary for member checking afterward. All interviews were audio recorded and transcribed verbatim. Data collection continued until no new themes emerged, indicating data saturation.

Theoretical framework, data analysis and synthesis

Interview transcripts were analyzed using the principles of framework analysis [41]. The updated Consolidated Framework for Implementation Research (CFIR) [29] guided our analysis. CFIR is a widely used framework for characterizing and classifying determinants that influence the implementation of healthcare innovations [42]. The 2022 CFIR update incorporates various recognized implementation theories, such as the COM-B constructs of the behavior change wheel [43]. It organizes barriers and facilitators into five domains: 1) innovation (the guideline being implemented), 2) inner setting (the setting in which the guideline is implemented, e.g., healthcare facility), 3) outer setting (the environment in which the inner setting exists, e.g., the health system), 4) individuals (the roles and characteristics of individuals, e.g., healthcare professionals and guideline committee members) and 5) implementation process (the activities and strategies used for guideline implementation) [29].

We applied deductive coding to the data. We developed an initial codebook based on the implementation domains and determinants from the updated CFIR to categorize the barriers and facilitators that representatives identified. Furthermore, open coding was used to capture interesting aspects that emerged from the data, such as additional barriers and facilitators. The codebook was updated iteratively throughout the process. Two researchers (AT and either TB or AG) independently coded the first eight interviews to align their coding. Subsequently, one researcher (TB, AG, or AT) coded the remaining interviews, cross-checked by a second researcher (AT or HM). The final coding tree is provided in Appendix 11. Coding was conducted using MAXQDA (version 2022).

After systematically categorizing the identified barriers and facilitators using the updated CFIR and organizing them in a data extraction template (Excel), we conducted a further analysis to explore their interactions and dynamics. This involved examining patterns, connections and influences between barriers and facilitators, as well as across different stakeholders and CFIR domains. Through this additional thematic analysis, we identified seven themes of barriers and facilitators, extending beyond the original CFIR domains. To provide a clearer understanding of the interactions and dynamics between determinants, the results are presented according to these themes.

RESULTS

Participant characteristics

We interviewed 35 representatives of 24 different guideline organizations. An overview of the representatives and their respective guideline organizations is presented in Table 1. To ensure that the quotes could not be traced back to specific representatives, we grouped them using four overarching labels: guideline developers (scientific/professional

organizations and knowledge institutes), governmental agencies, health insurers and other national organizations. The findings are presented using these group labels. Eight representatives held dual roles, such as working at both a governmental agency and a professional organization. Additionally, four representatives actively served as healthcare professionals while employed at a scientific organization and six representatives had prior experience working as healthcare professionals.

Table 1. Interview participant characteristics

Categories of guideline organizations	Guideline organizations	Number of participants
Guideline developers (scientific/professional organizations and knowledge institutes)	Dutch Quality Alliance in Mental Health Care (Akwa GGZ)	1
	Netherlands Comprehensive Cancer Organisation (IKNL)	1
	Knowledge Institute of the Dutch Association of Medical Specialists (KIMS)	2
	Dutch College of General Practitioners (NHG)	1
	Dutch Society for Internal Medicine (NIV)	2
	Dutch Society of Physicians for Respiratory Diseases and Tuberculosis (NVALT)	1
	Dutch Geriatrics Society (NVKG)	1
	Dutch Society of Obstetrics and Gynaecology (NVOG)	2
	Netherlands Society of Cardiology (NVVC)	1
	Dutch Society for Surgery (NVvH)	1
	Netherlands Association of Nurses and Care Workers (V&VN)	2
	Netherlands Association of Sports Medicine (VSG)	2
Governmental agencies	Health and Youth Care Inspectorate (IGJ)	1
	Dutch Healthcare Authority (NZa)	1
	Ministry of Health, Welfare and Sport (VWS)	2
	National Health Care Institute (ZIN)	4
	Netherlands Organisation for Health Research and Development (ZonMw)	1

Table 1. Interview participant characteristics

Categories of guideline organizations	Guideline organizations	Number of participants
Health insurers	Health insurance company	1
	Health Insurers Netherlands (ZN)	1
Other national organizations	Netherlands Federation of University Medical Centres (NFU)	1
	Dutch Hospital Association (NVZ)	1
	Netherlands Patients Federation (PFN)	1
	Health Care Evaluation and Appropriate Use (ZE&GG)	2
	Independent Clinics Netherlands (ZKN)	2

Implementation barriers and facilitators

Representatives mentioned 45 different implementation barriers and 35 different implementation facilitators. Appendix 12 provides a comprehensive list of the barriers and facilitators, classified according to the updated CFIR framework and illustrated by quotes.

We identified seven recurring themes of barriers and facilitators that were interconnected and extended across the five domains of the updated CFIR:

1. Healthcare demand and resource availability,
2. Implementation knowledge and expertise,
3. Guideline characteristics: representation, evidence base and design,
4. Partnerships and collaboration,
5. Characteristics of guideline implementation planning, execution and evaluation strategies,
6. Characteristics of healthcare professionals: need, capability, opportunity and motivation,
7. Legal and regulatory compliance.

We have outlined the barriers and facilitators according to these seven themes in the findings below and in Table 2.

1. Healthcare demand and resource availability

Representatives unanimously recognized that barriers and facilitators related to healthcare demand and resource availability influenced guideline implementation. At the health

system level, increasing demand for care, driven by factors like an aging population, combined with care resource constraints, such as staff shortages, forced compromises in care quality, accessibility and affordability. As a result, the high standards outlined in guidelines were not always attainable. However, representatives noted that this pressure also heightened the focus on prioritizing appropriate care (described in guidelines), de-implementation of low-value care and effective implementation:

"*We face challenges in healthcare on all fronts, including accessibility, staffing and affordability. When it comes to making critical decisions about where to allocate our limited workforce, we prefer to focus on care that we know adds value for the patient.*" – Representative 1, national organization

Another mentioned macro-level barrier was the weak link between care quality and reimbursement, as the system is still dominated by fee-for-service payment structures instead of quality-based payment models. Some representatives noted concerns among healthcare facilities and professionals about revenue reduction when (de-)implementing or reallocating care across professions, as recommended in guidelines. Representatives also encountered issues with temporary funding of guideline implementation projects, leading to unsustainable implementation or continued use of outdated guidelines or tools that had not been properly de-implemented.

At the level of guideline organizations and guideline committees, representatives observed a predominant allocation of resources (time, staff, funding) to developing and revising guidelines, rather than to their dissemination and implementation. Guideline committees often lacked time for implementation planning, resulting in concise, non-specific and copied implementation plans and insufficient follow-up for their practical execution.

"*[The implementation plan] is actually made entirely at the end of the guideline process and there is a certain budget allocated for creating it. We almost always run out of time, leaving very little time to truly focus on implementation. It becomes more of a checkbox exercise and is often filled in without much thought. And subsequently, scientific organizations, I believe, also don't look into it enough.*" – Representative 10, guideline developer

Representatives noted that guideline funders varied in prioritizing implementation as an integral part within guideline development. Guideline developers often had to request separate funds for developing implementation strategies, which were not always approved. Some guideline developers, often with a large number of members (healthcare professionals), allocated dedicated resources and teams for planning and executing implementation strategies. However, most guideline organizations reported

having limited or no capacity for implementation due to the sheer volume of guidelines, limited resources and prioritization of more urgent and mandatory tasks (e.g., quality programs, registrations):

"*That it's impossible to continuously work on implementing 3,000 guidelines, goals and who knows what else, while constantly knowing the progress and what is or isn't effective. So it's all about choices, choices, choices.*" – Representative 35, governmental agency

Consequently, the responsibility for planning and executing implementation strategies typically fell on the guideline committee members, often relying on their motivation and voluntary efforts.

Representatives mentioned that healthcare facilities and professionals also struggled to prioritize and implement guidelines due to the multitude of quality initiatives and guidelines available, limited capacity and funding, and the compatibility of requested organizational changes. According to a few representatives, this caused guideline fatigue among healthcare professionals. Here, financial compensation was seen as an important facilitator, allowing healthcare facilities and professionals to dedicate time for implementation tasks.

2. Implementation knowledge and expertise

Various representatives noted the widespread misconception that implementation occurs swiftly and automatically once a guideline is published, and that implementation requires minimal resources. Furthermore, representatives observed that some guideline committees lacked the consideration and expertise to address guideline implementability and actual implementation. Often, there was a lack of understanding of barriers hindering compliance with specific guidelines across different settings (from patient to health system).

"*The success of implementation also depends on how well the guideline is constructed. Has implementability been adequately considered in that guideline? Is there sufficient capacity to make changes? Is the physician population ready to tackle things differently? Is there enough funding? Is the hospital willing to invest? So, those are all aspects that you actually need to discuss very thoroughly when [developing] a guideline. And I see that that is not always the case.*" – Representative 27, national organization

To address these barriers related to implementation knowledge and expertise, some guideline developers formed dedicated implementation teams or added implementation experts, like communication specialists, to their guideline committees.

Representatives also noted a frequent lack of implementation expertise among healthcare professionals and facilities. "*They don't really get that from their training, so they sometimes find it very difficult to do*" (Representative 12, national organization). Those with expertise were frequently overburdened. To address this, several guideline organizations invested in training implementation (science) practitioners.

3. Guideline characteristics: representation, evidence base and design

Representatives mentioned that representation of stakeholders within guidelines affected implementation. Some observed that guidelines, guideline committees and/or involved guideline developers often reflected an (academic) medical professional perspective. They expressed concerns that the content and design of certain guidelines insufficiently considered broader stakeholder interests and contexts. Specifically, some guidelines overlooked the patient perspective and misaligned with the diversity in patient populations or care capabilities, for example in non-academic hospitals or clinics. Furthermore, certain guidelines focused too narrowly on medical and condition-specific possibilities, missing broader considerations like costs and care organization implications. Representatives said that these aspects led to some guideline organizations not fully endorsing the guidelines, slow or incomplete implementation in healthcare facilities and mixed support from guideline developers' members:

"*But we sometimes still see a gap between the scientific organization and actual practice. Scientific organizations often consist of enthusiastic people who want to collaborate and prioritize quality highly. So, even if such a scientific organization is at the table, it doesn't mean that the entire professional group stands behind it.*" – Representative 23, governmental organization

Another challenge that representatives encountered was reaching consensus on multidisciplinary guidelines, as the involvement of many stakeholders with differing interests complicated and slowed the development and implementation process. On the other hand, representatives noted that guidelines developed by medical peers and endorsed by reputable guideline developers were more likely to be accepted and supported among healthcare professionals. Another facilitator mentioned was writing guidelines from the patient's perspective (patient journey), which fostered a sense of joint effort for patients among end users.

The evidence supporting guideline recommendations was considered another key determinant. Representatives noted that guidelines quickly became outdated due to the constant influx of new evidence and lengthy development processes, hindering their effective use. The weak formulation of guideline recommendations, due to insufficient conclusive evidence, also negatively impacted adoption. A representative noted that

guideline recommendations were sometimes deliberately formulated vaguely, as guideline committees wanted to preserve professional autonomy. Conversely, representatives mentioned that concretely formulated recommendations and strong supporting evidence helped convince end users to adapt their practice:

"*The guidelines that implement most easily are simply the ones where the evidence is very clear. … Then you don't even need to create a guideline, so to speak. If the outcome is clear, then there is no problem at all in implementing the guideline. None at all.*" – Representative 31, guideline developer

The third influential guideline characteristic was its design. The recently introduced modular updating and structuring enabled faster incorporation of new insights, potentially saving the guideline committee time and energy that could be redirected towards implementation. However, representatives noted that guidelines remained extensive, often unread and difficult to navigate for some users (e.g., patients, care assistants).

4. Partnerships and collaboration

An overarching health system challenge affecting implementation was mutual distrust among central and local stakeholders (e.g., healthcare facilities, governmental agencies, health insurers), driven by negative perceptions of each other's interests. Representatives observed that this distrust hindered effective collaboration on guideline implementation:

"*Yeah, and if I trust you, then I want to help you get that done. … Collaborating isn't saying, 'you have to do that'. Collaborating is thinking together, 'what do we have, what needs to happen and what can I do?' And we're really not there yet, are we? … That lack of collaboration, lack of trust, it's in all parties.*" – Representative 32, guideline developer

Representatives saw formal collaborative agreements, such as the Outline Agreement on Medical Specialist Care (HLA-MSZ) and the Health Care Evaluation and Appropriate Use (ZE&GG) program – an initiative where patients, healthcare professionals, facilities, insurers and the government work together to deliver the proven best care for patients – as facilitators. Representatives argued that these agreements not only facilitated easier access to other stakeholders, but also improved collaboration, built trust and ensured collective commitment to implementation: "*And that's what the ZE&GG program is currently striving to achieve: to emphasize that everyone has a role to play in this endeavor*" (Representative 14, governmental agency).

However, some representatives observed missed opportunities for collaboration between organizations. They mentioned that a lack of awareness about shared goals and

collaboration opportunities between their quality initiatives and restrictive collaborative regulations limited joint efforts.

At the level of healthcare facilities and professionals, some representatives noted that shorter communication lines between healthcare professionals, support functions (IT department) and management – often found in smaller facilities such as clinics – facilitated quicker adaptation to guidelines.

5. Characteristics of guideline implementation planning, execution and evaluation strategies

Regarding implementation planning, representatives noted significant variations in guideline development and implementation policies across guideline organizations. This included differences in guideline names, characteristics and development and implementation processes. This lack of standardization was viewed by some as a barrier:

"*Then you should really take a moment to consider: how can we ensure that we streamline it as much as possible? So that it's easier for everyone to understand. All those different definitions of guideline types, the entire process, all those different entities involved. It should be more standardized.*" – Representative 5, national organization

Representatives also observed that implementation was often considered only in the final phase of guideline development instead of from the outset and throughout. Additionally, stakeholders, including end users, were sometimes engaged late or overlooked in implementation planning and execution, resulting in missed opportunities for tailored implementation. Another identified barrier was that implementation strategies (tools) were not always tailored to meet end users' needs: "*It [implementation tool] was introduced and then no doctor looked at it. Simply because it didn't fit into their work and they didn't have time for it*" (representative 1, national organization). Various representatives noted that guideline databases were particularly untailored. While commonly used and valued for dissemination, storing different types of guidelines in separate databases reduced user-friendliness and introduced uncertainty about guideline quality and currency. Some also learned from healthcare professionals that database search options and other features did not meet their information needs.

Representatives identified facilitators that complement the previously stated barriers. They observed that addressing implementation and engaging stakeholders early in the development process could enhance implementation effectiveness. Close stakeholder engagement provided guideline organizations with insights into implementation feasibility, barriers and end users' needs. Additionally, creating a detailed step-by-step plan could

streamline both development and implementation processes: "*so, we've created several good process descriptions. I find that beneficial*" (representative 15, guideline developer).

Regarding implementation execution, representatives highlighted several used strategies that, in their experience, specifically enhanced implementation. They emphasized the importance of having a dedicated implementation leader, as well as a communication specialist to aid in developing effective implementation strategies. A representative noted that establishing recurring fixed guideline publication moments (e.g., at the yearly conference) set clear expectations for end users and improved dissemination. Ensuring guideline accessibility was also emphasized, including publishing in a guideline database and updating and aligning information sources like patient and professional websites. At the healthcare facility level, representatives highlighted aligning information technology, such as electronic patient records, with guidelines as an effective strategy. Another perceived effective strategy was ZE&GG's implementation agenda, which raised awareness in healthcare facilities about the recommendations that needed to be implemented. At the patient level, developing tailored guideline information to empower patients was emphasized as an important strategy.

With regard to implementation evaluation, representatives indicated that collecting and presenting audit and feedback information was valuable for identifying areas for improvement and driving care enhancements. However, some noted a lack of high-quality data on implementation performance, leaving the state of practices and undesirable practice variations unclear. Additionally, healthcare facilities and professionals sometimes dismissed the data as inaccurate. Finding a balance between the benefits (identifying areas of improvement) and burdens (administrative workload) of data collection for evaluation was considered challenging and required compromises.

6. *Characteristics of healthcare professionals: need, capability, opportunity and motivation*

Representatives identified implementation determinants related to characteristics of healthcare professionals. With regard to need, representatives noted that a strong, bottom-up demand for a specific guideline boosted its implementation. High uncertainty, risk of harm and urgency surrounding conditions, such as with COVID-19, created a pressing need for clear, reliable recommendations among healthcare professionals.

In terms of capability, representatives emphasized that healthcare professionals' (interpersonal) skills and (implementation) knowledge significantly impacted implementation. According to representatives, a considerable number of professionals lacked the necessary knowledge, confidence and expertise for effective guideline implementation. New guidelines often required more specialized skills, which could be

daunting. Another factor influencing implementation was that some medical professional groups, such as nurses, were relatively new to using guidelines, unlike more experienced groups like GPs with a long history of guideline use. Additionally, representatives noted that the introduction of new or revised guidelines, particularly those aimed at discontinuing low-value care, often met with hesitation from professionals due to concerns about potential patient harm, conflicting expectations, or resistance during consultations: "*but when a patient makes a request to you, it's very difficult to say no*" (Representative 25, health insurer).

Regarding implementation opportunities for healthcare professionals, representatives suggested that a learning-centered approach in healthcare facilities could aid implementation, by allowing healthcare professionals to learn without immediate consequences. In turn, strong hierarchical structures based on experience, seniority and nurse-physician dynamics could impede the open communication needed for learning and implementing changes.

Regarding motivation, many representatives emphasized that healthcare professionals were intrinsically motivated to improve care, which should be encouraged and harnessed by guideline organizations. "*I would say, within nursing, that a promoting factor is their true passion for the profession and strong motivation to deliver quality care*" (Representative 4, guideline developer). However, representatives frequently experienced that healthcare professionals clung to old habits, making change difficult after years of established routines. Cognitive dissonance – the mental discomfort healthcare professionals experience upon realizing that their past or current practices conflict with guideline-recommended practices – was another identified barrier. Representatives also mentioned that some healthcare professionals perceived guidelines as hindering personalized care and limiting their professional autonomy.

7. Legal and regulatory compliance

Representatives identified various barriers and facilitators related to legal and regulatory compliance. They mentioned that conflicting guidelines and regulations, such as European guidelines, volume standards or regulations from the Authority for Consumers and Markets (ACM) sometimes hindered implementation:

"*We're going to see how we measure up against the European professional association, which is holding its conference here in Amsterdam in September and will be presenting all their new guidelines.*" – Representative 33, guideline developer

Furthermore, several representatives from governmental agencies and health insurers felt that their organizations lacked the mandate to drive implementation compared to

healthcare professionals. They respected professional autonomy but desired additional means to enforce implementation when necessary. The Health and Youth Care Inspectorate (IGJ), the governmental agency that supervises the quality and safety of healthcare and youth care services in the Netherlands, was recognized as having this authority to enforce implementation. However, the IGJ focused on broader quality and safety aspects beyond guidelines (e.g., organizational culture and working environment) and pursued its own improvement objectives. Another identified facilitator was the legal obligation for healthcare professionals to follow guidelines. In case of serious incidents or complaints, healthcare professionals had to justify their actions to a review board and undergo assessment, which served as an extrinsic motivator to align their practices with guidelines:

"*A negative situation is when you experience a complication and you have to appear before the disciplinary board or incident review board because you need to justify yourself. Yes, those who have experienced it once will definitely read the guidelines the next time. But that's only one in so many cases.*" – Representative 17, guideline developer

DISCUSSION

The implementation of guidelines is a critical process that directly impacts the quality of healthcare delivery. However, the successful translation of these guidelines into practice faces numerous barriers while also benefiting from various facilitators. This qualitative study offers a comprehensive overview of the barriers and facilitators encountered by representatives of Dutch guideline organizations in their efforts to support the implementation of guidelines. We identified 45 barriers and 35 facilitators, categorized into seven overarching themes. Representatives encounter barriers and facilitators predominantly on the level of implementation team members (guideline committees/guideline organizations), those delivering care (healthcare professionals) and the outer setting in which guideline organizations operate.

Important health system-wide barriers to effective guideline implementation include the constrained availability of resources for both care delivery and implementation, compounded by the growing demand for care and the multitude of quality recommendations, initiatives and tasks. These determinants make it challenging for guideline organizations and end users to prioritize guideline implementation. Such barriers have also been identified in previous research, including two meta-reviews on global implementation barriers and facilitators [31, 33], as well as more targeted empirical studies examining implementation experiences of international guideline organizations, Dutch hospitals and Dutch general practitioners [16, 30, 44]. As workforce shortages, care demands and the number of care quality recommendations continue to grow [9, 45,

46], achieving the optimal care standards outlined in guidelines is likely to become even more difficult in the years ahead. This urges the need to rethink guideline policies and nationwide care quality strategies. With advancements in artificial intelligence potentially enabling efficient real-time guideline development [47], we propose to strategically invest in this innovative approach, coupled with a gradual reallocation of efforts towards guideline contextualization and implementation. Blume et al. (2017) [27], for instance, recommend that guideline developers should grade the relative relevance of guideline recommendations to better align with real-world constraints, so that end users can balance the delivery of guideline-recommended care against the available resources. Furthermore, we suggest structurally embedding implementation as a core objective of the guideline development process, supported by dedicated resources. Lastly, stakeholders could reassess the prioritization of guideline implementation in the multitude of their care quality tasks. These strategies may tackle the aforementioned barriers, improving the applicability, implementation and impact of guidelines on healthcare outcomes.

The identified determinants in this study also highlight other systemic issues. The determinants of trust, collaboration, stakeholders' enforcement power and the weak link between care quality and reimbursement, fit within broader current criticisms of the 'managed competition' model underlying the Dutch healthcare system. This model, in which healthcare facilities negotiate with health insurers on price, volume and quality of care, aims to improve efficiency, reduce central governance and enhance accessibility of good quality health services at acceptable societal costs [48]. Critics, however, argue that market mechanisms have been overextended. Competition and cost-savings have become more important than collaboration and healthcare quality. Furthermore, a power conflict exists between health insurers and healthcare facilities and trust between stakeholders is low [49-51]. Boosted by the increased collaboration during the COVID-19 pandemic and recent collaborative initiatives like the Integral Care Agreement [52] and ZE&GG program, there seems to be growing support for enhanced stakeholder cooperation to stimulate appropriate care, moving beyond a strict managed competition model. Our results show that stakeholders in guideline implementation are interdependent, as each can address only part of the identified determinants. Greater collaboration between guideline organizations and end users may therefore offer key opportunities for improvement. We recommend to collectively focus implementation resources and actions on specific, robustly evidence-based recommendations with significant positive impact. This national implementation agenda setting, an extension of ZE&GG's Implementation Agenda [53], could foster alignment of implementation efforts, trust between stakeholders and delivery of appropriate care as outlined in the guidelines.

Our study also highlights conflicting regulations, legal obligations and the balance between professional autonomy and guideline organizations' enforcement mandates

Table 2. Implementation barriers and facilitators identified by guideline organization representatives, categorized using the updated CFIR and organized into seven overarching themes.

CFIR categories of implementation determinants	Barriers
THEME 1: HEALTHCARE DEMAND AND RESOURCE AVAILABILITY	
Outer setting domain	
Local attitudes	*No barrier identified in this category*
Local conditions	Due to the increasing demand for care and limited care provision resources, concessions must be made regarding quality, accessibility, and affordability, which means that not all guideline recommendations can be implemented
Financing	Many guideline organizations lack standard budgets for implementation and instead depend on supplementary external funding
	The connection between quality of care and care reimbursement/ financial incentives is weak and challenging to establish in the current healthcare system
	Fear of reduced revenue due to the de-implementation or relocation of certain care practices as recommended in the guideline
	Implementation projects/programs and their funding are temporary and lack structural updates, leading to unsustainable implementation or continued use of outdated guidelines/ implementation tools
External pressure	Priority towards developing/revising guidelines rather than disseminating/implementing them
Available capacity / resources [a]	Guideline organizations lack the capacity/resources to handle the multitude of (quality) tasks, including implementation of guidelines, and therefore have to determine which quality initiatives to prioritize
Inner setting domain	
Relative priority	Healthcare facilities need to determine which quality initiatives (e.g. programs, guidelines) to prioritize and implement, given the abundance of initiatives, limited capacity/funding and the compatibility of the requested organizational changes
Available resources	*No barrier identified in this category*
Individuals domain (roles subdomain / characteristics subdomain) [b]	
Implementation team members / opportunity	Guideline committee has insufficient capacity/time to plan/execute implementation strategies

Facilitators
Increased implementation momentum/urgency/more attention to implementation
Due to the increasing demand for care and limited care provision resources, more attention is given to implementing appropriate care described in guidelines
Various funders of guidelines require guideline developers to meet implementation criteria as a prerequisite for funding the development of guidelines
Healthcare facilities receive financial compensation in exchange for creating an implementation action plan
No facilitator identified in this category
No facilitator identified in this category
No facilitator identified in this category
Healthcare facility has allocated funding to enable healthcare professionals to dedicate time to implementation
No facilitator identified in this category

Table 2. (continued)

CFIR categories of implementation determinants	Barriers
Implementation team members / motivation	Guideline committee lacks motivation to plan/execute implementation strategies
Innovation deliverers / opportunity	Healthcare professionals struggle with keeping track of and implementing the multitude of guidelines due to limited capacity and time constraints
Innovation deliverers / motivation	Healthcare professionals experience guideline fatigue
Implementation process domain	
Planning	Guideline implementation plan is very concise, not concrete and/or copied from a previous guideline
	No adequate attention/follow-up/action to guideline implementation plan/pilot implementation
THEME 2: IMPLEMENTATION KNOWLEDGE AND EXPERTISE	
Outer setting domain	
Local attitudes	Belief that implementation occurs swiftly/automatically once a guideline is published and requires minimal resources
Individuals domain (roles subdomain / characteristics subdomain)	
Implementation team members / capability	Guideline committee insufficiently considers or lacks the necessary expertise to address the implementability of the guideline during its development process
	Guideline committee lacks adequate expertise in planning/executing implementation strategies
Innovation deliverers / capability	Healthcare professionals have insufficient implementation expertise
THEME 3: GUIDELINE CHARACTERISTICS: REPRESENTATION, EVIDENCE-BASE AND DESIGN	
Innovation domain	
Innovation source	Guideline, guideline committee and/or guideline developer predominantly reflect an (academic) medical professional perspective, giving less consideration to other interests, stakeholder perspectives and contexts (e.g. patient or general hospital perspective)

Facilitators
No facilitator identified in this category
No facilitator identified in this category
No facilitator identified in this category
No facilitator identified in this category
No facilitator identified in this category
No facilitator identified in this category
Train implementation (science) practitioners to improve implementation expertise
Guidelines developed by peers and endorsed by scientific organizations foster consensus and support for their use among healthcare professionals
Acceptance of the guideline is influenced by the favorable reputation that scientific/professional organizations maintain among their associated healthcare professionals

Table 2. (continued)

CFIR categories of implementation determinants	Barriers
Innovation evidence-base	Guidelines quickly become outdated due to the constant influx of new evidence and the lengthy development process
	Insufficient conclusive evidence, resulting in weak guideline recommendations
Innovation complexity	Multidisciplinary guidelines are harder to develop and implement due to the involvement of multiple stakeholders with different interests
Innovation design	Guideline recommendations are formulated vaguely, as guideline committees are cautious about formulating strong recommendations, to preserve professional autonomy and avoid being held accountable by peers
	Guidelines are extensive documents, difficult to understand for some end users
Outer setting domain	
Partnerships & connections	Not all (guideline) organizations agree with certain guideline recommendations
THEME 4: PARTNERSHIPS AND COLLABORATION	
Outer setting domain	
Partnerships & connections	Guideline organizations do not have a clear view of the similarities and collaboration opportunities regarding each other's quality initiatives
	Central and local stakeholders (e.g. insurers, healthcare professionals, healthcare facilities' board of directors) do not collaborate effectively due to mutual distrust
	Guideline organizations do not use all collaborative opportunities to inform stakeholders about guidelines
Inner setting domain	
Relational connections	*No barrier identified in this category*
THEME 5: CHARACTERISTICS OF GUIDELINE IMPLEMENTATION PLANNING, EXECUTION AND EVALUATION STRATEGIES	
Innovation domain	
Innovation design	*No barrier identified in this category*

Facilitators
Guideline's (perceived) credibility and evidence-base
Guideline recommendations that are concrete, practical, and straightforward, without unnecessary complexity
Modular updating and structuring of guidelines save the guideline committee energy/time which could be re-allocated towards implementation efforts, enable faster incorporation of new insights, and make the recommendations more manageable to disseminate/implement
Guideline described from patient perspective
No facilitator identified in this category
The bond of trust between specific (representatives of) guideline organizations strengthens implementation efforts
Formal collaborative agreements between guideline organizations (e.g., ZE&GG program) ensure a collective commitment to implementation and provide opportunities to more easily reach multiple stakeholders
Healthcare facilities with short communication lines between healthcare professionals, support functions (IT department) and management adapt to guidelines more quickly
Recurring fixed guideline publication moment

Table 2. (continued)

CFIR categories of implementation determinants	Barriers
Outer setting domain	
Partnerships & connections	*No barrier identified in this category*
Inner setting domain	
Structural characteristics	*No barrier identified in this category*
Access to knowledge & information	*No barrier identified in this category*
Individuals domain (roles subdomain / characteristics subdomain)	
Implementation leads / motivation	*No barrier identified in this category*
Implementation process domain	
Assessing needs	*No barrier identified in this category*
Planning	Implementation is not addressed throughout the process, but only in the last phase
Tailoring strategies	Guidelines are published in different guideline databases, which makes it less user-friendly and creates uncertainty about guideline currency and quality
	Implementation strategies are not tailored to guideline end users
Engaging	Forgotten/late engagement of stakeholders in the implementation planning/execution
Doing	No standardized guideline development and implementation process
Reflecting & evaluating	Insufficient good quality data on the success of implementation
	Balancing the need for data collection for measuring implementation success against the perceived burden of administration is challenging

	Facilitators
	Critical sources/websites containing guideline information (e.g. Thuisarts and websites of scientific/ professional organizations) are updated and aligned
	Aligning information technology infrastructure with the guideline
	Structural attention to guidelines in healthcare professional practice meetings (e.g. handovers, multidisciplinary consultations)
	Implementation Agenda raises awareness within healthcare facilities about the need for implementation and their responsibility in the process
	Dedicated implementation leader
	Through close engagement with stakeholders, guideline organizations can better understand their implementation needs and effectively facilitate them
	Creating a detailed step-by-step plan for the implementation process
	Addressing implementation and engaging stakeholders early on, already in the guideline development process
	Ensuring easy access to guideline content for end users (through guideline database and patient information)
	Empowering patients through the development of guideline information specifically for patients
	A communication advisor is involved and assists implementation
	No facilitator identified in this category
	Audit & feedback benchmark information is useful to support implementation and evaluation

Table 2. (continued)

CFIR categories of implementation determinants	Barriers
THEME 6: CHARACTERISTICS OF HEALTHCARE PROFESSIONALS: NEED, CAPABILITY, OPPORTUNITY AND MOTIVATION	
Inner settings domain	
Communications	Open communication across hierarchical structures (e.g. work experience, nurse-physician relationship) about changing practice is perceived as challenging
Culture	*No barrier identified in this category*
Individuals domain (roles subdomain / characteristics subdomain)	
Innovation deliverers / need	*No barrier identified in this category*
Innovation deliverers / capability	Certain medical professional groups are not yet accustomed to using guidelines
	Healthcare professionals are hesitant to (de-)implement out of fear of causing harm to patients
	Healthcare professionals' lack of confidence/knowledge/skills to execute guideline
	Healthcare professionals' fear of going against patients' expectations/wishes
Innovation deliverers / motivation	Healthcare professionals cling to old habits and routines
	Healthcare professionals experience cognitive dissonance between their past/current practices and the guideline-recommended practices
	Healthcare professionals perceive guidelines as restricting their professional autonomy

Facilitators
No facilitator identified in this category
Healthcare facility and healthcare professionals are learning-centered
Culture of adhering to guidelines ingrained within the profession
There is a strong demand among healthcare professionals for a specific guideline (e.g. there is a high level of uncertainty)
No facilitator identified in this category
Healthcare professionals are intrinsically motivated to improve and deliver good care

Table 2. (continued)

CFIR categories of implementation determinants	Barriers
THEME 7: LEGAL AND REGULATORY COMPLIANCE	
Outer setting domain	
Policies & laws	Regulations (e.g. volume standards, rules about fair cooperation between healthcare facilities from the Authority for Consumers and Markets (ACM)) hinder implementation
	Conflicts between different guidelines/protocols on the same topic
External pressure	Guideline organizations have insufficient mandate/power to push implementation, compared to significant healthcare professional autonomy

Implementation determinants are classified according to the updated CFIR [29]. Definitions and detailed descriptions of the updated CFIR concepts are presented in the additional files of Damschroder et al. (2022).
[a] Implementation determinants that did not fit in the original updated CFIR were classified and added in *italicized* text.
[b] In the individuals domain, we coded the relevant characteristics for each identified role, following the recommendation of Damschroder et al. (2022).

as important determinants. These determinants stress the intricate interplay between intrinsic and extrinsic motivators in enhancing change. While extrinsic motivators are commonly employed to target 'laggards' [54], some guideline organizations in our study proposed expanding their use due to the current pressures on healthcare and slow implementation progress. Extrinsic motivators may enhance guideline adherence and prompt quick changes, but they may also cause resistance, lead to superficial compliance, undermine professional autonomy, fail to increase change capacity, divert focus from other potentially more urgent issues and require significant resources for implementation and monitoring [55-57]. Sustainable improvement may therefore require strategies that foster intrinsic motivation and integrate guideline implementation into the culture and daily practice of healthcare professionals and facilities, alongside extrinsic motivators that align with these end users' intrinsic values [56, 57].

Our results indicate that because of growing pressures on the healthcare system, stakeholders are increasingly interested in what is written in guidelines regarding what low(er)-value care to remove, replace, reduce or restrict. Previous research highlights differences between the act of implementing versus de-implementing, including unique determinants and effective strategies [58-60]. Although our study does not specifically explore these differences, we identify several barriers to de-implementation that highlight its complexity and distinct challenges. These include established routines, cognitive dissonance, concerns about potential patient harm, conflicting expectations and potential

Facilitators
Healthcare professional must justify themselves to a disciplinary or incident review board due to an incident/complaint and undergo assessment to determine if they have worked in accordance with the professional standard
Health and Youth Care Inspectorate (IGJ) can use its authority/power to push implementation in healthcare facilities

revenue loss. Guideline organizations should consider the differing determinants when selecting and tailoring strategies for implementation versus de-implementation, as certain strategies – such as holding healthcare professionals accountable when prescribing low value care [61] – may be especially effective for de-implementation. Additionally, when revising guidelines, outdated recommendations and associated implementation tools must be explicitly de-implemented to avoid continued use.

Another important finding is the gap in implementation knowledge and expertise among guideline committees and end users. The expectations of effective guideline implementation with minimal activities and resources contrast sharply with the complex, unpredictable, resource-intensive realities of actual implementation. This misconception has been noted in previous studies among national and local guideline implementation initiatives as well as broader governmental policy implementation [3, 62-64]. Literature stresses the need to integrate implementation science and expertise into implementation teams and initiatives [18, 64, 65]. Alongside current efforts to improve implementation knowledge and expertise, such as appointing communication specialists and training implementation science practitioners, stakeholders would benefit from guidance from a central implementation team. This team could support context-specific implementation by leveraging implementation knowledge, insights from best practices and adaptable implementation tools. This approach would prevent stakeholders from reinventing the wheel and potentially lead to more effective implementation efforts.

Lastly, representation, evidence base and design are considered key guideline characteristics in successful guideline development and implementation. Our results confirm that guidelines overly focused on certain stakeholders can alienate other perspectives and interests, which could affect guideline acceptance, relevance and applicability across various settings [66, 67]. However, we also found that involving numerous stakeholders can delay the guideline development and implementation process. This corroborates previous Dutch research on guideline development, emphasizing the importance of balancing inclusiveness with efficiency [68]. The study also supports previous research [69, 70] showing that outdated or weakly evidence-based recommendations hinder adoption, underscoring the importance of regular guideline updates to align with the latest scientific findings. Modular updates are viewed as efficient for maintaining relevance and potentially freeing up time for implementation. However, it remains uncertain whether the time saved is actually redirected towards implementation or instead used for developing and revising other guideline modules, which further challenges end users in staying up to date.

Strengths and limitations

A key strength of this study is the great diversity of participating guideline organizations. This diversity provided a broad representation of various roles, perspectives, professions and specializations, enriching the research with multiple viewpoints. However, it is important to note that the participating organizations may have had a greater interest in implementation, potentially leading to selection bias. While thematic saturation was achieved, the interviewed organizations may not fully represent the entire spectrum of guideline organizations and their implementation practices.

In asking the representatives about the barriers and facilitators, we adopted an open and exploratory approach. We did not review the entire list of potential barriers and facilitators provided by CFIR with each representative, nor did we cross-check all the barriers and facilitators mentioned by the representatives with others. Consequently, certain determinants may have been missed or may have been considered more or less important. Given that determinants vary across different settings, guidelines and even individual recommendations, tailored and barrier-driven implementation strategies focused on key recommendations are necessary to enhance adherence of specific guidelines in practice. Nevertheless, we are confident that our interview method has enabled us to capture the most significant guideline-transcending barriers and facilitators.

A final limitation is that the representatives also mentioned determinants they believed were significant from the perspective of other stakeholders, such as healthcare professionals. In this study, it was difficult to verify the accuracy of these interpretations. However, some representatives worked closely with other stakeholders or held multiple

roles within different organizations. For example, some representatives were also working as healthcare professionals or had previously worked in that capacity. Further research is needed to explore and verify the perceived guideline implementation barriers and facilitators among other stakeholders.

CONCLUSION

Guideline organizations play an important role in facilitating the implementation of guidelines in practice. This study offers valuable insights into the complex dynamics of barriers and facilitators perceived by representatives of guideline organizations in nationwide guideline implementation. The findings help explain why healthcare professionals and healthcare facilities may (not), slowly or inconsistently adhere to guideline recommendations in practice. Findings from this study also provide considerations and guidance for policymakers to re-evaluate and improve nationwide quality and guideline implementation policies, to eventually improve clinical practice and health outcomes for patients.

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5

From policy to practice: an ethnographic process evaluation of a public HTA agency's role in nationwide implementation of asthma recommendations

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ABSTRACT

Background

Growing healthcare demand, rising healthcare costs and workforce shortages are pressuring health systems to improve the efficiency and effectiveness of care delivery. Health technology assessment (HTA) agencies play a key role by identifying low- and high-value care and issuing recommendations for improvement. This study examines the role of a public HTA agency in stimulating the implementation of its asthma appropriate care recommendations nationwide and the determinants perceived to influence this process.

Methods

We used the Dutch National Health Care Institute's Appropriate Care program asthma as a case study. Our ethnographic approach entailed document analysis, participant observation and in-depth conversations and interviews with key informants.

Results

The National Health Care Institute initially positioned itself in a facilitative role, delegating implementation responsibilities to patients, healthcare professionals, healthcare facilities, health insurers and their representative organizations. Due to factors such as limited capacity and resources, insufficient commitment and co-dependency among stakeholders, the process evolved into a more collaborative effort between the Institute and stakeholder organizations. Implementation strategies were partly selected and tailored based on implementation planning approaches that are known to enhance recommendation uptake and impact; decisions were partially informed by pre-identified barriers and developed in close collaboration with stakeholders. However, implementation activities were not systematically guided by implementation theories, models and frameworks. The asthma project primarily used dissemination strategies, with limited use of more interactive implementation strategies.

Conclusions

The Institute faced challenges in realizing its initial implementation 'plans as imagined'. Its assumptions and expectations about implementation turned out to diverge considerably from practice, requiring adaptation to the situational context. Our findings highlight the importance of evidence-based, flexible and proactive implementation planning and cross-organizational coordination of roles, possibilities and actions. This includes integrating implementation considerations from the start and selecting and tailoring implementation strategies based on pre-identified barriers, stakeholder engagement, and implementation theories, models and frameworks. Future research could compare whether a more intensive collaborative approach and collective agenda-setting for nationwide quality improvement lead to more efficient and effective implementation efforts and improved healthcare outcomes.

BACKGROUND

Providing high-quality, accessible, and affordable healthcare is becoming increasingly challenging in high-income countries. Ever more expensive treatment options and rising demand for healthcare services coincide with shortages of healthcare professionals and resources [1]. To deal with these pressures, decision-makers try to improve health system efficiency and effectiveness, to maximize value for patients with the resources at hand [2].

Health Technology Assessment (HTA) is a systematic evaluation method that informs the prioritization of healthcare services. HTA is defined as "*a multidisciplinary process that uses explicit methods to determine the value of a health technology at different points in its lifecycle. The purpose is to inform decision making in order to promote an equitable, efficient, and high-quality health system*" [3]. Herein, a 'health technology' may refer to a broad range of interventions, including pharmaceuticals, devices, procedures, programs and organizational and managerial systems. HTA uses the best available (scientific) evidence to evaluate the value and implications of implementing a (new) health technology compared to existing alternatives. Factors considered in this evaluation include clinical effectiveness, costs, ethical and legal considerations, as well as organizational and environmental aspects. The assessment culminates in a formal recommendation on the adoption of the health technology [3].

For the health system to benefit, these HTA recommendations must be put into practice. This involves effectively and sustainably de-implementing (or more commonly in HTA: *disinvesting from*) low-value care and implementing (or *reinvesting in*) high-value care. With growing pressures on health systems, both the urgency and interest regarding the implementation of HTA recommendations have increased [4, 5]. Worldwide, various (public) agencies are tasked with conducting HTA at the national and regional level. However, the success of these initiatives in ultimately driving meaningful practice changes has been mixed. In their review of HTA disinvestment initiatives, Chambers et al. (2017) found that fewer than half of the identified studies reported a reduction in the use of low-value healthcare services [5]. Consequently, patients may not receive appropriate care and valuable healthcare resources are wasted [6-11].

Although effective (de-)implementation is recognized as an essential component of the HTA lifecycle approach, it has received relatively limited attention [5, 12, 13]. This may be partly due to the remits of HTA agencies, which often prioritize their role in evidence synthesis over implementation [12]. To bridge the gap between recommendations on paper and implementation in practice, it is essential to understand the implementation process and the determinants that influence it. It is also important to examine the role of the HTA agency as the initiator, evidence-synthesizer and sender of the recommendations. More evidence is needed in this context to enable HTA agencies to effectively drive meaningful practice improvements [4, 5].

Therefore, our aim is to gain in-depth insight into how HTA agencies can stimulate implementation of their recommendations in practice and the key determinants perceived to influence this process. Our case study examines the Dutch *Appropriate Care program* (*Passende Zorg verbetertrajecten*, formerly known as *Zinnige Zorg*). The program was established by the National Health Care Institute (*Zorginstituut Nederland* – hereafter referred to as 'the Institute'), one of the key organizations responsible for HTA in the Netherlands. The Institute is an independent public agency that oversees, promotes and regulates healthcare quality improvement, accessibility and affordability for Dutch citizens [14]. To fulfill this role, the Institute introduced its own HTA program, the Appropriate Care program, in 2013. Through this program, the Institute seeks to promote appropriate care by identifying and addressing both overuse of low-value care and underuse of high-value care. To achieve this, the Institute collaborates with key stakeholders, including other governmental agencies and organizations representing healthcare professionals, patients and health insurers (hereafter referred to as 'stakeholder organizations') [15, 16]. One of the 27 initiatives within the Appropriate Care program is the asthma care project. We use this project to explore how an HTA agency, such as the Institute, can drive nationwide implementation of recommendations.

The objectives of this study are to:

1. Examine how the Institute stimulates implementation of the Appropriate Care program's asthma recommendations, including:
    a. The Institute's role in the implementation process.
    b. The methods used to plan and execute implementation.
2. Identify key determinants perceived to influence implementation success.

METHODS

We reported our methods and findings using the consolidated criteria for reporting qualitative research (COREQ) (Appendix 13) [17].

Case description: the National Health Care Institute and the Appropriate Care program asthma

The national Health Care Institute

The Institute is responsible for safeguarding healthcare quality, affordability and accessibility in the Netherlands. Its core legal functions include promoting the development of quality instruments (e.g. clinical practice guidelines), supporting the transparency of quality of care information for citizens, distributing public funds among health insurers based on risk equalization and improving exchange of digital information between healthcare professionals [18]. The Institute is best known, however, for its task of advising the Ministry of Health, Welfare and Sport on whether specific (new) healthcare services

should be included in the basic health insurance package. Everyone who lives or works in the Netherlands is legally obliged to take out this basic health insurance and is therefore covered for the included treatments [19]. The Institute bases its advice on HTA [20]. This process is primarily applied to evaluate new outpatient and expensive inpatient pharmaceuticals. Other non-pharmaceutical interventions and existing treatments are only assessed when there is uncertainty about insurance coverage among healthcare professionals, facilities, patients and/or health insurers [18, 21].

The Appropriate Care program

Besides these tasks, the Institute launched the Appropriate Care program in 2013, when the Minister of Health, Welfare and Sport commissioned the Institute to systematically review the basic health insurance package for appropriate use of care as part of a financial cutback and stricter approach to package management [22]. In response, the Institute expanded its HTA activities and launched the Appropriate Care program, aimed at identifying and de-implementing overused low-value care and implementing underused high-value care. By promoting appropriate care, the Institute aimed to enhance the quality of care and improve health outcomes for patients. Additionally, it sought to reduce unnecessary costs, targeting structural savings of 225 million Euros per year starting in 2017 [23]. The program was seen as a complementary approach to insurance package management – favoring a more participative governmental role which potentially could lead to better compliance. This was preferred over a more controlling role involving immediate, government-imposed cuts to the insurance package, which could undermine stakeholder support and acceptance, and risk excluding necessary and effective care for individual patients with exceptional needs [15, 24].

The Appropriate Care program follows four phases aimed at analyzing and improving delivered care. Figure 1 and the following sections illustrate the four-phase program theory.

Screening phase

The first phase is the screening phase. The Institute systematically screens each ICD-10 domain (disease classification system including 22 disease categories) to analyze how care is delivered and detect signs of inappropriate care [25]. It engages stakeholder organizations to gather input on potentially inappropriate care and reviews sources such as professional media, patient-reported outcome measures (PROMs), consultancy reports, scientific literature and clinical practice guidelines [26]. The Institute also checks routinely collected national healthcare data (including medical claims data from health insurers) for practice variation, significant cost increases or decreases, extended hospital stays, and/or high rates of complications, reoperations or readmissions [20]. Topics for further investigation are prioritized based on the number of affected patients, healthcare costs and burden of disease [27]. The phase concludes with a screening report for each ICD-10

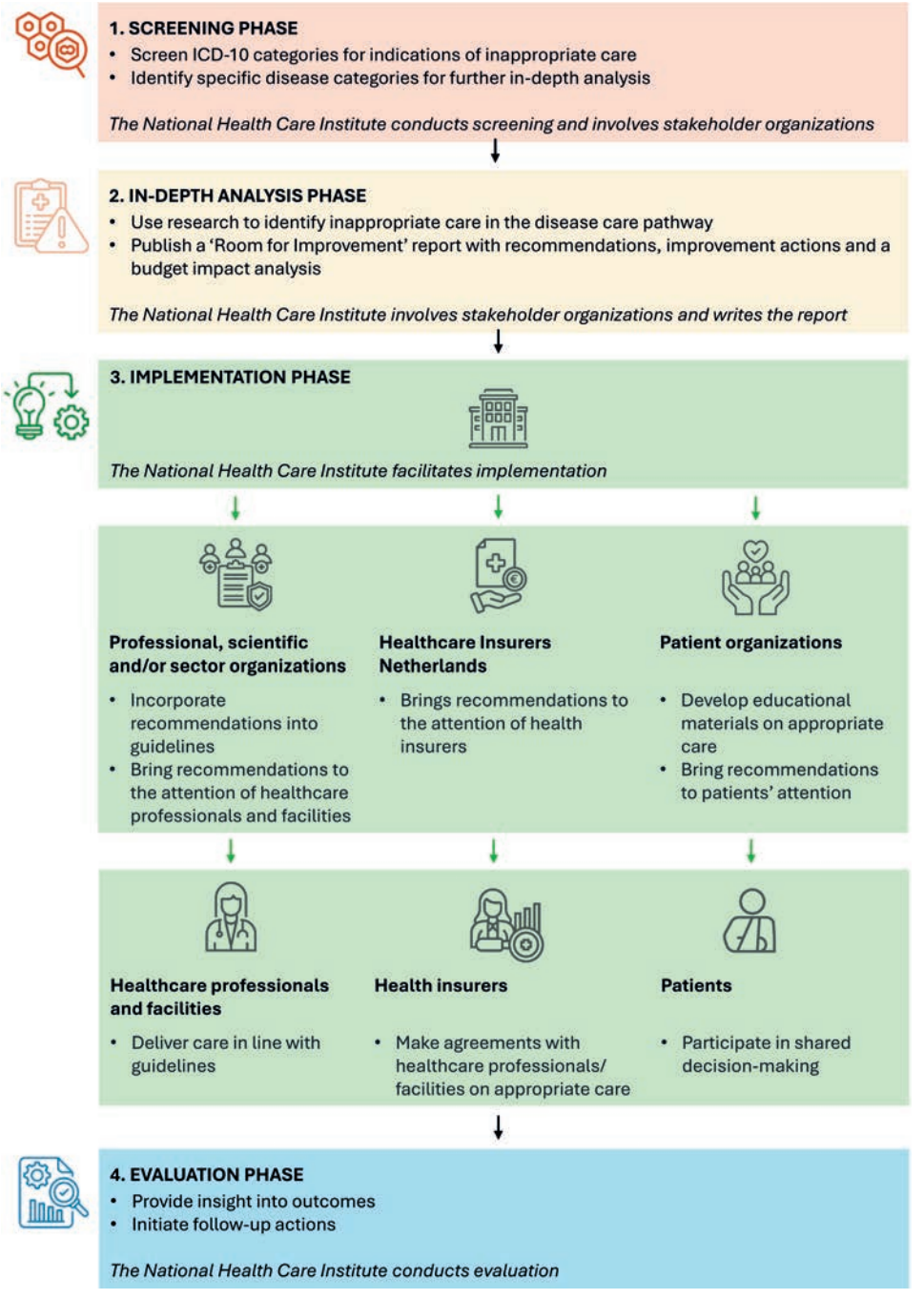

Figure 1. Appropriate Care Program theory (adapted from [16, 20]).

domain, outlining selected topics for further research [25]. While the Institute retains independent responsibility for topic selection, input from stakeholder organizations is carefully considered [26].

In-depth analysis phase

In the second phase, the Institute analyzes selected topics in-depth. It compares the best available research and guidelines on what should be considered appropriate care to aforementioned national dataset indicators and research findings on how care is actually delivered [20, 27]. The goal is to identify inappropriate care – such as under- or overdiagnosis and under- or overtreatment – and knowledge gaps [27]. Stakeholder organizations are invited to advise the project team through participation in an advisory committee [26]. Besides, the Institute shares and discusses their insights with stakeholder organizations and collaboratively explores actions they could take to realize the recommendations [16, 26]. The findings, recommendations, proposed improvement actions and a budget impact analysis estimating financial implications are compiled in a *Room for Improvement* report ('verbetersignalement'), which is submitted to stakeholder organizations for formal written consultation.

Implementation phase

The third phase, the implementation phase, is of primary interest to our study. While the Institute is responsible for the progress and outcomes of the screening, in-depth analysis and evaluation phases, it delegates the responsibility for implementing the recommendations to the stakeholder organizations [27]. Each of these organizations is expected to take action based on their role within the Dutch health system. The Institute assumes that the recommendations, via stakeholder organizations, will be translated into practice and lead to more appropriate use of care [16]. In some cases, professional/scientific organizations must first incorporate the findings into guidelines. Health insurers then steer appropriate care usage by establishing (volume) agreements with healthcare professionals/facilities during the procurement process. Patient organizations inform patients (via education materials) about the recommendations for shared decision-making. The Institute, in turn, envisions a facilitative, supporting and monitoring role for itself during the implementation phase [27].

Evaluation phase

The fourth and last phase is the evaluation phase. The Institute assess whether the proposed improvements have been achieved and determines if further follow-up actions or measures are needed [27]. The outcomes of this evaluation are documented in an evaluation report.

Since 2013, several Appropriate Care projects have been executed with varying degrees of success. Program evaluations conducted in 2020 and 2021 revealed that, while

earlier projects had positive effects, they did not achieve the originally intended impact on appropriate care usage and cost reduction [16, 28, 29]. Estimated savings could potentially reach a maximum of 82 million Euros a year, instead of the earlier calculated 225 million Euros [16].

The Appropriate Care program asthma

From the 27 Appropriate Care projects, we selected the asthma care project for further investigation [30]. Asthma is a chronic, inflammatory lung disease [31]. It often develops at a young age and causes symptoms such as shortness of breath, coughing and wheezing. Asthma can typically be managed effectively with lifestyle changes, medication and additional treatments. However, asthma may also lead to severe lung attacks. If left untreated, it can result in lung function decline and, in rare cases, death [31]. In 2023, an estimated 577,500 people in the Netherlands were known to have received medical care for asthma [32]. In 2019, national healthcare expenditures related to asthma were estimated at 443.9 million Euros [33].

We selected the asthma care project, as the recommendations included were projected to enhance care for a large group of patients and yield substantial financial impact. Additionally, the project involved a broad coalition of stakeholder organizations, including scientific/professional organizations from primary and secondary care, as well as health insurers and patient organizations. Examining the Institute's collaboration with these stakeholders was particularly interesting given their potentially differing interests. Project timing also played a role: at the time of selection, the Room for Improvement report had just been published and the implementation phase was about to begin. The choice for the asthma care project was made in consultation with the Institute's Review Group, a panel that oversaw and contributed to ongoing Appropriate Care projects.

Figure 2 shows the timeline of the project. The screening phase for ICD-10 category X (J00–J99, diseases of the respiratory system) took place between October 2015 and December 2016. Of the diseases within this category, asthma was selected for in-depth analysis alongside COPD and obstructive sleep apnea syndrome. Between December 2016 and December 2021 (excluding a pause in the summer of 2018 and restart in November 2019), the asthma team at the Institute analyzed the asthma care pathway in-depth, in consultation with relevant stakeholder organizations [27]. Examples of such organizations are the Lung Foundation Netherlands (*Longfonds*), the Dutch Society of Physicians for Respiratory Diseases and Tuberculosis (NVALT) and Health Insurers Netherlands (ZN) (see Box 1 for an overview of all involved organizations). To determine what constituted appropriate asthma care and how asthma care was delivered in practice, the team assessed whether asthma care aligned with national and international guidelines [34-39], examined the evidence supporting these guidelines and conducted in-depth research

on national healthcare datasets. Furthermore, the Institute commissioned external parties to perform a systematic review [40] and two studies to evaluate asthma care provided in practice [41, 42]. In the resulting Room for Improvement report, published in December 2021, the Institute proposed seventeen recommendations on diagnostics, treatment and monitoring of asthma patients, along with several actions to enhance care (Table 1). The report also included an impact analysis, which estimated that implementing the proposed recommendations could result in an annual cost reduction of 13.8 million Euros [27]. The formal implementation phase took place from January 2022 to March 2025. The Institute's formal evaluation of the implementation process is scheduled for late 2025, while evaluation of the healthcare outcomes using national healthcare data is planned for 2027.

Study design and data collection

We studied the Institute's implementation efforts by conducting ethnographic fieldwork and documentary research at the Institute between January 2022 and May 2025. We followed the implementation process, focusing on the roles, responsibilities, implementation planning approaches, implementation strategies and experiences of the Institute in relation to those of the involved stakeholder organizations. We also examined the determinants that influenced implementation success.

Organizations involved in the Appropriate Care program asthma:

- Dutch COPD and Asthma GP Advisory Group (CAHAG)
- InEen
- Knowledge Centers for Complex Chronic Lung Diseases (KCCL)
- Royal Dutch Society for Physical Therapy (KNGF)
- Royal Dutch Pharmacists Association (KNMP)
- Lung Alliance Netherlands (LAN)
- Lung Foundation Netherlands (*Longfonds*)
- Dutch College of General Practitioners (NHG)
- Dutch Society of Physicians for Respiratory Diseases and Tuberculosis (NVALT)
- Dutch Society for Paediatrics (NVK)
- Dutch Society of Lung Function Analysts (NVLA)
- Netherlands Association of Nurses and Care Workers (V&VN)
- Asthma Society Netherlands and Davos (VND)
- Dutch National Health Care Institute (the Institute)
- Health Care Evaluation and Appropriate Use (ZE&GG)
- Health Insurers Netherlands (ZN)

Box 1. Overview of the organizations involved in the Appropriate Care program asthma.

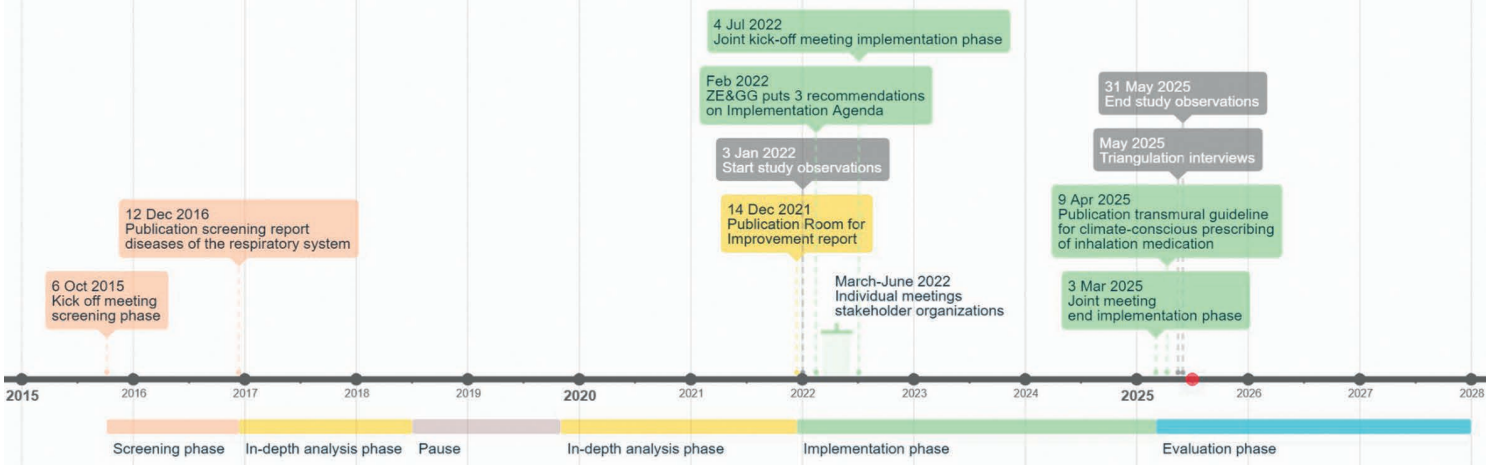

Figure 2. Timeline of the Appropriate Care program asthma, highlighting key activities. The in-depth analysis phase was paused between the summer of 2018 and November 2019 due to the team temporarily lacking a medical advisor and project leader, as well as challenges in selecting suitable topics for the project. During the COVID-19 pandemic (approximately March 2020 to May 2022) several asthma team members and representatives of stakeholder organizations had to temporarily shift their focus to other responsibilities.

The Medical Ethics Review Committee of Amsterdam University Medical Centers reviewed and approved the study protocol. They decided that the study did not fall within the scope of the Dutch Medical Research Involving Human Subjects Act, as representatives were not subjected to medical procedures or required to adhere to specific behavioral rules [43]. Therefore, no additional formal ethical approval was required (statement ID 2022.0360).

Empirical data were collected by the first author through multiple methods: participant observation, informal conversations, document analysis and interviews. Firstly, the first author shadowed the Institute's asthma team. While team composition varied over time, it typically included a project leader, medical advisor, data analyst, policy advisor and project support officer. Several team members had prior or current medical experience, including in general practice and pulmonology. The first author employed moderate to active participant observation [44]. In the initial phase, she familiarized herself with the program through informal conversations with members of the asthma team and other Institute staff, as well as by reviewing written materials related to the program. During the first two months of observation and familiarization, the author maintained a passive observational role. As understanding of the program and rapport with the asthma team grew, she became more actively involved. Upon request of the team members, she shared theoretical knowledge on implementation process theory, contributed observations and opinions, posed questions to support reflection and discussion, took meeting minutes and provided feedback on team members' presentations and formal documents. In meetings with representatives of stakeholder organizations, she conducted non-participant observation. In this way, the first author and the team members worked together as colleagues with different skills, in a process of mutual learning, while the team members still had control over the process [45]. All those attending the meetings were informed about the research and verbally consented to the presence of the first author. Asthma team members and permanent representatives of stakeholder organizations also provided written consent for observation. In total, 121 meetings were observed, including 86 (bi-)weekly internal asthma team meetings and 35 meetings with representatives of stakeholder organizations.

Secondly, informal conversations were held with asthma team members to clarify events and explore their personal experiences and perspectives. Thirdly, field documents were analyzed, including public reports, internal documents (e.g. implementation guidelines and meeting minutes) and websites of involved organizations. The Institute's management provided the first author with a digital workplace and archive access. Findings from the observations, conversations and document analysis were recorded in detailed field notes. Lastly, in order to triangulate the observations and documentary research findings, the first author conducted interviews in May 2025, after the formal implementation

phase. The interviews were conducted using a semi-structured format, guided by a topic list (Appendix 14). Through 'purposive' sampling [46] of information-rich informants, 7 key persons were selected: 3 asthma team members and 4 representatives of stakeholder organizations. After receiving the informants' consent, all interviews were audio-recorded and transcribed. Selected quotes were verified through member checking by the respective informants.

Theoretical framework and data analysis

Field notes and interview transcripts were analyzed using thematic analysis [47] and framework analysis [48]. Data were thematically analyzed by the first author while sensitizing on the roles, implementation planning approaches, implementation strategies and experiences of the Institute in relation to those of the involved stakeholder organizations, as well as the determinants that influenced implementation success.

We also compared the implementation practices – '*work as done*' – with the Appropriate Care program theory [26, 27, 30, 49, 50] and with established scientific implementation theories and frameworks – '*work as imagined*' – using framework analysis. The latter comparison was guided by various theoretical constructs. With regard to implementation planning, previous research suggests that selecting and tailoring implementation strategies using three specific approaches can enhance the implementation of recommendations [51-55]. Dissemination and implementation strategies are more likely to improve professional practice when they are (1) designed in engagement with relevant stakeholders and (2) selected and tailored to address existing barriers [52, 55, 56]. (3) Applying principles from implementation theories, models and frameworks (TMFs) to guide and shape these strategies can further enhance implementation outcomes [53, 54]. In our investigation of implementation planning approaches, we, therefore, conducted an in-depth exploration of whether the Institute and stakeholder organizations used pre-identified barriers, stakeholder engagement and implementation TMFs.

Our analysis of perceived implementation determinants was guided by the updated Consolidated Framework for Implementation Research (CFIR) [57]. CFIR is a widely used framework for characterizing and classifying determinants that influence implementation of healthcare innovations [58]. The 2022 CFIR update incorporates various recognized implementation theories, such as the COM-B constructs of the Behavior Change Wheel [59]. It organizes determinants into five domains: 1) innovation (the recommendations being implemented), 2) inner setting (the setting in which the recommendations are implemented, e.g., healthcare facilities), 3) outer setting (the environment in which the inner setting exists, e.g., the health system), 4) individuals (the roles and characteristics of individuals, e.g., asthma team members, representatives of stakeholder organizations, healthcare professionals and patients) and 5) implementation process (the activities and strategies used for implementing the recommendations) [57].

The first author coded the data. Both deductive and inductive coding were applied. An initial codebook was developed based on the aforementioned (theoretical) constructs. The codebook was refined through open coding to incorporate emerging themes from the data. To ensure accuracy and reliability, the second author reviewed and verified the coding. Additionally, findings were discussed during monthly meetings with the research team, which included Institute representatives not directly involved in the Appropriate Care program. Furthermore, a draft version of the manuscript was reviewed by two Institute staff members with extensive experience in the Appropriate Care program and three asthma team members. Findings are structured in alignment with the study's research objectives.

RESULTS

Here, we analyze how the implementation process unfolded in practice, compared to how it was set out in the Institute's program theory and implementation science theory. We first examine the roles of the the Institute and stakeholder organizations, followed by an analysis of the implementation planning approaches and dissemination and implementation strategies used. Table 1 summarizes the asthma recommendations, proposed actions and executed implementation activities. Key determinants perceived to have influenced implementation are highlighted throughout and at the end of this section. Table 2 offers an overview of these determinants with exemplary quotes.

Roles of the Institute versus stakeholder organizations

The Institute

As opposed to its leading role in the screening, in-depth analysis and evaluation phases, the Institute saw a more secondary role for itself in the implementation of the recommendations. It positioned itself as a "*connector*", "*supporter*" and "*facilitator*" (Room for Improvement report, 21 December 2021, p. 2, 36). Potential implementation tasks it identified for itself included: 1) "*facilitating meetings to share experiences and good practices*", 2) "*discussing determinants that facilitate or hinder implementation*", 3) "*engaging relevant partners*", 4) "*providing data and benchmarking information", 5) "conducting additional research*", and 6) "*supporting communication about the agreed improvement actions and the underlying analysis*" (Room for Improvement report, 21 December 2021, p. 2, 36). If implementation results proved insufficient and the nature of the recommendations allowed it, the Institute could also leverage its legal instruments, such as advising on the inclusion or exclusion of certain care in the basic health insurance package.

At the beginning of the implementation phase, the Institute's asthma team reflected on their added value in implementation. Their means of influence did not extend directly

to what happened in the consultation room and they lacked clarity on how they could facilitate implementation. The team therefore decided to consult the stakeholder organizations to explore how they could provide support: "*Wouldn't it be helpful to first understand what our added value could be? We don't have a bag of money to help them. We don't have significantly more expertise to offer. And we don't have many more contacts*" (asthma team member 3, field notes, 10 January 2022)

Internally, the Institute did not appear to prioritize implementation (facilitation) of the recommendations. Over time, asthma team size, allocated time and internal team meeting frequency gradually declined. In addition, internal departments – such as communications and management – provided less support than requested by the team. According to one asthma team member, this lack of internal support was partly due to the negative findings in previous evaluations of the Appropriate Care Program [16].

Stakeholder organizations

Acceptance, support and value of the recommendations

Although the Institute labeled the recommendations as "*improvement agreements*" and invited feedback prior to publication, they were not formally authorized by the stakeholder organizations involved. However, organizations generally accepted and supported the recommendations and recognized the value of the report. Findings largely aligned with their existing guidelines, raised awareness about improvement opportunities and helped set priorities on the collective national agenda: "*I also think that the recommendations being clearly supported by concrete figures is important for conveying the urgency of various issues. So yes, I think that has been one of the facilitating factors*" (Interview Representative 7). The report also provided organizations with a foundation for funding requests for (research) projects and for initiating discussions with other organizations.

However, some organizations argued that certain target values for change that were set in the report were unrealistic: "*Regarding the stated target value of 90%, as previously indicated, this is not achievable*" (comment from CAHAG and NHG, Room for Improvement report, 21 December 2021, p. 41). Some organizations advocated for further refinement of the recommendations, did not prioritize the implementation of certain recommendations or felt that previously proposed key topics for change were missing: "*There is a lack of reasoning here as to why these topics were chosen, as the screening meeting on 05-03-2020 also highlighted other topics that were considered important. Of course, not everything can be discussed, but a justification of the choices made is highly desirable.*" (comment from NVALT, Room for Improvement report, 21 December 2021, p. 47). It was also noted that most recommendations largely confirmed what organizations already knew and that the report failed to provide new insights into the causes of lagging care: "*These improvements are not new and are already*

described in the guidelines, but implementation in practice is failing. An analysis of these barriers is appreciated." (Comment from NVALT, *Room for Improvement* report, December 21, 2021, p. 48)

Diverging expectations of involvement

Regarding the role of the stakeholders and stakeholder organizations, the Institute stated that "*realizing the improvement recommendations is the responsibility of the relevant parties in healthcare, in line with the distribution of responsibilities within the health system*" (Room for Improvement report, 21 December 2021, p. 2). In the lead-up to the Appropriate Care program or asthma care project, the Institute had not coordinated implementation efforts or formalized a binding collaborative agreement with stakeholder organizations concerning the division of roles, commitment levels or prioritization of resources for implementation. Because most recommendations aligned with stakeholders' own guidelines, the Institute regarded their implementation a part of stakeholders' routine responsibilities and expected their active commitment. However, some organizations indicated that they already struggled to implement their own guidelines: "*I think we have excellent guidelines on how things should be done, but implementing them is difficult – and there's really no one who actually [sees to it] or takes the lead, right? … And I think the biggest obstacle was that, at some point, the National Health Care Institute said: 'Now it's up to the field to take over.' But that's exactly the issue – there's no one doing it. No one is [ensuring implementation].*" (Interview Representative 18)

That came somewhat unexpectedly for the asthma team members and they were also affected by it: "*Then you think, like, hey, what on earth are we doing here, right? If a guideline is drawn up by a professional organization, and in the end – well, a lot of time was put into it, a lot of energy was put into it, passion was poured into it by some people. And then it gets put away in a drawer, like, hey, we don't really expect much from it. So I really struggled with that when I heard it, to be honest.*" (Interview asthma team member 2)

Implementation capacity and resources

Several stakeholder organizations reported having limited capacity and resources to implement the recommendations. They cited manpower shortages and competing demands of both their own and external (mandatory) quality initiatives. Some representatives indicated that they conducted their work for the stakeholder organization on a voluntary basis, alongside their regular jobs. Some organizations, such as the NHG, faced greater strain due to GPs' central role within the health system, requiring their involvement in numerous initiatives.

"*The NHG would like to coordinate its activities in this area with the Institute, particularly to assess what is feasible in terms of capacity, finances, and scope of influence. The reason is that NHG receives numerous requests each year to carry out activities and*

develop products – not only from the Institute but also from the Ministry of Health, Welfare and Sports, the National Institute for Public Health and the Environment, other scientific organizations and many others. Each year, NHG determines which matters have the highest priority and develops plans accordingly" (comment from NHG and CAHAG, Room for Improvement report, 21 December 2021, p. 39)

To manage capacity, stakeholder organizations prioritized their resources for key initiatives. Some created an annual agenda that contained a limited number of key topics, for which they actively engaged in disseminating information and developing supporting implementation tools. This structured approach supported manageability and ensured a clear focus for their members. As the publication of the Room for Improvement report was not coordinated with these organizations' agendas, priority had already been given to other quality initiatives, making it difficult to reallocate resources to implementing the asthma recommendations.

To enable implementation activities, organizations asked for additional funding from the Institute already before the report was published, or sought its assistance in applying for external grants. They also suggested trying to make asthma a priority on their organization's future annual agenda, or leveraging existing national asthma initiatives/ working groups in which the organizations were already involved, as platforms to engage the asthma team. However, the Institute could not provide funding for implementation – only for additional research. The asthma team did not pursue the other suggestions, as it focused on shorter-term, more readily available strategies first.

Conflicting expectations about each other's level of involvement

Some organizations anticipated a greater level of involvement from one another than was ultimately realized, with limited engagement from health insurers identified as a particularly important gap. The Institute had identified Health Insurers Netherlands (ZN) as a key stakeholder organization in supporting the realization of most of the asthma recommendations. However, ZN viewed its role differently:

"*We believe that the actions to be undertaken primarily fall within the responsibility of the field. The improvement actions do not clearly specify what is expected from ZN. Health insurers cannot dictate in policy and contracts which medications should be used or prescribed. … ZN does not see it as its role to co-develop these content-related matters. … We cannot commit in advance to something without knowing what the actions entail or what their impact will be. Additionally, it remains uncertain whether this should be a role for ZN as the collective of health insurers or whether it concerns individual insurers due to their own corporate policies. … Of course, ZN can provide responses to specific inquiries when necessary, but in line with previous communications, ZN will not take an*

active role in the improvement actions." (comment from Health Insurers Netherlands, Room for Improvement report, 21 December 2021, p. 52)

During several meetings, it became clear that the asthma team and multiple stakeholder organizations disagreed with this stance. Organizations argued that health insurers' current actions, particularly regarding health insurers preferred medication policies ('*preferentiebeleid*') and contracting of asthma integrated care ('*ketenzorg*') conflicted with certain recommendations. Health insurers could also support implementation by attaching conditions to care procurement and employing targeted purchasing strategies. Nevertheless, health insurers were only marginally involved by the Institute and organizations during the remainder of the implementation phase and they did not take initiative to stay engaged themselves – both to the dissatisfaction of some: "*Perhaps the National Health Care Institute could have taken a more leading role by telling the insurers more directly: You are part of this problem – make sure it gets solved together with the other parties.*" (Interview Representative 7)

Asthma team adapts a more active role in implementation

After several attempts to transfer responsibility and initiative, the asthma team gradually (following the joint kick off meeting of the implementation phase) assumed a more active role in the implementation process. They began leading, planning and co-developing implementation strategies, in close collaboration with stakeholder organizations. The next section outlines how these strategies were selected and tailored.

Implementation planning approaches

Dissemination and implementation strategies were developed through a combination of pragmatic and stakeholder-informed planning approaches.

Applying principles from implementation TMFs

Implementation TMFs were not explicitly integrated into the asthma team's approach to planning and stimulating the implementation of recommendations. The Institute had several internal (Appropriate Care program) implementation guidelines [30, 49, 50]. Some of them incorporated practice-based knowledge from ongoing projects and scientific insights on implementation. The guidelines upheld a clear distinction between the Institute's guiding role as implementation "*facilitator*", "*supporter*" and "*connector*" and the stakeholders who were held responsible for executing implementation efforts. Accordingly, the guidelines mainly included tips for communicating with stakeholders, motivating them to take initiative and dissemination. With the asthma recommendations, however, this separation of roles largely faded, as the Institute and stakeholder organizations increasingly operated as equal collaborators, working on implementation strategies together. Concrete guidance on how to match or tailor strategies to

identified barriers or implementation TMFs, as well as examples of strategies or existing implementation infrastructure were lacking. The asthma team consulted the guidelines in a few instances. The implementation TMFs outlined in them were not explicitly applied in shaping the process.

The asthma team largely retained the same members who had previously conducted the in-depth analysis and did not add implementation specialists. The Institute had an internal committee with implementation expertise, which offered implementation inspiration sessions and was available for consultation. The asthma team, having some prior project implementation experience, consulted the committee once. However, some asthma team members indicated a need for more structured training or involvement of a dedicated implementation or behavior-change specialist:

"*There are people whose expertise is creating and supporting change or transformation. How do you motivate all 900 pulmonologists in the Netherlands? What's the best way to approach them? How do you respect them as professionals while still nudging them in a certain direction? I've come to realize just how hard it is to get professionals to change their behavior.*" (Asthma team member 2, field notes, 31 January 2022)

Engaging stakeholders

During the screening and in-depth analysis phase, the asthma team had already started consulting the stakeholder organizations regarding the content of the recommendations. This engagement expanded during the implementation phase, serving several purposes.

The primary objective was to transfer ownership for implementing the recommendations to these organizations. To support this transition, the team explored and discussed: 1) which organizations were interested in contributing to implementation, 2) potential lead organizations (process coordinators or chairs), 3) what resources/facilitation these organizations required for successful implementation, and 4) which dissemination and implementation strategies they were willing and able to undertake.

Potential prioritization of the 17 asthma recommendations was also explored, based on stakeholder motivation, perceived urgency and topic momentum. "*You need to sense where the energy lies that you can build on, and where it's lacking. And based on that, you need to make choices*" (Interview asthma team member 1). As a result, recommendations 11-13 (Table 1) concerning asthma patient monitoring were put on hold. Furthermore, the team aimed to transform the recommendations into more concrete, actionable goals using the SMART criteria (Specific, Measurable, Achievable, Relevant and Time-bound). Additionally, they sought to address any remaining conflicting perspectives on the recommendations. Finally, the asthma team asked stakeholder

organizations which other national, regional or local stakeholders should be involved in the implementation process.

The asthma team conducted individual meetings, a joint kick-off meeting and follow-up meetings with stakeholder organizations to explore opportunities and foster and align implementation activities on prioritized recommendations. Scheduling meetings proved sometimes challenging, as both asthma team members and designated representatives delivered patient care, had competing priorities or lacked dedicated project time. This occasionally delayed the development of implementation strategies. To keep stakeholder organizations informed, the team distributed two newsletters with progress updates and content contributions from representatives.

As stated above, the transfer of implementation ownership was only partially successful. Although the Institute actively engaged the stakeholder organizations, the initiative and leadership for many recommendations often remained with the asthma team. However, for a select number of recommendations, the initiative was taken over by organizations. This included the recommendations related to secondary care (recommendations 3-5, 8, Table 1), where one designated organization was responsible for creating a new guideline, and recommendation 10 on environmental impact in inhaler selection, which benefited from existing momentum.

The asthma team encouraged the formulation of SMART goals. Stakeholder organizations found this challenging, due to uncertainty about what was realistically achievable, limited resources for improvement initiatives and the fact that many organizations operated on a national level, reporting having only limited influence locally themselves. To make progress, the focus shifted from goal setting to developing dissemination and implementation strategies.

Stakeholder organizations valued the Institute's active collaboration with a broad range of organizations. They noted that this was important because many recommendations addressed complex issues that required cross-stakeholder approaches: "*That instead of a fragmented approach, you created a joint one, making the problem a shared responsibility rather than that of a single party. I think that has been very important*" (Interview Representative 7). Organizations stated that a joint approach to identifying barriers, setting priorities and aligning strategies fostered effective solutions, strengthened collective support for implementation and allowed stakeholders to better anticipate the impact of actions on others. Collaboration also improved awareness of existing implementation infrastructures and allowed organizations to refine their own strategies using others' insights. However, some stakeholder organizations questioned the added value of yet another collaborative initiative involving largely the same actors as existing efforts – such as the Lung Alliance Netherlands (LAN) and the Institute's Appropriate Care

project for COPD. Better alignment with these initiatives, they felt, could have enhanced the project's overall impact.

Pre-identification of barriers

Stakeholder organizations and external consultations helped identify barriers hindering the implementation of several recommendations, by drawing on their experiences, prior analyses and additional research. Identified barriers shaped the development of several strategies. For example, a survey was distributed to primary care organizations to assess barriers to performing diagnostic spirometry for all patients with suspected asthma (recommendation 1, Table 1). The findings and suggested solutions were returned to these organizations and an article based on this work was submitted to a Dutch scientific journal. Another example concerns recommendation 10 on considering environmental impact in inhaler selection. In response to divergent stakeholder views on this topic, the asthma team facilitated consensus meetings and co-developed a joint guideline with organizations, which received national media attention. However, other structural barriers raised by organizations, such as conflicting health insurer preferred medication policies, remained largely unaddressed.

Based on the observations, the selection and tailoring of dissemination and implementation strategies was ultimately shaped by six factors: 1) whether the stakeholder organizations involved had the capacity and motivation to contribute, 2) whether organizations could leverage familiar, established, or easily executed strategies and infrastructures, 3) whether organizations saw additional opportunities beyond current or past initiatives, 4) whether there was momentum around the topic, 5) pre-identified barriers, and 6) whether strategies had the potential to reach a large proportion of the national target audience.

Executed dissemination and implementation strategies

While there was no shortage of ideas for dissemination and implementation strategies, previously mentioned barriers – such as limited capacity – prevented the Institute and stakeholder organizations from pursuing them all. Table 1 outlines the strategies that were executed by the asthma team and stakeholder organizations.

The asthma team and stakeholder organizations primarily used dissemination strategies, such as emailing the report and factsheets, posting on their websites and LinkedIn and publishing (scientific) articles in (inter)national journals. In addition, new research and guidelines were developed, requiring further dissemination and implementation.

Furthermore, three interactive implementation strategies were used. Firstly, several recommendations were included in the National Implementation Agenda [60], containing improvement recommendations that healthcare facilities were obligated to implement as

part of a national collaborative agreement. Second and third, stakeholder organizations developed performance indicators for both pharmacists and healthcare facilities to assess alignment with specific recommendations and benchmark their performance against peers, to guide necessary actions.

Strategies mainly targeted healthcare professionals (pulmonologists, pharmacists and GPs). No strategies specifically targeted policy change of health insurers or patients' behavior, largely due to the limited involvement of their relevant stakeholder organizations – often constrained by capacity or competing priorities.

The Institute did not leverage its legal instruments, such as recommending the inclusion or exclusion of certain care from the basic health insurance package. These measures were not considered by the asthma team, as the Institute rarely applied them to this type of recommendations. Monitoring and regulating compliance would be difficult within the current system and the measures were also deemed disproportionate in relation to their intended goals of regulating care quality and reducing costs. A team member also raised concerns that such 'hard governance' could undermine stakeholder support and limit stakeholders' responsibility and autonomy.

Implementation determinants

Nationwide implementation efforts, progress and outcomes were perceived to be influenced by a range of barriers and facilitators (see Table 2 for an overview). The determinants observed clustered around four themes: 1) implementation infrastructure and preconditions, 2) organizations' cross-level influence, strategic coordination and synergy, 3) characteristics of recommendations, and 4) external factors.

Barriers related to implementation infrastructure and preconditions hindered progress. Based on observational data, these included the absence of a concrete implementation plan and a lack of implementation process leadership, capacity and resources.

Organizations also faced challenges related to limited cross-level influence, strategic coordination and synergy. Several national organizations perceived a lack of means and authority to drive change locally or influence other stakeholders. Conflicting interests, policies and misaligned financial incentives and reimbursement structures further hindered collective implementation and created fragmented translation of recommendations into local asthma care practices.

Furthermore, characteristics of the recommendations influenced implementation. Many recommendations were perceived as credible and relevant, which motivated stakeholder organizations to engage. However, some recommendations were deprioritized and certain

implementation targets were viewed as unrealistic. Although the recommendations were largely based on stakeholder's own guidelines, asthma team members felt they had to invest extra effort to build trust and support among stakeholders. This was because the recommendations were formulated by the Institute, which was perceived as an outsider: "*As a non-colleague addressing the scientific or professional organizations, you have to explain, "Hey, you're doing great work, but some things could be improved." And that's when the tension starts to arise.*" (interview asthma team member 2).

Lastly, external factors further limited implementation, including COVID-19 disruptions, public deprioritization of asthma's impact on patients and shortages of skilled professionals and suitable facilities. Within this theme, growing momentum around environmental concerns supported implementation of the greener inhaler recommendation.

Table 1. Overview of the asthma appropriate care recommendations and corresponding stakeholder organizations, proposed actions and employed implementation activities

Recommendations	**Stakeholder organizations who expressed interest (Dec 2021)**
All recommendations	
Room for Improvement report with all recommendations	*Not applicable*
Spirometry	
1. (Re)confirm asthma diagnosis with spirometry a. Use spirometry when asthma is suspected b. Confirm asthma diagnosis by demonstrating reversibility or variability of airflow obstruction	NHG, CAHAG, NVALT, NVLA, NVK, lead organization to be appointed

Most of the identified determinants fell within the outer setting and implementation process domains of CFIR. The outer setting reflects the national, macro health system level in which the Institute and stakeholder organizations operate. The implementation process domain involves factors related to planning and executing implementation.

	Actions and planning for improvement proposed by the Institute in the Room for Improvement report (Dec 2021)	**Executed dissemination and implementation strategies and executing organizations (May 2025)**
	No proposed actions and planning for improvement noted	- **Emailing** Room for Improvement report to involved stakeholder organizations | the Institute, Ministry of Health, Welfare and Sport - **Website and/or LinkedIn posts** about Room for Improvement report | V&VN, the Institute - Report discussed during **member meetings** | NVALT, CAHAG - **Poster presentation** of asthma recommendations at Health Technology Assessment international conference | the Institute
	Goals/actions: - 90% of new asthma patients has received spirometry and has demonstrated reversibility - Organizations will establish (interim) percentage targets and a plan to achieve the goal in 2024 - Organizations will decide on the approach for spirometry in existing asthma patients **Timeline**: develop plan in 2022. Achieve target by 2024	- **Factsheet** about spirometry in the region emailed to primary care organizations | InEen - Pending **scientific article publication** about the findings of a survey investigating barriers to performing spirometry in the region in a Dutch journal for GPs ('*Huisarts & Wetenschap*') | CAHAG, NHG, InEen, the Institute

Table 1. (continued)

Recommendations	Stakeholder organizations who expressed interest (Dec 2021)
2. Improve conditions for high-quality spirometry a. Ensure daily maintenance of the spirometer b. Discontinue inhalation medication in time before diagnostic spirometry	NHG, CAHAG, NVALT, NVLA, lead organization to be appointed
Additional diagnostic tests	
3. Appropriately use additional diagnostic tests a. Request an allergy test if there is uncertainty about allergies b. Request a chest X-ray only when indicated	a: NHG, CAHAG, NVALT, NVLA, NVK, lead organization to be appointed b: NVALT (lead organization)
Fractional exhaled nitric oxide (FeNO) test	
4. Determine the role of the FeNO test in the diagnostic trajectory	NVALT (lead organization), NVK
5. Adjust treatment for patients with frequent exacerbations based on FeNO test levels	NVALT (lead organization), NVK

	Actions and planning for improvement proposed by the Institute in the Room for Improvement report (Dec 2021)	Executed dissemination and implementation strategies and executing organizations (May 2025)
	Goals/actions: - Expand spirometry practice with preconditions (calibration, cleaning and monitoring of temperature and humidity) - Expand spirometry practice with timely discontinuation of inhalation medication - Spread awareness among GPs and GP nurses **Timeline**: develop plan in 2022	
	Goals/actions: - Develop an action plan for implementing the guideline recommendations - Set a target value or refine the indication for chest X-rays **Timeline**: develop plan in 2022	- Clarification of indications of use of chest X-rays and allergy tests in new secondary care **asthma guideline** (draft in consultation) | NVALT - 'Perform a chest X-ray only when clinically indicated for diagnosing asthma' was included on the **National Implementation Agenda** [60], containing improvement recommendations that healthcare facilities are obliged to implement | ZE&GG - Development of **standardized indicator** ('*Uniform Data Definitions*') for reliable audit and feedback on clinically indicated X-ray | ZE&GG, NVALT, health insurer, the Institute
	Goals/actions: - Organizations determine the role of the FeNO test in the diagnostic trajectory of adults and children **Timeline**: develop plan in 2022	**- Scientific article (review) publication** about the effectiveness of FeNO-guided treatment in adult asthma patients [61] | Cochrane, the Institute - Clarification of indications for FeNO testing in new secondary care **asthma guideline** (draft in consultation) | NVALT
	Goals/actions: - Determine the indication for aligning treatment with FeNO - Request a reimbursement code for FeNO **Timeline**: develop plan in 2022	

Table 1. (continued)

Recommendations	Stakeholder organizations who expressed interest (Dec 2021)
Pharmaceutical treatment	
6. Prevent overuse of short-acting beta(2)-agonists (SABA)	KNMP (lead organization), NHG, CAHAG, NVALT, NVK, Lung Foundation
7. Stop long-acting beta(2)-agonist (LABA) monotherapy	KNMP (lead organization), NHG, CAHAG, NVALT, NVK, Lung Foundation
8. Reduce overuse of oral corticosteroids (OCS)	NVALT (lead organization), NHG, CAHAG, KNMP, NVK
Inhalers and environmental impact	
9. Minimize inhalation technique errors a. Stimulate the use of inhalers with a dose counter or indicator b. Avoid using multiple inhalers requiring different inhalation techniques	KNMP (potential lead organization), NHG, CAHAG, NVALT, Lung Foundation, NVK, V&VN
10. Consider the impact of greenhouse gases when choosing an inhaler	KNMP, Lung Foundation, NVALT, NVK, lead organization to be appointed

	Actions and planning for improvement proposed by the Institute in the Room for Improvement report (Dec 2021)	Executed dissemination and implementation strategies and executing organizations (May 2025)
	Goals/actions: develop a plan to prevent SABA overuse **Timeline**: develop plan in 2022	- Development of **indicators** to assess SABA and OCS overuse, LABA monotherapy, ICS non-adherence and use of ICS at start SABA for **pharmacy audit and feedback** | KNMP - Grant applications for **pilot projects** to develop a regional collaborative approach to address suboptimal asthma pharmacotherapy in two regions | Stakeholders in two Dutch pilot regions (motivated by KNMP) - 'Prevent overuse of SABA' and 'Stop LABA monotherapy' were included on the **National Implementation Agenda** [60] | ZE&GG - Development of **standardized indicator** ('*Uniform Data Definitions*') for reliable audit and feedback on SABA overuse and LABA monotherapy | ZE&GG, NVALT, health insurer, KNMP, the Institute - Clarification of indications for OCS treatment in new secondary care **asthma guideline** (draft under review) | NVALT
	Goals/actions: - Inform patients and healthcare professionals about the drawbacks - Pharmacies monitor the dispensing of LABA monotherapy for patients under 50 years of age - Update website *Farmacotherapeutisch Kompas* **Timeline**: develop plan in 2023	
	Goals/actions: develop a plan to reduce OCS overuse **Timeline**: develop plan in 2022	
	Goals/actions: - Set target value for reducing inhalers without dose counters - Develop a plan to raise awareness among patients and healthcare professionals about the risks of using inhalers with different techniques **Timeline**: plan and target value ready in 2022	- **3 scientific articles** about the potential emission reduction and costs of switching to greener inhalers in an international journal, a Dutch journal for GPs ('*Huisarts & Wetenschap*') and a Dutch journal for respiratory nurses ('*Inspiratie*') | NHG, V&VN, the Institute - Development of **indicators** to assess appropriate inhaler technique and the use of greener inhalers, for **pharmacy audit and feedback** | KNMP - **Research report** on the considerations of patients, healthcare professionals and health insurers on prescribing and using greener inhalers | Leiden University Medical Center, the Institute - **Transmural guideline** for climate-conscious prescribing of inhalation medication, spread through organizations' websites and LinkedIn. Received national media attention | NVALT, NHG, CAHAG, KNMP, NVK, Lung Foundation Netherlands, the Institute
	Goals/actions: information plan for patients and healthcare professionals on the CO2 impact of inhalers, including a link to the recently published NHG inhaler selection table **Timeline**: develop plan in 2022	

Table 1. (continued)

Recommendations	Stakeholder organizations who expressed interest (Dec 2021)
Monitoring	
11. Conduct annual asthma monitoring	NHG, CAHAG, Lung Foundation, NVALT, NVK, lead organization to be appointed
12. Address both pharmacological and non-pharmacological asthma management aspects	NHG, CAHAG, Lung Foundation, NVALT, KNGF, NVK, lead organization to be appointed
13. Appropriately use spirometry during monitoring	NHG, CAHAG, NVALT, NVLA, lead organization to be appointed

Table 2. Determinants that are perceived to influence the implementation of the asthma appropriate care recommendations.

Categories of implementation determinants (classified by the updated CFIR)	Determinant
A. Innovation domain	
Innovation source	[-] Perceived outsider status of the Institute hinders stakeholder support
Innovation evidence-base	[-] Stakeholder considers the proposed implementation target value unrealistic
	[+] Recommendations reflect stakeholders' own guidelines and proposed improvement opportunities, enhancing their credibility and relevance

	Actions and planning for improvement proposed by the Institute in the Room for Improvement report (Dec 2021)	Executed dissemination and implementation strategies and executing organizations (May 2025)
	Goals/actions: - Set target value for the number of patients yearly monitored per asthma management step - Develop a plan to achieve this target **Timeline**: develop plan in 2022. Achieve target by 2024 **Goals/actions**: Develop a plan to appropriately use pharmacological and non-pharmacological asthma management aspects **Timeline**: develop plan in 2022. Achieve target by 2024 **Goals/actions**: - Set target value for the number of patients yearly monitored for asthma management step 2 and 3 - Develop a plan to achieve this target **Timeline**: develop plan in 2022. Achieve target by 2024	*Put on hold/not prioritized by the Institute and stakeholder organizations.*

	Exemplary quote corresponding to the determinant
	"But the fact that someone who isn't directly involved – let's say, not a direct medical colleague – comes up with [suggestions for improvements] for you, always causes a bit of friction." (Interview asthma team member 2)
	"We also indicated that the target value of 90% in the report is not realistic. A built-in problem has been created. I find that challenging in terms of implementation. We're not going to reach it, we already know that." (Representative 1, field notes, 3 March 2022)
	"Yes, the KNMP agrees with the proposed improvements and considers them to be well supported by data." (Comment from KNMP, Room for Improvement report, 21 December 2021, p. 43)

Table 2. (continued)

Categories of implementation determinants (classified by the updated CFIR)	Determinant
B. Outer setting domain	
Critical incidents	[-] Asthma care was disrupted during the COVID period, efforts to resume it have faced difficulties
Local attitudes	[-] Stakeholder disagrees with or assigns low priority to implementing recommendation
	[-] Public opinion tends to downplay the seriousness of asthma, reducing the sense of urgency to improve asthma care
	[+] Increased momentum/urgency for environmental impact of inhaler selection
Partnerships & connections	[-] Involved stakeholder organizations operate nationally and have little influence on local healthcare professionals' and patients' behavior
	[-] The Institute has insufficient mandate/means to push implementation
Policies & laws	[-] Conflicting regional formularies developed by care groups, national guidelines, health insurer preferred medication policies and medicine shortages make it difficult to prescribe the appropriate medical treatment for individual patients
	[-] The program operates without a binding formal collaborative agreement that encourages stakeholder cooperation
Financing	[-] The Institute does not have funding available for implementation leaders or initiatives
	[-] Health insurers' cutbacks on asthma-related integrated care ('*ketenzorg*', '*farmacotherapeutisch overleg*') hinder the provision of appropriate asthma care

	Exemplary quote corresponding to the determinant
	"I do hear people around me saying that, after two years of COVID, we really need to shake things up again when it comes to spirometry." (Representative 14, field notes, 29 April 2022)
	"When considering the environment more broadly, asthma patients are far more affected by wood burning and car emissions than by inhalers. The priority should be improving overall air quality, rather than targeting emissions from inhalers." (Representative 4, field notes, 25 April 2022)
	"Lung diseases are seen as conditions where you can afford to wait a bit. With diabetes or cancer, waiting isn't an option. Lung diseases are perceived as less urgent." (Representative 14, field notes, 29 April 2022)
	"The difference in emissions between types of inhalers wasn't really seen as an issue initially. But now I feel that 'we in the field of respiratory care' need to do something about it." (Representative 14, field notes, 29 April 2022)
	"[Stakeholder organization] is not sitting next to the GP. We can write all kinds of guidelines, create e-learnings and indicators, but we're not there alongside the GP and patient who are unwilling." (Representative 1, field notes, 3 March 2022)
	"I think we wrote quite a solid and well-argued Room for Improvement report. … That was kind of our way of trying to get them to take action, you know, to actually do something. Because beyond that, you don't really have much leverage – you can't force them to do anything. So you really have to rely on arguments, right?" (Interview asthma team member 1)
	"Preferred medication policies also play a role here. Insurers hold considerable power in this regard. This sometimes leads to unworkable situations and an increase in ICU admissions. Patients receiving a different inhaler from the pharmacy than originally intended, without adequate inhaler explanation, leading to instability." (Representative 16, field notes, 8 June 2022)
	"I think it's quite different with [other national program], because they have an implementation agenda and a formal collaborative agreement that forms the basis of their work. People are to some extent obligated to participate in that [other national] program." (Representative 1, field notes, 10 January 2022)
	"In addition to the high number of requests, there is no standard funding for these activities and products. Applying for grants requires time and money, and funding is not always granted. Perhaps the Institute could play a role in this." (Comment from NHG and CAHAG, Room for Improvement report, 21 December 2021, p. 39)
	"[Stakeholder organization] has a meeting with [insurer] soon, specifically about the cuts they intend to implement for GP nurses. On the one hand, we are asking for more effort in asthma care, because spirometry is clearly still being done too little or not properly. But on the other hand, there's a threat of cutbacks on GP nurses. That doesn't add up." (Asthma team member 2, field notes, 24 January 2022)

Table 2. (continued)

Categories of implementation determinants (classified by the updated CFIR)	Determinant
	[-] Healthcare professionals lack financial incentive to conduct appropriate diagnostics (e.g. spirometry, FeNO test), as current reimbursement does not cover the actual costs, or a reimbursement code is absent
	[-] Spirometry equipment must soon be replaced due to the discontinuation of software updates
	[-] Implementation projects and their funding are temporary, leading to unsustainable implementation
Available capacity / resources [a]	[-] Stakeholder organizations lack the capacity/ resources to handle the multitude of (quality) tasks, including implementation of recommendations, and therefore have to determine which quality initiatives/ recommendations to prioritize
External pressure	[+] Commercial companies (e.g. pharma) support implementation of recommendations as it aligns with their financial interests
C. Inner setting domain	
Available resources	[-] Shortage of skilled healthcare professionals and appropriate facilities (e.g. GPs, GP nurses, diagnostic centers) to deliver the required additional care (e.g. spirometry) or invest time to focus on implementation
D. Individuals domain [b]	
Leaders / motivation	[+] Stakeholder organization representatives are enthusiastic and motivated to work on implementation
Innovation deliverers / capability	[-] Healthcare professionals are hesitant to (de-)implement out of fear of misdiagnosis or causing harm to patients
Innovation deliverers / motivation	[-] Healthcare professionals cling to old habits and routines

Exemplary quote corresponding to the determinant
"The problem is that there is currently no adequate reimbursement for the diagnostic process. Care that isn't paid for is usually not provided." (Representative 17, field notes, 8 June 2022)
"Ninety percent of our spirometers will be phased out. Who's going to take care of that? Someone needs to take action, or nothing will happen." (Representative 18, field notes, 4 July 2022)
"Or it's temporary funding that disappears again. Then you've carried out an improvement initiative for three years, only for everything to fade away afterwards. We really need to address that. It's really a barrier to implementation." (Representative 24, field notes, 4 July 2022)
"We're doing an incredible amount with the budget and people we have. But going beyond that, doing anything extra, is very difficult. Then we need to talk about the necessary preconditions, if that's something being asked. Our capacity is limited. There needs to be prioritization. There's a lot coming our way." (Representative 1, field notes, 3 March 2022)
"Information about SABA overuse has always been widely circulated. But I have to say, it's often the pharmaceutical companies themselves – like [pharmaceutical company] – that give it a lot of attention, because of course, they have an alternative to SABA." (Interview representative 7)
"Staff shortages and lack of space are additional challenges. For instance, spirometry requires a dedicated room." (Representative 18, field notes, 16 May 2022)
"I actually found [representative] to be quite enthusiastic. He was thinking about how they could approach it and what they might be able to contribute. A proactive attitude, which is definitely positive. At the very least, he gave the impression that they were willing to work on it." (Representative 1, field notes, 31 January 2022)
"It's easy to check the box, and it's reassuring when the X-ray comes back clean. Sometimes it takes more energy to hold yourself back and decide that additional testing isn't necessary. There's no clear indication for [when to conduct an X-ray]." (Asthma team member 2, field notes, 24 January 2022)
"I can't imagine that certain changes would require much extra effort, cost or time. For example, stopping a chest X-ray or discontinuing LABA monotherapy isn't particularly expensive or complicated. I get the sense that a lot of it comes down to habit." (Interview asthma team member 3)

Table 2. (continued)

Categories of implementation determinants (classified by the updated CFIR)	Determinant
Innovation recipients / motivation	[-] It's challenging to motivate patients who are stable in the short term but are not using their asthma medication appropriately to come in for consultation
E. Implementation process domain	
Teaming	[-] Absence of a dedicated Appropriate Care program officer with mandate and power at each stakeholder organization
	[-] Absence of a (neutral) process lead/manager to lead discussions, coordinate stakeholders and initiatives and oversee progress
	[-] Absence of centralized management team within the Institute to oversee and coordinate all Appropriate Care program trajectories, enabling strategic oversight of recommendations and stakeholders' improvement capacity, as well as implementation planning
	[-] Perceived lack of authority and negotiating power makes stakeholder organizations hesitant to initiate dialogue with other organizations (e.g. health insurers)
	[-] Absence of asthma champions/implementation leads (e.g. specialized asthma GPs) in some regions or care groups
	[-] Lack of implementation or behavior change expertise within the asthma team
	[+/-] Existing national asthma initiatives/working groups could serve as a springboard, but recommendations/ new initiatives may also risk being perceived as redundant, duplicative or unnecessarily complex
	[-] Discrepancy between the role the stakeholder envisions for itself and the role other stakeholders expect it to play in implementation

Exemplary quote corresponding to the determinant
"It's hard to monitor once treatment has started. If patients are doing well, you often don't see them again – sometimes not even after trying to actively reach out." (Representative 17, field notes, 8 June 2022)
"If you really have someone dedicated to this trajectory within each professional group – someone with authority and the mandate to speak up – then yes, that's incredibly helpful. And we certainly didn't have that across all parties." (Interview asthma team member 1)
"Attendees believe that the implementation of many solutions has a better chance of success if one or more working groups are established that are led by a (neutral) process facilitator who provides central coordination." (Minutes joint kick-off meeting, 8 July 2022)
"You noticed that no one really provided clear direction for all these trajectories – what was being addressed and what wasn't. Because of that … some parties got frustrated, feeling overwhelmed by how much was being asked of them. And yes, of course, a strong, guiding program leadership could have prevented that. I noticed, for example, that GPs were being bombarded from all sides with various questions." (Interview asthma team member 1)
"In theory, you should be able to compel a health insurer to change its policy. If [stakeholder organization] was the lead organization, [health insurers] would see us coming – and they'd probably just laugh us off. The Institute or the Dutch Healthcare Authority (NZa) actually have much more steering power. We need to find a good balance between our roles in that." (Representative 2, field notes, 16 May 2022)
"Not every region has frontrunners or champions to drive change. In region-focused implementation initiatives, patients in less proactive regions may be disadvantaged in their care." (Minutes joint kick-off meeting, 8 July 2022)
"It's also about whether you have the right people to properly carry out the implementation. You continue with the people you have, but [the team] wasn't specifically set up for implementation. Although we had subject-matter knowledge and enthusiasm. … We were relatively inexperienced [with regard to implementation]." (Interview asthma team member 1)
"What exactly is the intention? So much is already being done. … Is the idea simply to consolidate what's already happening within the professional groups? Because new working groups – while there are already national groups – that doesn't seem to be the goal, right?" (Representative 18, field notes, 4 July 2022)
"ZN has indicated that they are leaving implementation to the field and do not consider themselves a direct stakeholder in this process. I have pointed out to ZN that several parties would like them to be involved in the thinking process. ZN is willing to provide input by responding to specific questions." (Asthma team member 1, field notes, 7 March 2022)

Table 2. (continued)

Categories of implementation determinants (classified by the updated CFIR)	Determinant
	[-] Stakeholder organization does not effectively relay information to the members/organizations it represents
	[-] Some asthma team members felt that internal Institute departments (e.g. communications, management) did not provide the requested support or act on identified opportunities
	[+] Cross-stakeholder collaboration aligned implementation efforts and built collective support
Assessing needs	[-] Recommendations restate known issues, while stakeholders need support to overcome barriers and boost implementation
Planning	[-] No thought-out, concrete step-by-step plan or process model for implementing the recommendations
	[-] Difficulties in scheduling meetings, as both asthma team members and designated representatives actively deliver patient care, have competing priorities or lack dedicated project time – often contributing in their own time. This sometimes leads to stand-ins who lack sufficient familiarity with the content
Reflecting & evaluating	[-] Negative findings from external evaluations of the Appropriate Care program's outcomes are perceived to have led to decreased internal prioritization and resource commitment

[-] = implementation barrier. [+] = implementation facilitator

Implementation determinants are classified according to the updated CFIR [57]. Definitions and detailed descriptions of the updated CFIR concepts are presented in the additional files of Damschroder et al. (2022).

[a] Implementation determinants that did not fit in the original updated CFIR were classified and added in *italicized* text.

[b] In the individuals domain, we coded the relevant characteristics for each identified role, following the recommendation of Damschroder et al. (2022).

	Exemplary quote corresponding to the determinant
	"The incident with [member organization] is quite unfortunate. Is it our responsibility to point out to [stakeholder organization] that it's important for the [member organizations] to be informed as well? That [report] shouldn't just end up in a drawer at [stakeholder organization] with nothing done, but instead be actively forwarded to [member organizations] accompanied by a clear explanation." (Asthma team member 2, field notes, 31 January 2022)
	"Ideally, I would have liked the National Health Care Institute to have asked for a bit more attention to this topic at the director or board level, in the context of appropriate care. ... It fits so well with appropriate care." (Interview asthma team member 3)
	"What I appreciate about what the National Health Care Institute does is bringing all the parties together. This gives insight into what's going on, and it allows you to see how collaboration is already taking place and how it can be further developed." (Interview representative 21)
	"The analysis of the barriers to these improvements is missing. These improvements are not new and are already described in the guidelines, but implementation in practice is failing. An analysis of these barriers is appreciated." (Comment from NVALT, Room for Improvement report, 21 December 2021, p. 48)
	"The strange thing, of course, is that the implementation phase wasn't properly considered – or not enough – when the program was designed. Then you suddenly find yourself in the implementation phase and think, 'Oh, what are we supposed to be or do now?'" (Interview asthma team member 1)
	"You're very dependent on the other parties' contributions. Scheduling meetings is really difficult of course, and everything always takes much longer than you'd like." (Interview asthma team member 1)
	"What also played a role, was the report of the Netherlands Court of Audit and how it was received, along with the effects it had on the entire program, such as less attention being given to the Appropriate Care program. For the implementation part there was less funding, less time and less energy available." (Interview asthma team member 1)

DISCUSSION

The realization of appropriate care requires a solid implementation approach. This paper reflects on the 3.5-year implementation trajectory of asthma appropriate care recommendations, initiated by a public HTA agency. Although the actual impact of the Appropriate Care program asthma on healthcare outcomes will become clear following the evaluation planned for 2027, our findings already shed light on the complex nature of translating national recommendations into local practice.

In practice, the asthma team faced challenges in realizing the Institute's initial implementation *plans as imagined* [26, 27, 30, 49], such as transferring implementation responsibility to and setting concrete implementation goals with stakeholder organizations. The Institute's assumptions and expectations about implementation turned out to diverge from practice, requiring adaptation to the situational context.

The Institute's plan was to delegate responsibility for implementation to stakeholder organizations, positioning itself in a facilitative role. While this shift aligned with systemic roles, it overlooked the (practical) challenges stakeholder organizations faced in stimulating implementation. Although the Institute had involved stakeholder organizations in the development of the recommendations, incorporated their guidelines, and most organizations regarded the recommendations as credible and relevant (despite not having formally authorized them), organizations displayed varying levels of ownership, commitment and action. They reported facing significant barriers, including limited capacity and resources, competing improvement initiatives and limited local influence. Moreover, effective implementation required strategic coordination and synergy among interdependent stakeholder organizations. However, alignment was hindered by varying degrees of engagement and influence and diverging interests. As a result, implementation responsibilities remained largely unclear and actions fragmented.

In response, the asthma team reflected on the implementation course and gradually adjusted its approach. It assumed a more active role and began collaborating with stakeholder organizations to carry out implementation activities.

Our findings show the complexity of national, multi-stakeholder implementation initiatives. Initial assumptions and expectations unfolded differently in practice. The findings suggests that a proactive, adaptive and evidence-based approach to implementation planning is only partially embedded in the *work as imagined* and *work as done* by the Institute and stakeholder organizations [62-64]. These issues are not unique to this project. Two recent reviews on global approaches to guideline implementation planning [51, 65], as well as a study by the current authors on the approaches of Dutch guideline organizations [66] reported similar findings. It highlights the need for adaptive planning and execution,

early identification of barriers and proactive cross-organizational coordination of roles, possibilities and actions – ideally from the start of projects [51].

The used implementation planning approaches, executed dissemination and implementation strategies and encountered implementation determinants show strong parallels with similar international initiatives like *Choosing Wisely*, NICE's *Do Not Do* recommendations and nationwide guideline implementation efforts [5, 65, 67, 68]. This indicates that challenges in implementing appropriate care recommendations are health system-independent. They also occur in more top-down governed health systems like the United Kingdom's National Health Service (NHS).

The asthma care project relied mainly on dissemination strategies, with limited use of (more interactive) implementation approaches. It also generated new research and guidelines, requiring their own dissemination and implementation. Dissemination strategies are valuable for raising awareness among a broad, nationwide audience. However, a review of Choosing Wisely guideline implementation suggests that dissemination alone has little success in implementing appropriate care and reducing low-value care [67], a finding supported by broader evidence from a review on clinical guideline implementation strategies [63].

The Netherlands Court of Audit (2020) evaluated earlier projects of the Appropriate Care program [16]. Determinants like the importance of stakeholder collaboration and the persistent misalignment between reimbursement structures and the incentives needed to support appropriate care were already identified in this earlier evaluation. They also observed, as we did, that the high number of parallel appropriate care improvement initiatives hinders rather than supports implementation. Recent inventories have identified nearly 40 national initiatives/programs – including the Appropriate Care program, which alone encompasses 27 projects – and over 2,000 clinical guidelines [66, 69]. These may overwhelm and overburden stakeholder organizations, healthcare professionals and facilities – especially those with a central role in the health system – making it difficult to prioritize and implement improvements effectively. It would be beneficial if national-level improvement initiatives were better coordinated. The Court of Audit also observed that the recommendations that they evaluated often failed to align with daily clinical practice and lacked broad support from stakeholder organizations [16]. In contrast, the recommendations from the asthma care project were generally perceived as credible and relevant.

In this study, we also reflected on the option to shift from a soft governance approach to stricter, Institute-imposed care exclusions and conditions within the basic health insurance package to steer improvements. Asthma team members noted that such measures likely would not have worked for these recommendations, due to difficulties with monitoring

and regulating compliance, perceived disproportionality of measures and concerns about stakeholder support and autonomy. Previous research shows that stakeholder support is essential for the success of such measures. Changes to – and especially the removal of – care included in the basic health insurance package often provoke significant public and political backlash, lawsuits and attempts to bypass the system [70]. These measures can also undermine long-term trust in the organization and diminish stakeholder's willingness to collaborate [71]. Moreover, the review by Chambers et al. (2017) found that disinvestment measures alone often yield limited impact, underscoring the need for strategies that effectively support and reinforce these efforts [5]. Thus, in this case, stricter measures were unlikely to offer an effective solution.

For a future national appropriate care initiative, it may be helpful to account for a wide range of possible scenarios and allow flexibility in tailoring roles and implementation to address project-specific issues. For example, by securing access to additional funding for stakeholders – not only to support further research, but also, when necessary, to facilitate implementation activities. Embedding an implementation specialist in the Institute's and/or stakeholders' project team or providing early implementation training could also strengthen efforts. Furthermore, lessons learned, along with tested implementation strategies and infrastructures from this and other Appropriate Care projects, should be systematically documented. This would enable the Institute to better prepare for future collaborative improvement projects and build on existing knowledge and resources.

The Appropriate Care program required the Institute to move beyond 'conventional HTA practices' [72] and adopt a more collaborative role, through learning by doing. Stakeholder organizations expressed appreciation for their collaboration with the Institute and one another. Health systems are increasingly confronted with complex, multi-actor wicked problems [71], for which collaborative governance offers a promising model [73]. This approach may be particularly well-suited to countries like the Netherlands, which has a longstanding history of consensus-based decision-making [74]. For future national improvement initiatives, it would be interesting to examine whether intensified collaborative governance leads to more impactful and sustainable outcomes. This could be explored through engaging with existing multi-stakeholder networks and working groups – such as the LAN in the context of lung care – or by involving stakeholder organizations more actively as equal partners in decision-making from the earliest stages of screening and in-depth analysis. Key conditions for this type of more intensive collaboration are clear agreements on conditions, collaboration and commitment (e.g. reflect on how to integrate perspectives, agree on definitions and sources of knowledge [72]), and allocation of sufficient resources to enable representatives with decision-making authority within their organizations to actively participate. Collaborative governance may foster ownership, initiative, commitment and alignment of implementation efforts. For example, stakeholder organizations could simultaneously include relevant topics on their

internal agenda's. It may also help resolve issues that involve significant disagreement but require joint solutions. Such an approach also facilitates evidence-based selection and tailoring of implementation strategies, through stakeholder engagement and pre-identification of barriers [51-55]. Finally, it may help reduce the number of improvement efforts stakeholders need to engage with.

However, more intensive collaboration and co-creation may come with its own challenges; it can be time-consuming and may slow decision-making [75]. Yet, aligning implementation efforts could potentially compensate for the time lost [71]. Future research could compare whether this approach, combined with collective agenda-setting, leads to more efficient and effective improvement efforts and better health outcomes.

Strengths and limitations

A major strength of this study is its comprehensive design, involving 3.5 years of in-depth ethnographic fieldwork. This long-term engagement enabled a nuanced, context-rich understanding of the implementation process. Data triangulation – through observations, document analysis, conversations and interviews – provided valuable insights into organizational dynamics and decision-making and strengthened the validity of our findings. While this study focused on a single Appropriate Care project, limiting generalizability, similar patterns observed in previous evaluations of the Appropriate Care program and other nationwide quality improvement initiatives [16, 51, 65, 66] suggest broader relevance. Lastly, the first author's moderate to active participant observation in the asthma team – such as providing insights from implementation theory – may have potentially affected the natural progression of events and (positively) influenced implementation.

CONCLUSION

Evaluating the value of delivered care and effectively replacing low-value care with high-value care are vital for achieving optimal patient outcomes and ensuring the sustainability of health systems. This study examined the role of the Dutch National Health Care Institute in stimulating nationwide implementation of asthma appropriate care recommendations, as well as the key determinants perceived to influence this process. The Institute faced challenges in realizing its initial implementation *plans as imagined*. Its assumptions and expectations about implementation turned out to diverge considerably from practice, requiring adaptation to the situational context. This study shows the complexity of national multi-stakeholder implementation initiatives. It highlights the importance of evidence-based, flexible and proactive implementation planning and cross-organizational coordination of roles, possibilities and actions. This includes integrating implementation considerations from the start and selecting and tailoring implementation strategies based

on pre-identified barriers, stakeholder engagement, and implementation theories, models and frameworks. Future research could compare whether a more intensive collaborative approach and collective agenda-setting for nationwide quality improvement lead to more efficient and effective efforts and improved health outcomes.

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6

General discussion

In a vastly changing world, evidence-based care recommendations are important means to summarize the existing evidence and regulate the quality, affordability, accessibility and environmental impact of care. For healthcare professionals and patients, recommendations serve as a key reference for decision-making in practice. For researchers, they are important vessels to make care more evidence-based and they offer sources for ideas for new research to fill existing knowledge gaps. Regulators, in turn, use them as a foundational basis for monitoring, evaluating and procuring care.

On average, it takes 15 years to implement new evidence – far too slow for a world that's evolving at a much faster pace. With over 2,000 Dutch guidelines and numerous other regularly updated recommendations issued by various central organizations, it has become increasingly difficult for healthcare professionals and facilities to stay up to date – let alone implement recommendations swiftly, especially when their local context may not be prepared or supportive. Central organizations play an important role in the implementation process. They can spread awareness, are able to shape the healthcare environment in ways that support change and they can give that extra implementation push.

In this thesis, we examined the role of central organizations in the implementation of evidence-based care recommendations to advise on how to optimize their implementation efforts and ultimately improve patient health outcomes. The research objectives of this thesis were:

- To gain insight into how central organizations can stimulate the implementation of recommendations in healthcare.
- To explore the determinants that central organizations perceive as influencing the implementation of recommendations.

In the following sections, I address the overarching thesis objectives by synthesizing the findings from the four studies and situating them within the context of existing literature. Additionally, I discuss methodological considerations and propose implications for practice, policy and future research.

MAIN FINDINGS AND THEIR INTERPRETATION

How central organizations stimulate the implementation of recommendations

Implementation responsibility: recognized, but not fully realized

The study presented in **Chapter 3** explored, through interviews, how Dutch central organizations plan, execute, monitor and evaluate the dissemination and implementation of guidelines. Although central organizations generally regarded healthcare professionals and facilities as the primary actors responsible for implementing recommendations,

they also acknowledged that these end users could not manage implementation alone. The organizations recognized their own responsibility in supporting implementation efforts and the need to actively contribute to successful uptake. However, this sense of responsibility was not always translated into prioritization, professionalization, structural embedding of or dedicated resource allocation for implementation efforts. As a result, their approaches to implementation were inconsistent: varying both in methods and intensity.

The ethnographic study in **Chapter 5** examined the role of the Dutch National Health Care Institute in stimulating the implementation of its asthma appropriate care recommendations. The study revealed that implementation responsibility is not simply delegated from one central organization to another or to end users. This holds true even when formal roles within the health system expect them to and the recommendations are based on organizations own guidelines and are perceived as credible and relevant. Factors such as recommendation ownership, implementation resources and the sheer number of competing improvement initiatives vying for organizations' limited attention also played a role. Furthermore, the findings of this study showed that the coordinated actions of central organizations are an important factor for successful nationwide implementation of recommendations. Each organization has its own authority and means of influence. Aligning their policies and practices is essential to optimize preconditions for implementation and take away barriers that hinder progress.

Global research reveals patterns that mirror the findings of our studies. Previous investigations show that the responsibility for stimulating the implementation of recommendations varies significantly among central organizations worldwide [1-3]. Some organizations take on this responsibility themselves, given their knowledge of content and intent of the recommendations [1]. Others delegate the task to healthcare professionals and facilities, reasoning that these end users are ultimately responsible for implementation and are better positioned to identify effective implementation strategies. Some organizations view implementation as a shared responsibility, while some express uncertainty about who should be involved in ensuring implementation. As with the central organizations discussed in **Chapters 3** and **5**, international central organizations also frequently face challenges in assuming responsibility for the implementation of their recommendations. Although several of these organizations express a clear willingness to contribute, their efforts are often constrained by barriers. Gagliardi (2012), for instance, found that many such organizations lack a clear mandate for implementation and do not have dedicated resources to support these efforts – an issue also identified in our studies [1]. Even those with a formal mandate often operate without specific funding for implementation activities. As a result, the responsibility is typically passed on to local healthcare professionals and facilities.

The synthesis of **Chapters 3** and **5**, together with global research findings, show us that although many central organizations – both in the Netherlands and internationally – acknowledge their role in supporting the implementation of recommendations, this recognition often does not translate into concrete action. A gap exists between accepting responsibility and making the necessary investments in planning and execution to fulfill it. Implementing recommendations on a national scale is undeniably complex – a long-term endeavor that demands different knowledge and skills than those needed to develop recommendations. Nevertheless, end users depend on central organizations to raise awareness on how to optimize care, engage stakeholders, foster commitment and shape the broader context to enable behavior change. At the same time, central organizations rely on the commitment, time and local knowledge of end users to identify what is needed for successful implementation and to eventually change their practices. Ultimately, this is not a matter of either/or – it is a matter of both/and.

Implementation planning: practices, progress and persistent gaps

In **Chapter 2**, we conducted a systematic review of the strategies employed by central organizations to implement guidelines in hospital care. We examined the determinants influencing implementation and analyzed the impact of these efforts. The findings from **Chapter 2**, together with those from **Chapters 3** and **5**, show that both internationally and in the Dutch context, central organizations use different approaches for choosing and designing dissemination and implementation strategies. Only a subset of central organizations makes use of implementation theories, models and frameworks (TMFs), pre-identifies barriers and engages stakeholders to select and tailor strategies. These implementation planning approaches have been shown to improve implementation outcomes in previous research [4-8]. Other planning approaches, used either alongside or instead, included, among others: 1) replicating/adapting strategies from other (successful) similar studies and initiatives 2) relying on the motivations and preferences of the recommendation committee, 3) basing decisions on the practicality of implementation strategies, and 4) availability of implementation resources. This implies that also implementing evidence-based implementation planning approaches is influenced by many factors.

Prior to the 2000s, it was common practice in implementation science to replicate strategies that had proven successful in earlier studies [9]. This approach was grounded in the assumption that implementation strategies would be universally effective, regardless of the specific clinical issues that were being addressed or the contexts in which they were deployed [9]. This 'magic bullet' approach generally yielded limited success [10].

It prompted a growing recognition that effective implementation requires strategies to be selected and tailored based on a thorough understanding of the context. This involves identifying the root causes of quality and implementation gaps, assessing key

implementation determinants that influence implementation success and understanding the mechanisms and processes necessary to address them [9]. Implementation science researchers have systematically mapped potential implementation determinants and linked them to promising strategies. A notable example is the (updated) Consolidated Framework for Implementation Research (CFIR), which was used throughout this project, and the CFIR-ERIC matching tool that connects determinants to appropriate strategies [11-13]. Process models have also been developed to guide and optimize the implementation process [14-16]. In parallel, systematic reviews [17-21] and studies – such as the work of Vera de Weerdt [22, 23] within the same Academic Collaboration – have examined the active components of specific dissemination and implementation strategies, like audit and feedback. Research has also examined guideline features that influence their implementability [6] and effective methods for stakeholder engagement in implementation [24]. Together, these and other initiatives form a growing body of evidence that provides a robust scientific foundation for the selection and tailoring of dissemination and implementation strategies – yet, these implementation planning approaches are still waiting to get implemented.

Encouragingly, implementation planning efforts for evidence-based care recommendations have advanced globally in recent years [4]. Increasingly, these efforts are guided by implementation TMFs and incorporate proactive barrier identification and stakeholder engagement. This shift is likely driven by growing awareness of the expanding body of research focused on optimizing implementation processes [8]. Nevertheless, our studies have revealed that significant opportunities remain – both internationally and within the Netherlands – to further enhance implementation by investing in well-considered and strategic planning. The practicality of strategies, the availability of implementation infrastructure and resources and the motivations and preferences of representatives from central organizations to develop certain strategies are critical factors that must be acknowledged and addressed. However, it is equally important to explore – within these contextual boundaries – how implementation TMFs can be applied more effectively, how barriers can be proactively identified and how stakeholders can be more meaningfully engaged.

Smart selection of dissemination and implementation strategies

Chapters 2, 3 and **5** show a large scala of possible dissemination and implementation strategies that can be used by central organizations to stimulate implementation. In the review in **Chapter 2**, we identified 62 strategies in total. The initiatives described in the included studies predominantly employed multifaceted rather than single strategies. On average, nine strategies per initiative were used (ranging from 1 to 16). Most frequently reported strategies were educational sessions, the provision of additional implementation supporting materials and the publication of information on websites.

Eighty-five percent of the implementation initiatives identified in the review showed improvements in one or more reported outcomes. Using multiple active implementation strategies and particularly the strategies 'provide/request a protocol from hospitals in line with the recommendations' and 'inform/involve hospital management in implementation' seemed to be associated with mixed/positive impact on clinical outcomes. Initiatives that provided a protocol or requested one from participating hospitals aimed to actively translate recommendations into the realities of specific clinical settings. Those that involved or informed management sought to build broader organizational and leader support for implementation within the facility. Active involvement of both healthcare professionals and other (supporting) staff plays a crucial role in facilitating implementation. Staff can influence the local context and culture by offering necessary resources, support and leadership [25-27]. Central organizations may benefit from proactively applying these strategies in their own setting to increase the likelihood of successful implementation. However, given the limitations of this review – including the inability to conduct a comprehensive quantitative meta-analysis and the inclusion of only a limited number of studies in the in-depth impact analysis – caution is warranted when generalizing these findings. Moreover, it remains essential to consider the specific context in which implementation takes place, including local barriers and facilitators that may significantly influence the process.

The review also found that even the use of a single strategy can be associated with positive outcomes. It would be practical if central organizations only needed to use a single strategy, as this would allow them to focus their efforts and this would likely reduce both time and financial costs. The specific conditions under which a single strategy proves sufficiently effective remained unclear. While employing multifaceted strategies appears intuitively beneficial, research comparing them to single-strategy approaches has yielded mixed results [8, 28]. A meta-review found no strong evidence that combining multiple strategies leads to better outcomes than using a single, well-targeted approach [28]. One reason for this, as Grimshaw et al. (2012) suggest, is that many multifaceted strategies may not be effectively selected and tailored [29]. They may not be carefully chosen and designed based on pre-identified barriers, in engagement with stakeholders and guided by implementation TMFs. With multifaceted strategies, it may be often a '*hail shot*' or a '*throw everything at the problem*' approach, without a clear plan. Wensing et al. add that the way we define 'single' and 'multifaceted' strategies can be misleading [30]. For example, 'educational sessions' might refer to a simple, single webinar aimed solely at updating healthcare professionals' knowledge, or it could encompass a range of activities – such as interactive training, peer discussions, and implementation support – designed to address multiple barriers. Ultimately, they suggest that multifaceted strategies may be more effective, but only if the components are carefully selected and tailored based on evidence-based planning approaches [30].

Implementation strategies identified in the Dutch context, outlined in **Chapters 3** and **5**, were largely dissemination-focused. Common dissemination strategies included (1) distributing draft guidelines to healthcare professionals and other central organizations (pre-publication for consultation on recommendations or after publication, via email), (2) advertising guideline materials (e.g. via guideline databases, journals, newsletters, websites, (social) media and patient websites) and (3) presenting guideline materials (e.g. conferences and annual meetings). Dissemination strategies are also widely used by central organizations globally, as highlighted in **Chapter 2** and the work of Gagliardi (2012) [1].

While dissemination strategies are relatively cheap, practical and capable of reaching a broad national audience, previous research indicates that dissemination alone leads to limited implementation success [25, 31]. Interactive or tailored implementation strategies have generally been shown to be more effective in promoting adherence [8, 29]. Dutch Central organizations incorporated only a limited number of more interactive approaches (e.g. training, audit and feedback). A more interactive implementation strategy that was often employed by central organizations was educating healthcare professionals about the recommendations (e.g. through workshops), similar to what was found in the review in **Chapter 2**.

Interviews from **Chapter 3** revealed that regular and structured evaluation of the process, outcomes or impact of recommendation implementation is rare. As a result, it is difficult for Dutch central organizations to assess whether what they are doing is the right thing: whether their recommendations and implementation strategies are making a positive difference.

These findings underscore that there are significant opportunities for improvement in the selection and tailoring of dissemination and implementation strategies. Central organizations – within the scope of their capacity – should move beyond broadcasting information about recommendations and focus on actively engaging end users with the content in meaningful, interactive ways. To support this, central organizations can draw inspiration from or make more effective use of existing implementation structures. These include ZE&GG's Implementation Agenda, audit and feedback systems like the one used by the Royal Dutch Pharmacists Association (KNMP) and the mandatory accreditation point system for healthcare professionals. For example, learning about new evidence-based care recommendations (such as through peer-learning sessions) could be made a formal requirement within the accreditation process. Moreover, regularly evaluating what ultimately reaches and resonates with end users can provide valuable insights to shape and refine implementation strategies more effectively.

Perceived determinants that influence implementation

The studies in **Chapters 2**, **4** and **5** identified a broad range of determinants perceived to influence the implementation of recommendations. The systematic review in **Chapter 2** identified 72 implementation barriers and 42 facilitators across international implementation initiatives. The interview study presented in **Chapter 4** specifically focused on implementation determinants encountered by Dutch central organizations in their efforts to support guideline implementation. In this study we found 45 different barriers and 35 facilitators. Meanwhile, the ethnographic study in **Chapter 5**, which focused on 17 asthma care recommendations, uncovered 38 perceived influential determinants.

The findings across these three studies reveal a consistency in the identified determinants and overarching determinant themes, highlighting similarities between international initiatives and the Dutch implementation context. A key issue is the limited availability of resources for implementation – both within central organizations and at the local level in healthcare facilities. The predominant focus remains on the development of recommendations, while dedicated funding for implementation is often lacking or not systematically integrated. Furthermore, numerous quality improvement initiatives compete for the same limited attention and capacity of both central organizations and healthcare professionals, further complicating effective implementation. Recent inventories have identified nearly 40 Dutch national improvement initiatives/programs and over 2,000 clinical guidelines [32, 33]. These may overwhelm and overburden stakeholder organizations with limited capacity and/or a central role in the health system and diffuse focus among healthcare professionals and facilities, making it difficult to prioritize and effectively implement improvements.

Challenges related to time and resources for implementation are well-known in implementation science. They have been identified in previous research, including two (meta-)reviews on global implementation barriers and facilitators [25, 34], as well as in more targeted empirical studies examining the implementation experiences of international central organizations, Dutch hospitals and Dutch GPs [1, 2, 35, 36]. As workforce shortages are projected to worsen [37], care demands continue to rise [38] and the number of recommendations grows [39], allocating sufficient time and resources to active implementation – and achieving the high standards outlined in these recommendations – is likely to become increasingly challenging in the years ahead.

We have also observed that the interdependence of organizations, along with effective coordination and alignment of policies and practices – both at the central level and at the local, healthcare facilities' level – play a critical role in successful implementation. Each stakeholder can only address a subset of the identified determinants. Coordination and alignment are important for harmonizing (conflicting) recommendations, policies,

organizational and reimbursement structures and implementation activities. Additionally, as discussed in **Chapter 2**, the involvement of additional healthcare facility staff – such as management and IT personnel – can facilitate implementation at the local level. Their support can help embed new care practices into existing operational and technological systems.

In addition, the strength of the evidence base and the perceived relevance and credibility of the recommendations play a crucial role in their uptake. Also important is the credibility and recognizability of the issuing organization, which can foster central organizations' and end users' trust and strengthen commitment to implementation [29].

Furthermore, factors related to how the implementation process was approached played a role. Implementation was often considered only at the final stages of the development process, rather than being integrated early during the formulation of recommendations – when feasibility and preparatory actions could already be addressed. In many cases, there was no concrete implementation plan, or developed plans were not adequately followed through. A lack of implementation expertise within the responsible teams was also frequently noted. Moreover, dedicated implementation leadership emerged as an important factor influencing the success of implementation efforts. The expectations of effective guideline implementation with minimal activities and resources stands in stark contrast to the complex, unpredictable and resource-intensive realities of actual implementation. This misconception has been noted in previous studies examining both national and local guideline implementation efforts, as well as broader governmental policy initiatives [4, 40-42]. Literature stresses the importance of integrating implementation science and relevant expertise into implementation teams and initiatives to navigate these complexities effectively [4, 6, 15].

The alignment of determinants across international and Dutch contexts indicates that many implementation challenges may be systemic and not unique to a specific setting. This consistency provides an opportunity for shared learning and the development of broadly applicable improvements. Importantly, these barriers are not beyond resolution and can be mitigated. It is a system in which potential for effective implementation exists, but is often undermined by limited resources, fragmented efforts and insufficient planning. Overcoming these challenges requires a shift toward proactive, better-resourced and tailored implementation strategies focused on strong and relevant recommendations, supported by cross-sector collaboration.

LIMITATIONS

The studies presented in this thesis primarily focused on the role and perspectives of central organizations, rather than assessing the impact of evidence-based care recommendations or implementation strategies on clinical practice or patient outcomes. We did not investigate whether the use of such recommendations leads to improved care delivery or how they are applied in everyday clinical settings. However, other projects do address these aspects. For instance, Floris Weller – part of the same Academic Collaboration – examines what role guidelines play in medical specialists' medical decision-making [43, 44], while earlier research by Louise Blume explores the viewpoint of hospitals [45].

Furthermore, we cannot definitively determine how representative the participants and initiatives in our studies are of all Dutch central organizations and recommendation implementation efforts. Nonetheless, we made a conscious effort to recruit a diverse and varied sample of participants. Additionally, we were able to compare our findings from the Dutch context with those of international initiatives analyzed in the systematic review. This comparison revealed a notable degree of consistency. This alignment further reinforces the broader relevance and validity of our conclusions.

IMPLICATIONS FOR POLICY, PRACTICE AND RESEARCH

In 1999, Grol & Grimshaw asserted that evidence-based practice must be complemented by evidence-based implementation [46]. More than 25 years later, there are still many opportunities for improvement in the evidence-based implementation of evidence-based care recommendations.

Healthcare professionals at the wheel, central organizations as the GPS

Healthcare professionals are, without question, primarily responsible for implementing recommendations. No other party currently can – or wishes to – take their seat. However, central organizations have an important role to play in supporting healthcare professionals to optimize their practice. This support is especially critical given the increasingly demanding and fast-paced nature of healthcare, with even more challenging times ahead. A representative from a central organization once shared a compelling analogy why supporting healthcare professionals in this is important:

"*It's like a doctor being compared to a taxi driver. The driver transports people from point A to point B, always doing it in the way he was taught. One day, someone sits beside him and says, 'Hey, if you take this other route via the newly opened bridge, it might be faster or more efficient.' On which the driver replies: 'I don't have time to figure that out right now – I'm busy getting you safely to your destination.'*" (representative of a central organization, 2025)

This analogy illustrates the tension between the urgency of day-to-day healthcare delivery and the need for continuous improvement. Healthcare professionals are expected to stay informed of all changes. Central organizations can act as co-drivers, offering guidance. Or they may provide the map, the navigation system, overhead traffic signs or a short break – tools that allow healthcare professionals to step back, reassess and find more efficient or effective routes in their daily work. With this in mind, we provide several recommendations for policy, practice and research.

Towards a sustainable system for quality improvement

Rethinking recommendation development in the age of AI

Evaluating and reshaping how evidence-based care recommendations are developed and implemented is a crucial step toward strengthening centrally guided quality improvement – especially in light of the rapid advancements and systemic demands that lie ahead. The pace of medical research is accelerating and care is becoming more personalized. At the same time, healthcare systems are increasingly under pressure. These trends demand that recommendations are continuously updated to reflect the latest, high-quality evidence as well as the practical possibilities within the constraints of the healthcare system.

However, the traditional, manual methods of developing and updating these recommendations are rapidly becoming unsustainable – if they have not already reached that point. This strain extends to implementation, which must evolve in parallel to ensure that updated recommendations are effectively translated into practice. Without a shift in both development and implementation, recommendations risk losing their clinical relevance in guiding care.

Yet, these increasing pressures also present a valuable opportunity: to fundamentally redesign the recommendation system into one that is more agile, scalable and implementation-ready. One that is capable of keeping pace with innovation while driving meaningful improvements in care quality.

As we have seen in this thesis, the primary emphasis of central organizations remains on the development of recommendations, while implementation continues to receive comparatively limited attention. With recent advancements in artificial intelligence (AI) [47], it is worth exploring how the development and updating of evidence-based care recommendations – potentially in real time – can be streamlined and partially delegated to large language models. Given current challenges in AI – such as limited transparency, lack of explainability, and the risk of bias and inequality – it would be ideal to use white-box models to enable decisions to be interpretable, transparent and verifiable. Integrating these AI models with data-driven learning systems based on real-world data would further enhance their effectiveness. This shift would potentially free up central organizations'

time to focus less on developing recommendations and more on contextualizing them (assessing whether the proposed care options are feasible within current settings) and supporting their implementation.

Towards a coordinated central strategy for guideline implementation

Central organizations can – partly collectively – set priorities for where additional dissemination and implementation strategies are most needed. Priority should be given to recommendations that are strongly evidence-based and have a significant impact on disease burden, resource use, the healthcare workforce and/or environmental sustainability. Blume et al. (2017) recommend that guideline developers should grade the relative relevance of recommendations to enable end users to better align care delivery with real-world constraints [48]. Such a grading system could also support central organizations in making informed decisions about which recommendations to prioritize for implementation.

For multidisciplinary recommendations, central organizations whose members hold key positions in the healthcare system (such as GPs) should take the lead in setting these priorities. This ensures that improvement initiatives do not have to compete that much for the attention of central organizations and healthcare professionals. This central implementation agenda setting – potentially as an extension of ZE&GG's Implementation Agenda [49] – could help system-wide coordination of efforts and collective actions, build trust among stakeholders and support the delivery of appropriate care as outlined in the recommendations.

Furthermore, I strongly advocate for embedding implementation as a core objective throughout the entire guideline development process, supported by dedicated resources. Central organizations should invest in selecting and tailoring dissemination and implementation strategies based on identified barriers, stakeholder input and implementation TMFs. Support from implementation experts can be leveraged to guide and strengthen this process. Regularly evaluating what approaches ultimately reach and resonate with end users can provide valuable insights to shape and refine implementation strategies more effectively.

Guidance at the point of care

Lastly, a new approach could be considered to present recommendations to healthcare professionals in a more digestible format. A readily accessible, easy to use clinical decision support system – powered by AI and natural language processing and integrated with the electronic health record – would be a promising strategy. Trained on existing guidelines and enriched with patient-specific data from the electronic health record, such a system could enable healthcare professionals to perform fast and flexible searches of

the best available evidence. To support informed decision-making, such a system should clearly indicate the source of each recommendation, allowing for verification and deeper exploration when needed. It should also convey the strength of each recommendation – distinguishing between 'must-do's' and 'nice-to-do's' – to highlight when justified deviations may be appropriate. Promising tools in this space are already being developed (e.g. EvidenceHunt and clinical knowledge modeling [50]). Once implemented, such a clinical decision support system could significantly accelerate the adoption of real-time recommendation updates.

If we want recommendations not only to be developed but also to truly make a difference in practice, we must give implementation the attention it deserves. Just like the taxi driver aiming to get passengers to their destination, it is not enough for a better route to exist – it must also be known, understood, trusted, usable and easy to follow. Only then can we ensure that patients arrive safely and efficiently at the right destination: the best possible care for optimal health and well-being.

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50. Edelman, E., Tijssen, F., Munniksma, P.R., Bast, W., Bohmer, H.T., van Eldik, N., ... van Merode, F. *Clinical knowledge modeling: An essential step in the digital transformation of healthcare.* Innovation (Camb), 2024. **5**(6): p. 100718. DOI: 10.1016/j.xinn.2024.100718.

APPENDICES

APPENDIX 1. PRISMA CHECKLIST AND SWIM CHECKLIST

PRISMA checklist

Section and Topic	Item #	Checklist item	Location where item is reported
Title			
Title	1	Identify the report as a systematic review.	Page 1
Abstract			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 1
Introduction			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 3-5
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 5
Methods			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6 + Appendix 2
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 6 + 7
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 6 + 7 + Appendix 2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7 + Appendix 2
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 8-10

PRISMA checklist (continued)

Section and Topic	Item #	Checklist item	Location where item is reported
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 8-10
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 8-10
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7 + 8
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8-10
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	N/a
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 8-10
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 8-10
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 8-10
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/a

PRISMA checklist (continued)

Section and Topic	Item #	Checklist item	Location where item is reported
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/a
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/a
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 19
Results			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 11 + Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 11 + Figure 1
Study characteristics	17	Cite each included study and present its characteristics.	Page 11 + 12 + Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 11 + additional file 3
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 11-15 + additional file 4-6
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 11-15 + additional file 4-6
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 11-15 + additional file 4-6
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/a
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/a

PRISMA checklist (continued)

Section and Topic	Item #	Checklist item	Location where item is reported
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/a
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Page 19
Discussion			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 16-20
	23b	Discuss any limitations of the evidence included in the review.	Page 18, 20-21
	23c	Discuss any limitations of the review processes used.	Page 18, 20-21
	23d	Discuss implications of the results for practice, policy, and future research.	Page 16-21
Other information			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 6
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 6
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Page 6
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Funding information
Competing interests	26	Declare any competing interests of review authors.	Declaration of competing interests
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Declarations

PRISMA=Preferred Reporting Items for Systematic Reviews and Meta-Analyses. Table adapted from Page et al. (2021) [1].

Synthesis Without Meta-analysis (SWiM) reporting items

SWiM is intended to complement and be used as an extension to PRISMA

SWiM checklist

SWiM reporting item	Item description	Page in manuscript where item is reported	Other
Methods			
1 Grouping studies for synthesis	1a) Provide a description of, and rationale for, the groups used in the synthesis (e.g., groupings of populations, interventions, outcomes, study design)	N/a	
	1b) Detail and provide rationale for any changes made subsequent to the protocol in the groups used in the synthesis	N/a	
2 Describe the standardised metric and transformation methods used	Describe the standardised metric for each outcome. Explain why the metric(s) was chosen, and describe any methods used to transform the intervention effects, as reported in the study, to the standardised metric, citing any methodological guidance consulted	Page 8-10	
3 Describe the synthesis methods	Describe and justify the methods used to synthesise the effects for each outcome when it was not possible to undertake a meta-analysis of effect estimates	Page 8-10	
4 Criteria used to prioritise results for summary and synthesis	Where applicable, provide the criteria used, with supporting justification, to select the particular studies, or a particular study, for the main synthesis or to draw conclusions from the synthesis (e.g., based on study design, risk of bias assessments, directness in relation to the review question)	Page 8-10	
5 Investigation of heterogeneity in reported effects	State the method(s) used to examine heterogeneity in reported effects when it was not possible to undertake a meta-analysis of effect estimates and its extensions to investigate heterogeneity	Page 8-10	
6 Certainty of evidence	Describe the methods used to assess certainty of the synthesis findings	Page 19	

SWiM checklist (continued)

SWiM reporting item	Item description	Page in manuscript where item is reported	Other
7 Data presentation methods	Describe the graphical and tabular methods used to present the effects (e.g., tables, forest plots, harvest plots). Specify key study characteristics (e.g., study design, risk of bias) used to order the studies, in the text and any tables or graphs, clearly referencing the studies included	Page 8-10	
Results			
8 Reporting results	For each comparison and outcome, provide a description of the synthesised findings, and the certainty of the findings. Describe the result in language that is consistent with the question the synthesis addresses, and indicate which studies contribute to the synthesis	Page 11-15	Appendixes 4-6
Discussion			
9 Limitations of the synthesis	Report the limitations of the synthesis methods used and/or the groupings used in the synthesis, and how these affect the conclusions that can be drawn in relation to the original review question	Page 18, 20-21	

SWiM= Synthesis Without Meta-analysis. Table adapted from Campbell et al. (2020) [2]

REFERENCES

1. Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., . . . Moher, D. *The PRISMA 2020 statement: an updated guideline for reporting systematic reviews.* Syst Rev, 2021. **10**(1): p. 89. DOI: 10.1186/s13643-021-01626-4.

2. Campbell, M., McKenzie, J.E., Sowden, A., Katikireddi, S.V., Brennan, S.E., Ellis, S., . . . Thomson, H. *Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline.* Bmj, 2020. **368**: p. l6890. DOI: 10.1136/bmj.l6890.

APPENDIX 2. SEARCH STRATEGY AND ELIGIBILITY CRITERIA

Search strategy PubMed

Concept #1 Clinical practice guideline

"Standard of Care"[Mesh] OR "Clinical Protocols"[Mesh] OR "Practice Guidelines as Topic"[Mesh] OR "Critical Pathways"[Mesh] OR "care standard*"[tiab] OR "standards of care"[tiab] OR "standard of care"[tiab] OR guidance[tiab] OR "clinical practice guideline*"[tiab] OR "practice guideline*"[tiab] OR "clinical protocol*"[tiab] OR "treatment protocol*"[tiab] OR "critical path*"[tiab] OR "clinical path*"[tiab]

Concept #2 main terms implementation

"Implementation Science"[Mesh] OR "Diffusion of Innovation"[Mesh] OR implement*[tiab] OR disseminat*[tiab]

Concept #3 additional terms implementation

"Guideline Adherence"[Mesh] OR uptake*[tiab] OR adopt*[tiab] OR adhere*[tiab] OR concord*[tiab] OR complian*[tiab] OR comply[tiab] OR non-adhere*[tiab] OR nonadhere*[tiab] OR non-concord*[tiab] OR nonconcord*[tiab] OR non-complian*[tiab] OR noncomplian*[tiab] OR accept*[tiab] OR conform*[tiab] OR approv*[tiab] OR distrib*[tiab] OR diffus*[tiab] OR integrat*[tiab] OR normali*[tiab] OR mainstream*[tiab] OR maintain*[tiab] OR sustain*[tiab]

Concept #4 barriers and facilitators

barrier*[tiab] OR limit*[tiab] OR obstacle*[tiab] OR challeng*[tiab] OR constraint*[tiab] OR threat*[tiab] OR bottleneck*[tiab] OR driver*[tiab] OR moderat*[tiab] OR mediat*[tiab] OR modif*[tiab] OR facilitator*[tiab] OR impediment*[tiab] OR hinder*[tiab] OR enabler*[tiab] OR motivator*[tiab]

Concept #5 strategy

mechanism*[tiab] OR strateg*[tiab] OR determinant*[tiab] OR framework*[tiab] OR theor*[tiab] OR model*[tiab] OR factor*[tiab]

Concept #6 Evidence-based practice and knowledge translation

"Evidence-Based Practice"[Mesh] OR "Translational Medical Research"[Mesh] OR evidence-base*[tiab] OR evidencebase*[tiab] OR evidence-practice[tiab] OR evidence-informed[tiab] OR evidenceinformed[tiab] OR "knowledge translation*"[tiab] OR "knowledge to action"[tiab] OR "knowledge transfer*"[tiab] OR "knowledge utilisation"[tiab] OR "knowledge utilization*"[tiab] OR "knowledge mobilisation"[tiab] OR "knowledge mobilization"[tiab] OR "research translation"[tiab] OR "research use*"[tiab] OR "research utilisation*"[tiab] OR "research utilization*"[tiab] OR "research

mobilisation"[tiab] OR "research mobilization"[tiab] OR "knowledge exchange*"[tiab] OR "translational research"[tiab] OR "translational medical science*"[tiab] OR "translational medical research"[tiab]

Search string: #1 AND #2 AND #3 AND (#4 OR #5) AND #6

Search strategy Embase (via Elsevier)

Concept #1 Clinical practice guideline

'practice guideline'/de OR 'clinical pathway'/exp OR 'clinical protocol'/exp OR 'nursing care plan'/exp OR 'nursing protocol'/exp OR (care NEAR/2 standard*):ti,ab,kw OR guidance:ti,ab,kw OR (clinical NEAR/2 guideline*):ti,ab,kw OR 'practice guideline*':ab,ti,kw OR 'clinical protocol*':ti,ab,kw OR 'treatment protocol*':ti,ab,kw OR 'critical path*':ti,ab,kw OR 'clinical path*':ti,ab,kw

Concept #2 main terms implementation

'implementation science'/exp OR 'dissemination'/exp OR implement*:ti,ab,kw OR disseminat*:ti,ab,kw

Concept #3 additional terms implementation

'protocol compliance'/exp OR uptake*:ti,ab,kw OR adopt*:ti,ab,kw OR adhere*:ti,ab,kw OR concord*:ti,ab,kw OR complian*:ti,ab,kw OR comply:ti,ab,kw OR non-adhere*:ti,ab,kw OR nonadhere*:ti,ab,kw OR non-concord*:ti,ab,kw OR nonconcord*:ti,ab,kw OR non-complian*:ti,ab,kw OR noncomplian*:ti,ab,kw OR accept*:ti,ab,kw OR conform*:ti,ab,kw OR approv*:ti,ab,kw OR distrib*:ti,ab,kw OR diffus*:ti,ab,kw OR integrat*:ti,ab,kw OR normali*:ti,ab,kw OR mainstream*:ti,ab,kw OR maintain*:ti,ab,kw OR sustain*:ti,ab,kw

Concept #4 barriers and facilitators

'barriers'/exp OR 'facilitator'/exp OR 'constraint'/exp OR barrier*:ti,ab,kw OR limit*:ti,ab,kw OR obstacle*:ti,ab,kw OR challeng*:ti,ab,kw OR constraint*:ti,ab,kw OR threat*:ti,ab,kw OR bottleneck*:ti,ab,kw OR driver*:ti,ab,kw OR moderat*:ti,ab,kw OR mediat*:ti,ab,kw OR modif*:ti,ab,kw OR facilitator*:ti,ab,kw OR impediment*:ti,ab,kw OR hinder*:ti,ab,kw OR enabler*:ti,ab,kw OR motivator*:ti,ab,kw

Concept #5 strategy

'mechanism'/exp OR 'strategy'/exp OR mechanism*:ti,ab,kw OR strateg*:ti,ab,kw OR determinant*:ti,ab,kw OR framework*:ti,ab,kw OR theor*:ti,ab,kw OR model*:ti,ab,kw OR factor*:ti,ab,kw

Concept #6 Evidence-based practice and knowledge translation

'evidence based practice'/exp OR 'translational research'/exp OR evidence-base*:ti,ab,kw OR evidencebase*:ti,ab,kw OR 'knowledge translation*':ti,ab,kw OR 'knowledge to action':ti,ab,kw OR 'knowledge transfer*':ti,ab,kw OR 'knowledge utilisation':ti,ab,kw OR 'knowledge utilization*':ti,ab,kw OR 'knowledge mobilisation':ti,ab,kw OR 'knowledge mobilization':ti,ab,kw OR 'research translation':ti,ab,kw OR 'research use*':ti,ab,kw OR 'research utilisation*':ti,ab,kw OR 'research utilization*':ti,ab,kw OR 'research mobilisation':ti,ab,kw OR 'research mobilization':ti,ab,kw OR 'knowledge exchange*':ti,ab,kw OR 'translational research':ti,ab,kw OR 'translational medical science*':ti,ab,kw OR 'translational medical research':ti,ab,kw OR evidence-practice:ti,ab,kw OR evidence-informed:ti,ab,kw OR evidenceinformed:ti,ab,kw

#1 AND #2 AND #3 AND (#4 OR #5) AND #6

&

Search strategy CINAHL (via Ebsco)

Concept #1 Clinical practice guideline

MH ("Protocols+" OR "Critical Path" OR "Nursing Protocols+" OR "Practice Guidelines") OR TI ((care N2 standard*) OR guidance OR (clinical N2 guideline*) OR practice guideline*" OR "clinical protocol*" OR "treatment protocol*" OR "critical path*" OR "clinical path*") OR AB ((care N2 standard*) OR guidance OR (clinical N2 guideline*) OR practice guideline*" OR "clinical protocol*" OR "treatment protocol*" OR "critical path*" OR "clinical path*")

Concept #2 main terms implementation

MH ("Implementation Science" OR "Diffusion of Innovation") OR TI (implement* OR disseminat*) OR AB (implement* OR disseminat*)

Concept #3 additional terms implementation

MH "Guideline Adherence" OR TI (uptake* OR adopt* OR adhere* OR concord* OR complian* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR non-complian* OR noncomplian* OR accept* OR conform* OR approv* OR distrib* OR diffus* OR integrat* OR normali* OR mainstream* OR maintain* OR sustain*) OR AB (uptake* OR adopt* OR adhere* OR concord* OR complian* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR non-complian* OR noncomplian* OR accept* OR conform* OR approv* OR distrib* OR diffus* OR integrat* OR normali* OR mainstream* OR maintain* OR sustain*)

Concept #4 barriers and facilitators

TI (barrier* OR limit* OR obstacle* OR challeng* OR constraint* OR threat* OR bottleneck* OR driver* OR moderat* OR mediat* OR modif* OR facilitator* OR impediment* OR

hinder* OR enabler* OR motivator*) OR AB (barrier* OR limit* OR obstacle* OR challeng* OR constraint* OR threat* OR bottleneck* OR driver* OR moderat* OR mediat* OR modif* OR facilitator* OR impediment* OR hinder* OR enabler* OR motivator*)

Concept #5 strategy

TI (mechanism* OR strateg* OR determinant* OR framework* OR theor* OR model* OR factor*) OR AB (mechanism* OR strateg* OR determinant* OR framework* OR theor* OR model* OR factor*)

Concept #6 Evidence-based practice and knowledge translation

MH ("Professional Practice, Evidence-Based+" OR "Nursing Practice, Evidence-Based+" OR "Professional Practice, Research-Based+") OR TI (evidence-base* OR evidencebase* OR "knowledge translation*" OR "knowledge to action" OR "knowledge transfer*" OR "knowledge utilisation" OR "knowledge utilization*" OR "knowledge mobilisation" OR "knowledge mobilization" OR "research translation" OR "research use*" OR "research utilisation*" OR "research utilization*" OR "research mobilisation" OR "research mobilization" OR "knowledge exchange*" OR "translational research" OR "translational medical science*" OR "translational medical research" OR evidence-practice OR evidence-informed OR evidenceinformed) OR AB (evidence-base* OR evidencebase* OR "knowledge translation*" OR "knowledge to action" OR "knowledge transfer*" OR "knowledge utilisation" OR "knowledge utilization*" OR "knowledge mobilisation" OR "knowledge mobilization" OR "research translation" OR "research use*" OR "research utilisation*" OR "research utilization*" OR "research mobilisation" OR "research mobilization" OR "knowledge exchange*" OR "translational research" OR "translational medical science*" OR "translational medical research" OR evidence-practice OR evidence-informed OR evidenceinformed)

#1 AND #2 AND #3 AND (#4 OR #5) AND #6

Results databases August 17th 2022

Database	**Results**
PubMed	3485
Embase.com	8427
CINAHL (Ebsco)	1380
Total	**13292**
After deduplication	**9287**

Definitive search history August 17th 2022 – update of July 10th 2020

PubMed search history August 17th 2022

Search	PubMed query August 17th 2022	Results
#7	#1 AND #2 AND #3 AND (#4 OR #5) AND #6	3,485
#6	"Evidence-Based Practice"[Mesh] OR "Translational Medical Research"[Mesh] OR evidence-base*[tiab] OR evidencebase*[tiab] OR evidence-practice[tiab] OR evidence-informed[tiab] OR evidenceinformed[tiab] OR "knowledge translation*"[tiab] OR "knowledge to action"[tiab] OR "knowledge transfer*"[tiab] OR "knowledge utilisation"[tiab] OR "knowledge utilization*"[tiab] OR "knowledge mobilisation"[tiab] OR "knowledge mobilization"[tiab] OR "research translation"[tiab] OR "research use*"[tiab] OR "research utilisation*"[tiab] OR "research utilization*"[tiab] OR "research mobilisation"[tiab] OR "research mobilization"[tiab] OR "knowledge exchange*"[tiab] OR "translational research"[tiab] OR "translational medical science*"[tiab] OR "translational medical research"[tiab]	240,098
#5	mechanism*[tiab] OR strateg*[tiab] OR determinant*[tiab] OR framework*[tiab] OR theor*[tiab] OR model*[tiab] OR factor*[tiab]	9,795,199
#4	barrier*[tiab] OR limit*[tiab] OR obstacle*[tiab] OR challeng*[tiab] OR constraint*[tiab] OR threat*[tiab] OR bottleneck*[tiab] OR driver*[tiab] OR moderat*[tiab] OR mediat*[tiab] OR modif*[tiab] OR facilitator*[tiab] OR impediment*[tiab] OR hinder*[tiab] OR enabler*[tiab] OR motivator*[tiab]	6,436,840
#3	"Guideline Adherence"[Mesh] OR uptake*[tiab] OR adopt*[tiab] OR adhere*[tiab] OR concord*[tiab] OR complian*[tiab] OR comply[tiab] OR non-adhere*[tiab] OR nonadhere*[tiab] OR non-concord*[tiab] OR nonconcord*[tiab] OR non-complian*[tiab] OR noncomplian*[tiab] OR accept*[tiab] OR conform*[tiab] OR approv*[tiab] OR distrib*[tiab] OR diffus*[tiab] OR integrat*[tiab] OR normali*[tiab] OR mainstream*[tiab] OR maintain*[tiab] OR sustain*[tiab]	5,176,323
#2	"Implementation Science"[Mesh] OR "Diffusion of Innovation"[Mesh] OR implement*[tiab] OR disseminat*[tiab]	786,279
#1	"Standard of Care"[Mesh] OR "Clinical Protocols"[Mesh] OR "Practice Guidelines as Topic"[Mesh] OR "Critical Pathways"[Mesh] OR "care standard*"[tiab] OR "standards of care"[tiab] OR "standard of care"[tiab] OR guidance[tiab] OR "clinical practice guideline*"[tiab] OR "practice guideline*"[tiab] OR "clinical protocol*"[tiab] OR "treatment protocol*"[tiab] OR "critical path*"[tiab] OR "clinical path*"[tiab]	563,326

Embase (Elsevier) search history August 17th 2022

Search	Embase.com Query August 17th 2022	Results
#8	#7 NOT ('conference abstract'/it OR 'conference review'/it)	8,427
#7	#1 AND #2 AND #3 AND (#4 OR #5) AND #6	11,326
#6	'evidence based practice'/exp OR 'translational research'/exp OR evidence-base*:ti,ab,kw OR evidencebase*:ti,ab,kw OR 'knowledge translation*':ti,ab,kw OR 'knowledge to action':ti,ab,kw OR 'knowledge transfer*':ti,ab,kw OR 'knowledge utilisation':ti,ab,kw OR 'knowledge utilization*':ti,ab,kw OR 'knowledge mobilisation':ti,ab,kw OR 'knowledge mobilization':ti,ab,kw OR 'research translation':ti,ab,kw OR 'research use*':ti,ab,kw OR 'research utilisation*':ti,ab,kw OR 'research utilization*':ti,ab,kw OR 'research mobilisation':ti,ab,kw OR 'research mobilization':ti,ab,kw OR 'knowledge exchange*':ti,ab,kw OR 'translational research':ti,ab,kw OR 'translational medical science*':ti,ab,kw OR 'translational medical research':ti,ab,kw OR evidence-practice:ti,ab,kw OR evidence-informed:ti,ab,kw OR evidenceinformed:ti,ab,kw	1,770,117
#5	'mechanism'/exp OR 'strategy'/exp OR mechanism*:ti,ab,kw OR strateg*:ti,ab,kw OR determinant*:ti,ab,kw OR framework*:ti,ab,kw OR theor*:ti,ab,kw OR model*:ti,ab,kw OR factor*:ti,ab,kw OR aspect*:ti,ab,kw OR element*:ti,ab,kw	12,961,448
#4	'barriers'/exp OR 'facilitator'/exp OR 'constraint'/exp OR barrier*:ti,ab,kw OR limit*:ti,ab,kw OR obstacle*:ti,ab,kw OR challeng*:ti,ab,kw OR constraint*:ti,ab,kw OR threat*:ti,ab,kw OR bottleneck*:ti,ab,kw OR driver*:ti,ab,kw OR moderat*:ti,ab,kw OR mediat*:ti,ab,kw OR modif*:ti,ab,kw OR facilitator*:ti,ab,kw OR impediment*:ti,ab,kw OR hinder*:ti,ab,kw OR enabler*:ti,ab,kw OR motivator*:ti,ab,kw	8,177,415
#3	'protocol compliance'/exp OR uptake*:ti,ab,kw OR adopt*:ti,ab,kw OR adhere*:ti,ab,kw OR concord*:ti,ab,kw OR complian*:ti,ab,kw OR comply:ti,ab,kw OR non-adhere*:ti,ab,kw OR nonadhere*:ti,ab,kw OR non-concord*:ti,ab,kw OR nonconcord*:ti,ab,kw OR non-complian*:ti,ab,kw OR noncomplian*:ti,ab,kw OR accept*:ti,ab,kw OR conform*:ti,ab,kw OR approv*:ti,ab,kw OR distrib*:ti,ab,kw OR diffus*:ti,ab,kw OR integrat*:ti,ab,kw OR normali*:ti,ab,kw OR mainstream*:ti,ab,kw OR maintain*:ti,ab,kw OR sustain*:ti,ab,kw	6,659,386
#2	'implementation science'/exp OR 'dissemination'/exp OR implement*:ti,ab,kw OR disseminat*:ti,ab,kw	1,002,243
#1	'practice guideline'/de OR 'clinical pathway'/exp OR 'clinical protocol'/exp OR 'nursing care plan'/exp OR 'nursing protocol'/exp OR (care NEAR/2 standard*):ti,ab,kw OR guidance:ti,ab,kw OR (clinical NEAR/2 guideline*):ti,ab,kw OR 'practice guideline*':ab,ti,kw OR 'clinical protocol*':ti,ab,kw OR 'treatment protocol*':ti,ab,kw OR 'critical path*':ti,ab,kw OR 'clinical path*':ti,ab,kw	997,458

CINAHL(Ebsco) search history August 17th 2022

Search	Cinahl (Ebsco) query August 17th 2022	Results
S7	S1 AND S2 AND S3 AND (S4 OR S5) AND S6	1,380
S6	MH ("Professional Practice, Evidence-Based+" OR "Nursing Practice, Evidence-Based+" OR "Professional Practice, Research-Based+") OR TI (evidence-base* OR evidencebase* OR "knowledge translation*" OR "knowledge to action" OR "knowledge transfer*" OR "knowledge utilisation" OR "knowledge utilization*" OR "knowledge mobilisation" OR "knowledge mobilization" OR "research translation" OR "research use*" OR "research utilisation*" OR "research utilization*" OR "research mobilisation" OR "research mobilization" OR "knowledge exchange*" OR "translational research" OR "translational medical science*" OR "translational medical research" OR evidence-practice OR evidence-informed OR evidenceinformed) OR AB (evidence-base* OR evidencebase* OR "knowledge translation*" OR "knowledge to action" OR "knowledge transfer*" OR "knowledge utilisation" OR "knowledge utilization*" OR "knowledge mobilisation" OR "knowledge mobilization" OR "research translation" OR "research use*" OR "research utilisation*" OR "research utilization*" OR "research mobilisation" OR "research mobilization" OR "knowledge exchange*" OR "translational research" OR "translational medical science*" OR "translational medical research" OR evidence-practice OR evidence-informed OR evidenceinformed)	157,006
S5	TI (mechanism* OR strateg* OR determinant* OR framework* OR theor* OR model* OR factor*) OR AB (mechanism* OR strateg* OR determinant* OR framework* OR theor* OR model* OR factor*)	1,729,752
S4	TI (barrier* OR limit* OR obstacle* OR challeng* OR constraint* OR threat* OR bottleneck* OR driver* OR moderat* OR mediat* OR modif* OR facilitator* OR impediment* OR hinder* OR enabler* OR motivator*) OR AB (barrier* OR limit* OR obstacle* OR challeng* OR constraint* OR threat* OR bottleneck* OR driver* OR moderat* OR mediat* OR modif* OR facilitator* OR impediment* OR hinder* OR enabler* OR motivator*)	1,171,678
S3	MH "Guideline Adherence" OR TI (uptake* OR adopt* OR adhere* OR concord* OR complian* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR non-complian* OR noncomplian* OR accept* OR conform* OR approv* OR distrib* OR diffus* OR integrat* OR normali* OR mainstream* OR maintain* OR sustain*) OR AB (uptake* OR adopt* OR adhere* OR concord* OR complian* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR non-complian* OR noncomplian* OR accept* OR conform* OR approv* OR distrib* OR diffus* OR integrat* OR normali* OR mainstream* OR maintain* OR sustain*)	914,344
S2	MH ("Implementation Science" OR "Diffusion of Innovation") OR TI (implement* OR disseminat*) OR AB (implement* OR disseminat*)	275,109

CINAHL(Ebsco) search history August 17th 2022 (continued)

Search	Cinahl (Ebsco) query August 17th 2022	Results
S1	MH ("Protocols+" OR "Critical Path" OR "Nursing Protocols+" OR "Practice Guidelines") OR TI ((care N2 standard*) OR guidance OR (clinical N2 guideline*) OR practice guideline*" OR "clinical protocol*" OR "treatment protocol*" OR "critical path*" OR "clinical path*") OR AB ((care N2 standard*) OR guidance OR (clinical N2 guideline*) OR practice guideline*" OR "clinical protocol*" OR "treatment protocol*" OR "critical path*" OR "clinical path*")	142,884

Eligibility criteria

&

Does the title or abstract indicate that the study is focused on **guideline(s)**?
- Guideline: documents intended to optimize patient care that include recommendations that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options.

Does the title or abstract indicate that the study is focused on **implementation** of the guideline?
- Include: dissemination, adoption, adherence, uptake, compliance, acceptance, approval, etc.

Does the title or abstract indicate that the paper is focused on the **approach**, **role, perspective or actions of central guideline organizations** regarding stimulating implementation?
- Guideline organization: non-profit umbrella organization (government, governmental agency, scientific/professional society) which (translates scientific evidence into new or renewed guidelines and) disseminates guidelines and initiates implementation.

Does the title or abstract indicate that the study is focused on guidelines for the **hospital setting**?
- Include: guidelines for (specialized) medical care given in hospitals.
- Include: secondary/tertiary healthcare setting | hospital inpatient, outpatient, emergency.
- Exclude: primary care, long-term care, revalidation and rehabilitation, psychological care, physiotherapy, dental care, etc.

Does the title or abstract indicate that it is a **primary study with empirical data or a review**?
- Include: studies with empirical data and reviews that conform to the other criteria and contain references to valuable studies with empirical data (snowballing effect).
- Exclude: i.a. editorial letters, conference abstracts and study protocols.

Does the title or abstract indicate that the study has been conducted in an **OECD country**?

Does the citation indicate publication **on or after 1992**?

Is the study published in any **language** understandable by the study team?
- Include: English, Dutch German, French, Spanish.

Is the full-text version of the article **available**?
- Unavailable: put in a request to the authors.

	Yes (continue screening)	Maybe/unsure (continue screening)	No (stop screening)	Reason for exclusion
				"No guideline"
				"No focus on implementation"
				"Implementation not from perspective of guideline organizations"
				"No hospital care"
				"No primary research"
				"No OECD country"
				"Wrong year"
				"Wrong language"
				"Full-text not available"

APPENDIX 3. SCORED QUALITY ASSESSMENTS MIXED METHODS APPRAISAL TOOL (MMAT), VERSION 2018

MMAT scored quality assessment

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Levy, 2010	3. Quantitative non-randomized studies	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1. Are the participants representative of the target population?			1
		3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?			1
		3.3. Are there complete outcome data?	1		
		3.4. Are the confounders accounted for in the design and analysis?	1		
		3.5. During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	2	0	3
Jain, 2006	2. Quantitative randomized controlled trial	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		2.1. Is randomization appropriately performed?	1		
		2.2. Are the groups comparable at baseline?	1		
		2.3. Are there complete outcome data?	1		
		2.4. Are outcome assessors blinded to the intervention provided?		1	
		2.5 Did the participants adhere to the assigned intervention?		1	
		Total items scored	3	2	0

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Cooney, 2004	3. Quantitative non-randomized studies	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?		1	
		3.3 Are there complete outcome data?		1	
		3.4 Are the confounders accounted for in the design and analysis?		1	
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	1	3	1
Eriksen, 2017	3. Quantitative non-randomized studies	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?	1		
		3.4 Are the confounders accounted for in the design and analysis?		1	
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?	1		
		Total items scored	4	1	0

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Kryworuchko, 2009	4. Quantitative descriptive study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		4.1 Is the sampling strategy relevant to address the research question?	1		
		4.2 Is the sample representative of the target population?	1		
		4.3 Are the measurements appropriate?			1
		4.4 Is the risk of nonresponse bias low?			1
		4.5 Is the statistical analysis appropriate to answer the research question?	1		
		Total items scored	3	0	2
Berenholtz, 2011	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?			1
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?			1
		3.3 Are there complete outcome data?	1		
		3.4 Are the confounders accounted for in the design and analysis?		1	
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	1	1	3

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Holroyd, 2004	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?	1		
		3.4 Are the confounders accounted for in the design and analysis?		1	
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	3	1	1
DePalo, 2010	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?	1		
		3.4 Are the confounders accounted for in the design and analysis?	1		
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	4	0	1

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Slattery, 2016	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?	1		
		3.4 Are the confounders accounted for in the design and analysis?	1		
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	4	0	1
Tabbers, 2010	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?			1
		3.3 Are there complete outcome data?		1	
		3.4 Are the confounders accounted for in the design and analysis?			1
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	1	1	3

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Burgers, 2003	4. Quantitative descriptive study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		4.1 Is the sampling strategy relevant to address the research question?	1		
		4.2 Is the sample representative of the target population?			1
		4.3 Are the measurements appropriate?	1		
		4.4 Is the risk of nonresponse bias low?	1		
		4.5 Is the statistical analysis appropriate to answer the research question?	1		
		Total items scored	4	0	1
Mehta, 2002	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?			1
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?			1
		3.4 Are the confounders accounted for in the design and analysis?		1	
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?		1	
		Total items scored	1	2	2

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Mehta, 2004	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?			1
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?			1
		3.4 Are the confounders accounted for in the design and analysis?			1
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	1	0	4
Gagliardi, 2012	1. Qualitative study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		1.1 Is the qualitative approach appropriate to answer the research question?	1		
		1.2 Are the qualitative data collection methods adequate to address the research question?	1		
		1.3 Are the findings adequately derived from the data?	1		
		1.4 Is the interpretation of results sufficiently substantiated by data?	1		
		1.5 Is there coherence between qualitative data sources, collection, analysis and interpretation?	1		
		Total items scored	5	0	0

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Morgan, 2013	1. Qualitative study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		1.1 Is the qualitative approach appropriate to answer the research question?	1		
		1.2 Are the qualitative data collection methods adequate to address the research question?	1		
		1.3 Are the findings adequately derived from the data?			1
		1.4 Is the interpretation of results sufficiently substantiated by data?	1		
		1.5 Is there coherence between qualitative data sources, collection, analysis and interpretation?	1		
		Total items scored	4	0	1
Palmer, 2018	1. Qualitative study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		1.1 Is the qualitative approach appropriate to answer the research question?	1		
		1.2 Are the qualitative data collection methods adequate to address the research question?	1		
		1.3 Are the findings adequately derived from the data?	1		
		1.4 Is the interpretation of results sufficiently substantiated by data?	1		
		1.5 Is there coherence between qualitative data sources, collection, analysis and interpretation?	1		

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
		Total items scored	5	0	0
Higuchi, 2013	1. Qualitative study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		1.1 Is the qualitative approach appropriate to answer the research question?	1		
		1.2 Are the qualitative data collection methods adequate to address the research question?	1		
		1.3 Are the findings adequately derived from the data?	1		
		1.4 Is the interpretation of results sufficiently substantiated by data?		1	
		1.5 Is there coherence between qualitative data sources, collection, analysis and interpretation?	1		
		Total items scored	4	1	0
Davies, 2008	5. Mixed methods study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		5.1 Is there an adequate rationale for using a mixed methods design to address the research question?	1		
		5.2 Are the different components of the study effectively integrated to answer the research question?	1		
		5.3 Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	1		
		5.4 Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	1		

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
		5.5 Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?		1	
		Total items scored	4	1	0
Urquhart, 2018	5. Mixed methods study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		5.1 Is there an adequate rationale for using a mixed methods design to address the research question?	1		
		5.2 Are the different components of the study effectively integrated to answer the research question?	1		
		5.3 Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	1		
		5.4 Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	1		
		5.5 Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	1		
		Total items scored	5	0	0
Gupta, 2021	5. Mixed methods study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		5.1 Is there an adequate rationale for using a mixed methods design to address the research question?	1		

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
		5.2 Are the different components of the study effectively integrated to answer the research question?	1		
		5.3 Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	1		
		5.4 Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	1		
		5.5 Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	1		
		Total items scored	5	0	0
Hayes, 2002	2. Quantitative randomized controlled trial	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		2.1. Is randomization appropriately performed?			1
		2.2. Are the groups comparable at baseline?	1		
		2.3. Are there complete outcome data?	1		
		2.4. Are outcome assessors blinded to the intervention provided?			1
		2.5 Did the participants adhere to the assigned intervention?			1
		Total items scored	2	0	3
Eagle, 2005	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?			1
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?			1
		3.4 Are the confounders accounted for in the design and analysis?	1		
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	2	0	3
Narayanaswami, 2015	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?			1
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?		1	
		3.3 Are there complete outcome data?			1
		3.4 Are the confounders accounted for in the design and analysis?		1	
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	0	2	3

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
Verkerk, 2022	5. Mixed methods study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		5.1 Is there an adequate rationale for using a mixed methods design to address the research question?	1		
		5.2 Are the different components of the study effectively integrated to answer the research question?		1	
		5.3 Are the outputs of the integration of qualitative and quantitative components adequately interpreted?		1	
		5.4 Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?		1	
		5.5 Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?			1
		Total items scored	1	3	1
Bhushan, 2016	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?			1
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?			1
		3.3 Are there complete outcome data?		1	
		3.4 Are the confounders accounted for in the design and analysis?			1

MMAT scored quality assessment (continued)

First author, year	Category of study design	Methodological quality criteria	Responses		
			Yes	No	Can't tell
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?			1
		Total items scored	0	1	4
McLaws, 2009	3. Quantitative non-randomized study	S1: Are there clear research questions?	X		
		S2: Do the collected data allow to address the research question?	X		
		3.1 Are the participants representative of the target population?	1		
		3.2 Are the measurements appropriate regarding both the outcome and intervention (or exposure)?	1		
		3.3 Are there complete outcome data?	1		
		3.4 Are the confounders accounted for in the design and analysis?			1
		3.5 During the study period, is the intervention administered (or exposure occurred) as intended?	1		
		Total items scored	4	0	1

Abbreviation: S1=screening question 1, S2=screening question 2

APPENDIX 4. IMPLEMENTATION STRATEGIES USED IN INCLUDED STUDIES

Implementation strategies used in included studies

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
1. Professional			
Distribute guideline materials	Mass mailing (electronic)	Gagliardi (2012) [3], Jain et al. (2006) [4], Hayes et al. (2002) [5], Slattery et al. (2015) [6], Kryworuchko et al. (2009) [7], Urquhart et al. (2019) [8], Narayanaswami et al. (2015) [9]	7 (26.9%)
	Mass mailing (hard-copy)	Gagliardi (2012) [3], Hayes et al. (2002) [5], Cooney et al. (2004) [10], Holroyd et al. (2004) [11], Tabbers et al. (2010) [12], Kryworuchko et al. (2009) [7], Urquhart et al. (2019) [8], Bhushan et al. (2016) [13]	8 (30.8%)
	App with guideline content	Gupta et al. (2021) [14]	1 (3.8%)
Advertise guideline materials	Posters summarizing guideline	Jain et al. (2006) [4], Levy et al. (2010) [15], Holroyd et al. (2004) [11], Mehta et al. (2002) [16], McLaws et al. (2009) [17], Verkerk et al. (2022) [18]	6 (23.1%)
	Pocket cards summarizing guideline	Jain et al. (2006) [4], Levy et al. (2010) [15], Eriksen et al. (2017) [19], Holroyd et al. (2004) [11], Tabbers et al. (2010) [12], Mehta et al. (2002) [16], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Bhushan et al. (2016) [13], Verkerk et al. (2022) [18]	10 (38.5%)
	Publish in journal	Gagliardi (2012) [3], Morgan et al. (2013) [22], Cooney et al. (2004) [10], Kryworuchko et al. (2009) [7], McLaws et al. (2009) [17], Narayanaswami et al. (2015) [9]	6 (23.1%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
	Publish in newsletter	Gagliardi (2012) [3], Hayes et al. (2002) [5], Levy et al. (2010) [15], Holroyd et al. (2004) [11], Slattery et al. (2015) [6], Tabbers et al. (2010) [12], Kryworuchko et al. (2009) [7], McLaws et al. (2009) [17]	8 (30.8%)
	Website publication(s)	Gagliardi (2012) [3], Higuchi et al. (2013) [23], Jain et al. (2006) [4], Levy et al. (2010) [15], Eriksen et al. (2017) [19], Berenholtz et al. (2011) [24], Holroyd et al. (2004) [11], Slattery et al. (2015) [6], Tabbers et al. (2010) [12], Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25], Urquhart et al. (2019) [8], McLaws et al. (2009) [17], Narayanaswami et al. (2015) [9]	14 (53.8%)
	Submit guideline to guideline clearinghouse (e.g. Guidelines International Network, Guideline Clearinghouse)	Gagliardi (2012) [3], Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25]	3 (11.5%)
	Media release to medical press	Gagliardi (2012) [3], Narayanaswami et al. (2015) [9]	2 (7.7%)
	Postcards, brochures, letters, flyers, t-shirts, badges, balloons	Eriksen et al. (2017) [19], McLaws et al. (2009) [17]	2 (7.7%)
	Social marketing: strong 'brand' name and values, unique selling point, recognizable lay-out	Eriksen et al. (2017) [19], McLaws et al. (2009) [17]	2 (7.7%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
	Social media advertisement: podcast, YouTube videos, Facebook, Twitter, LinkedIn	Narayanaswami et al. (2015) [9]	1 (3.8%)
	Mass media campaign	Gagliardi (2012) [3], Kryworuchko et al. (2009) [7], McLaws et al. (2009) [17]	3 (11.5%)
Present guideline materials at meetings	Conference presentation	Gagliardi (2012) [3], Morgan et al. (2013) [22], Burgers et al. (2003) [25], Verkerk et al. (2022) [18]	4 (15.4%)
	Presentation (national/regional/hospital)	Gagliardi (2012) [3], Morgan et al. (2013) [22], Hayes et al. (2002) [5], Cooney et al. (2004) [10], Eriksen et al. (2017) [19], Slattery et al. (2015) [6], Tabbers et al. (2010) [12], Mehta et al. (2002) [16], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Davies et al. (2008) [26], Urquhart et al. (2019) [8]	12 (46.2%)
Educate individuals about guideline intent/benefits	Academic detailing	Gagliardi (2012) [3], Berenholtz et al. (2011) [24], Holroyd et al. (2004) [11], Tabbers et al. (2010) [12], Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25], Verkerk et al. (2022) [18]	7 (26.9%)
Educate groups about guideline intent/benefits	Educational session(s)	Gagliardi (2012) [3], Levy et al. (2010) [15], Cooney et al. (2004) [10], Eriksen et al. (2017) [19], Berenholtz et al. (2011) [24], DePalo et al. (2010) [27], Holroyd et al. (2004) [11], Tabbers et al. (2010) [12], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Kryworuchko et al. (2009) [7], Davies et al. (2008) [26], Urquhart et al. (2019) [8], Gupta et al. (2021) [14], Bhushan et al. (2016) [13], Verkerk et al. (2022) [18]	16 (61.5%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
	Online course	Gagliardi (2012) [3]	1 (3.8%)
	(Online) education material	Levy et al. (2010) [15], Berenholtz et al. (2011) [24], Burgers et al. (2003) [25], Davies et al. (2008) [26], Gupta et al. (2021) [14]	5 (19.2%)
Use train-the-trainer strategies	Train designated healthcare professionals to train others in implementation of guideline	Jain et al. (2006) [4], Slattery et al. (2015) [6]	2 (7.7%)
Work with educational institutions	Work with educational institutions to train healthcare professionals	Gagliardi (2012) [3], Tabbers et al. (2010) [12]	2 (7.7%)
Provide reminders to individuals/groups about intent/benefits	Guideline reminder system	Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25]	2 (7.7%)
Provide feedback on guideline compliance and information	Support performance monitoring, evaluation and feedback mechanisms	Higuchi et al. (2013) [23], Berenholtz et al. (2011) [24], Holroyd et al. (2004) [11], Slattery et al. (2015) [6], Burgers et al. (2003) [25], McLaws et al. (2009) [17], Verkerk et al. (2022) [18]	7 (26.9%)
Provide feedback about patient outcomes	Support performance monitoring, evaluation and feedback mechanisms	Higuchi et al. (2013) [23], Jain et al. (2006) [4], Berenholtz et al. (2011) [24], DePalo et al. (2010) [27]	4 (15.4%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
Provide feedback on organization outcomes	Support performance monitoring, evaluation and feedback mechanisms	Higuchi et al. (2013) [23], Hayes et al. (2002) [5], Berenholtz et al. (2011) [24], Mehta et al. (2002) [16], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Gupta et al. (2021) [14]	7 (26.9%)
Provide feedback on health system/ national outcomes	Support performance monitoring, evaluation and feedback mechanisms	Higuchi et al. (2013) [23], Hayes et al. (2002) [5]	2 (7.7%)
Provide feedback from patients	Patient mediated interventions	Burgers et al. (2003) [25]	1 (3.8%)
Enable self-audit (training, material)	Suggest indicators, provide feedback data	Palmer et al. (2018) [28], Jain et al. (2006) [4], Berenholtz et al. (2011) [24], Slattery et al. (2015) [6], Kryworuchko et al. (2009) [7]	5 (19.2%)
	Provide database for data collection, transfer, audit and feedback	Levy et al. (2010) [15]	1 (3.8%)
Recruit champions	Recruit champions who recommend, support and stimulate implementation	Gagliardi (2012) [3], Jain et al. (2006) [4], Hayes et al. (2002) [5], Levy et al. (2010) [15], DePalo et al. (2010) [27], Mehta et al. (2004) [20], Eagle et al. (2005) [21], McLaws et al. (2009) [17], Verkerk et al. (2022) [18]	9 (34.6%)
	Create a network of champions (peer learning)	Gagliardi (2012) [3], Higuchi et al. (2013) [23], Levy et al. (2010) [15], Mehta et al. (2004) [20], Gupta et al. (2021) [14]	5 (19.2%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
Recruit an opinion leader	Recruit opinion leader who recommends and stimulates implementation	Eriksen et al. (2017) [19], Holroyd et al. (2004) [11], Mehta et al. (2002) [16], Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25]	5 (19.2%)
	Create a network of opinion leaders to encourage support	Mehta et al. (2002) [16]	1 (3.8%)
Provide additional implementation supporting materials	Implementation toolkit, data analytics tools, standardized clinical order sets, clinical decision support tools, implementation leadership training kit, guideline factsheet/summary, sample quality improvement plan, sample chart reminder system, care delivery tools, clinical pathway, patient discharge form, chart stickers, guideline reference material	Palmer et al. (2018) [28], Higuchi et al. (2013) [23], Jain et al. (2006) [4], Hayes et al. (2002) [5], Levy et al. (2010) [15], Berenholtz et al. (2011) [24], Slattery et al. (2015) [6], Mehta et al. (2002) [16], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25], Davies et al. (2008) [26], Gupta et al. (2021) [14] Narayanaswami et al. (2015) [9]	15 (57.7%)
Provide education/ support about implementation	Workshop about implementation strategies	Higuchi et al. (2013) [23], Hayes et al. (2002) [5], Levy et al. (2010) [15]	3 (11.5%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
	Coaching and consultation about implementation	Higuchi et al. (2013) [23], Jain et al. (2006) [4], Hayes et al. (2002) [5], Levy et al. (2010) [15], Berenholtz et al. (2011) [24], Slattery et al. (2015) [6], Mehta et al. (2004) [20], Davies et al. (2008) [26], Gupta et al. (2021) [14]	9 (34.6%)
Work on preconditions for implementation	Workshop on improved safety culture, communication, teamwork	Berenholtz et al. (2011) [24]	1 (3.8%)
2. Patient/consumer			
Education (single or group)	Patient e-learning	Verkerk et al. (2022) [18]	1 (3.8%)
	Patient version of guideline/patient information form	Mehta et al. (2002) [16], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Kryworuchko et al. (2009) [7], Burgers et al. (2003) [25], McLaws et al. (2009) [17], Narayanaswami et al. (2015) [9], Verkerk et al. (2022) [18]	8 (30.8%)
3. Financial			
3.1 Health professional			
Incentive (group or institutional financial reward or benefit)	Hospital or a group of healthcare professionals may receive a financial reward/benefit for compliance	Higuchi et al. (2013) [23], Berenholtz et al. (2011) [24], DePalo et al. (2010) [27], Burgers et al. (2003) [25], Hayes et al. (2002) [5], Mehta et al. (2002) [16], McLaws et al. (2009) [17]	7 (26.9%)
Penalty (group/ institution, for non-compliance)	Financial disincentive	Burgers et al. (2003) [25]	1 (3.8%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
Change in reimbursement (add/remove/substitute)	Hospital funding reform – set price per episode of care	Palmer et al. (2018) [28]	1 (3.8%)
	Drug is placed on formulary	Eriksen et al. (2017) [19]	1 (3.8%)
4. Organizational			
4.1 Health professional			
Creation of an implementation team	Recruit local implementation team	Hayes et al. (2002) [5], Berenholtz et al. (2011) [24], DePalo et al. (2010) [27], Mehta et al. (2002) [16], Mehta et al. (2004) [20], Eagle et al. (2005) [21], Gupta et al. (2021) [14], McLaws et al. (2009) [17]	8 (30.8%)
Communication between distant healthcare professionals	Tools/meetings to allow teams to collaborate across sites (ask questions, share tools/protocols/experiences/best practices)	Levy et al. (2010) [15], DePalo et al. (2010) [27], Davies et al. (2008) [26]	3 (11.5%)
4.2 Patient			
Consumer participation in governance	Encourage patient to question healthcare professionals to comply to guideline	McLaws et al. (2009) [17]	1 (3.8%)
4.3 Structural changes			
Physical structure, facilities or equipment	Change in structure of medical records, ordering system	Verkerk et al. (2022) [18]	1 (3.8%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
Leadership engagement	Inform and/or actively involve management in implementation	Berenholtz et al. (2011) [24], DePalo et al. (2010) [27], Slattery et al. (2015) [6], Eagle et al. (2005) [21], Davies et al. (2008) [26], McLaws et al. (2009) [17]	6 (23.1%)
Provide guidance on structural changes	Provide sequential approach to the requirements within the organization for successful implementation	Palmer et al. (2018) [28], Mehta et al. (2002) [16]	2 (7.7%)
Request commitment of organization	Request commitment statement of management	Berenholtz et al. (2011) [24], DePalo et al. (2010) [27]	2 (7.7%)
Request organization to submit improvement plan	Request an improvement plan from local implementation team/management	Higuchi et al. (2013) [23], Jain et al. (2006) [4], Hayes et al. (2002) [5], Mehta et al. (2002) [16], Eagle et al. (2005) [21], Davies et al. (2008) [26]	6 (23.1%)
Provide/request revised/new protocol	Provide or request a guideline-conform protocol	Jain et al. (2006) [4], Hayes et al. (2002) [5], Levy et al. (2010) [15], Berenholtz et al. (2011) [24], Davies et al. (2008) [26]	5 (19.2%)
5. Regulatory			
Change Legislation or regulation (which enforces or mandates)	Act mandates that hospitals should promote care that is based upon guidelines and incorporate guidelines into decision-making processes	Higuchi et al. (2013) [23]	1 (3.8%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
Change in licensing, credentialing or accreditation	Assign accreditation of excellence to organization	Gagliardi (2012) [3]	1 (3.8%)
	Assign best practice organization (competitive application)	Higuchi et al. (2013) [23], Davies et al. (2008) [26]	2 (7.7%)
	Integration of guideline into recertification or licensing examinations	Kryworuchko et al. (2009) [7]	1 (3.8%)
6. Central			
Use of evidence-based guideline development process	Use of tools to enhance quality of the guideline	Levy et al. (2010) [15], Tabbers et al. (2010) [12], Burgers et al. (2003) [25], Urquhart et al. (2019) [8]	4 (15.4%)
Guideline pilot testing	Test guideline in small population first	Jain et al. (2006) [4], Burgers et al. (2003) [25]	2 (7.7%)
Create an alliance	Create a multidisciplinary alliance of experts from national professional societies, health authorities, etc. to support implementation	Morgan et al. (2013) [22], Tabbers et al. (2010) [12], Narayanaswami et al. (2015) [9]	3 (11.5%)

Implementation strategies used in included studies (continued)

Categories of implementation strategies (classified by Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2])	Implementation strategy (details)	References	Total studies (n, %)
Advocacy to influence political beliefs	Lobby in favor of guideline implementation	Gagliardi (2012) [3]	1 (3.8%)
Expanded programs through Ministry of Health	Expand recommendations to other health programs	Gagliardi (2012) [3]	1 (3.8%)

Strategies are classified according to the 'taxonomy of strategies for achieving guideline implementation and compliance' of Mazza et al. (2013) [1], expanded by Gagliardi and Alhabib (2015) [2]. Definitions for/examples of the strategies are presented in the additional file of Mazza et al. (2013) [1]. Italicized items emerged from this study and were originally not included in the Mazza et al. (2013) [1] taxonomy.

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APPENDIX 5. IMPLEMENTATION BARRIERS REPORTED IN INCLUDED STUDIES

Implementation barriers reported in included studies

Category (classified by CFIR)	Barrier
Intervention characteristics	
Evidence Strength & Quality	Perceptions of the quality and validity of evidence supporting the belief that the intervention will have desired outcomes
Relative Advantage	Conflicts between different guidelines/protocols on same topic undermine credibility, encourage subjective decision-making and impede acceptance of the guidelines
Adaptability	Difficulties in modifying/integrating content into local context
Complexity	Medically complex guidelines with a high degree of clinical uncertainty required more sophisticated and clinically nuanced adoption supports to initiate
Design Quality & Packaging	Guideline too extensive to reference, memorize and use in practice
	Unclear accessibility of guideline
	Patient information too difficult to understand
Cost	Lack of funding for implementation
	Lack of funding for recommended changes
	High costs for implementation strategies versus unclear efficacy
	Fear of reduced revenue
Outer setting	
Patient Needs & Resources	Expectations/preferences of patient (environment) challenge implementation
	Patients refuse care
	Additional costs for patients
	Patient motivation
Governance	Guideline conflicts with ideological beliefs of government
	Guideline in conflict with political agenda

	References	Total studies (n, %)
	Morgan et al. (2013) [1], Urquhart et al. (2019) [2], Verkerk et al. (2022) [3]	3 (11.5%)
	Morgan et al. (2013) [1], Tabbers et al. (2010) [4], Verkerk et al. (2022) [3]	3 (11.5%)
	Gupta et al. (2021) [5]	1 (3.8%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Morgan et al. (2013) [1], Tabbers et al. (2010) [4]	2 (7.7%)
	Tabbers et al. (2010) [4]	1 (3.8%)
	Verkerk et al. (2022) [3]	1 (3.8%)
	Gagliardi (2012) [7], Palmer et al. (2018) [6], Urquhart et al. (2019) [2]	3 (11.5%)
	Morgan et al. (2013) [1]	1 (3.8%)
	Jain et al. (2006) [8]	1 (3.8%)
	Verkerk et al. (2022) [3]	1 (3.8%)
	Verkerk et al. (2022) [3]	1 (3.8%)
	Slattery et al. (2015) [9], Davies et al. (2008) [10]	2 (7.7%)
	Davies et al. (2008) [10]	1 (3.8%)
	Davies et al. (2008) [10]	1 (3.8%)
	Morgan et al. (2013) [1]	1 (3.8%)
	Morgan et al. (2013) [1]	1 (3.8%)

Implementation barriers reported in included studies (continued)

Category (classified by CFIR)	Barrier
Commercial interests	Lobbying of commercial parties in government against guideline implementation
	Guideline implementation leads to loss of revenue accruing from taxes
	Opposite priorities/marketing pressure of pharmaceutical industry
Inner setting	
Structural Characteristics	Hard to reach all staff at hospitals
	Conflict between new physical infrastructure and existing structures
Networks & Communications	No implementation strategies to facilitate collaboration among healthcare professionals, and between healthcare professionals and the broader clinical care teams, in applying guidelines
	Territorial issues about tasks between various types of healthcare professionals
	Lack of support from department/colleagues (administration)
Culture	Culture of organization not open towards ensuring implementation
Implementation Climate	Implementation supports provided were identical and did not address differences in hospitals' highly variable capacity to manage change
Tension for Change	Timing of project/lost momentum
Compatibility	Practice setting was not preconditioned to change
	Low-value care was convenient and highly accessible
	Inadequate information technology infrastructure impeded implementation and monitoring
Relative Priority	Organizations focus more on containing the costs of care than on improving adherence to the guideline, potentially undermining the guideline intent (policy drift)
	Practice pressure from overcrowding
	Competing priorities/competitive demands
Leadership Engagement	More resources and less barriers if leaders were more structurally engaged
	Lack of management support

	References	Total studies (n, %)
	Morgan et al. (2013) [1]	1 (3.8%)
	Morgan et al. (2013) [1]	1 (3.8%)
	Morgan et al. (2013) [1], Eriksen et al. (2017) [11]	2 (7.7%)
	Berenholtz et al. (2011) [12] Mehta et al. (2004) [13], Verkerk et al. (2022) [3]	3 (11.5%)
	McLaws et al. (2009) [14]	1 (3.8%)
	Palmer et al. (2018) [6], Verkerk et al. (2022) [3]	2 (7.7%)
	Mehta et al. (2002) [15]	1 (3.8%)
	Davies et al. (2008) [10], Urquhart et al. (2019) [2], Gupta et al. (2021) [5]	3 (11.5%)
	Urquhart et al. (2019) [2]	1 (3.8%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Davies et al. (2008) [10]	1 (3.8%)
	Holroyd et al. (2004) [16]	1 (3.8%)
	Verkerk et al. (2022) [3]	1 (3.8%)
	Urquhart et al. (2019) [2]	1 (3.8%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Holroyd et al. (2004) [16]	1 (3.8%)
	Mehta et al. (2002) [15], Davies et al. (2008) [10]	2 (7.7%)
	Berenholtz et al. (2011) [12]	1 (3.8%)
	Davies et al. (2008) [10], Urquhart et al. (2019) [2], Gupta et al. (2021) [5]	3 (11.5%)

Implementation barriers reported in included studies (continued)

Category (classified by CFIR)	Barrier
Available Resources	Insufficient healthcare professionals' time and resources
Characteristics of individuals	
Knowledge & Beliefs about the guideline	Fear of litigation
	Fear of patient harm
	Fear of harm to healthcare professionals' health
	Fear of going against patients' expectations/wishes
	Lack of belief in effectiveness of guideline
	Uncertain applicability of evidence to patient subpopulation
	Lack of detailed knowledge about guideline
	Frightening stories and incorrect information against guideline on the internet
Self-efficacy	Healthcare professional's lack of confidence/skill to execute guideline
Other Personal Attributes	Guideline fatigue
	Continuous guideline updating frustration
	Old habits and routines
	Staff's resistance to using components of implementation supporting material
	Staff's refusal to do 'cookbook medicine'
	Staff's resistance and lack of buy-in
Process	
Planning	Mismatch between the guideline organizations' developed adoption supports and the needs of hospitals due to insufficient stakeholder input
	Hospital finance administrators lacked adoption supports aimed at informing financial operations
	No barriers or facilitators identified that might influence adoption

	References	Total studies (n, %)
	Hayes et al. (2002) [17], Mehta et al. (2002) [15], Eagle et al. (2005) [18], Davies et al. (2008) [10], Urquhart et al. (2019) [2], Verkerk et al. (2022) [3]	6 (23.1%)
	Holroyd et al. (2004) [16]	1 (3.8%)
	Tabbers et al. (2010) [4], Verkerk et al. (2022) [3]	2 (7.7%)
	McLaws et al. (2009) [14]	1 (3.8%)
	Verkerk et al. (2022) [3], Holroyd et al. (2004) [16]	2 (7.7%)
	Slattery et al. (2015) [9], Davies et al. (2008) [10], McLaws et al. (2009) [14], Verkerk et al. (2022) [3]	4 (15.4%)
	Tabbers et al. (2010) [4], Verkerk et al. (2022) [3]	2 (7.7%)
	Tabbers et al. (2010) [4], Eagle et al. (2005) [18], Verkerk et al. (2022) [3]	3 (11.5%)
	Verkerk et al. (2022) [3]	1 (3.8%)
	Slattery et al. (2015) [9], Davies et al. (2008) [10], Verkerk et al. (2022) [3]	3 (11.5%)
	Morgan et al. (2013) [1]	1 (3.8%)
	Morgan et al. (2013) [1]	1 (3.8%)
	Holroyd et al. (2004) [16], Tabbers et al. (2010) [4], Verkerk et al. (2022) [3]	3 (11.5%)
	Mehta et al. (2002) [15], Mehta et al. (2004) [13], Eagle et al. (2005) [18], Verkerk et al. (2022) [3]	4 (15.4%)
	Eagle et al. (2005) [18]	1 (3.8%)
	Eagle et al. (2005) [18], Davies et al. (2008) [10], McLaws et al. (2009) [14], Verkerk et al. (2022) [3]	4 (15.4%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Urquhart et al. (2019) [2]	1 (3.8%)

Implementation barriers reported in included studies (continued)

Category (classified by CFIR)	Barrier
	Guideline organizations allowed insufficient time for guideline implementation, organizational change and individual healthcare professional adherence to occur
	Late provision of implementation supports to hospitals
Engaging	Implementation supports were not implemented due to lack of stakeholder buy-in
Opinion Leaders	Conflicting recommendations of opinion leaders
	Resistance to consultation from external opinion leaders
Formally Appointed Internal Implementation Leaders	Lack of skilled implementation staff
	Changes in appointed hospital implementation staff
Champions	No process to mobilize and support physician leaders and promote them as champions
	Less suitable champions chosen as they were not nominated by local peers, they left the job or did not work closely with end users
Executing	Lack of knowledge because not all staff attended education sessions
	Guideline organization's limited understanding of guideline implementation
	Competing demands of guideline organizations
	Lack of coordination
Reflecting & Evaluating	Indicators are lacking to enable comprehensive and ongoing evaluation of the scale of guideline adoption, the degree to which clinicians adhered to guideline, or the effect on patient outcomes.
	Healthcare professionals' disagreement with/skepticism about disseminated hospital-specific feedback
	Difficulty obtaining valid measures for monitoring/feedback
	Data collection for feedback is time-consuming

Barriers are classified according to CFIR [19]. Definitions for/examples of the CFIR concepts are presented in the additional files of Damschroder et al. (2009) [19]. Italicized items emerged from this study and were originally not included in CFIR. Eighteen studies (69.2%) reported in total 73 implementation barriers. Studies that did not report implementation barriers (8, 30.8%): Higuchi et al. (2013) [20], Levy et al. (2010) [21], Cooney et al. (2004) [22], Eriksen et al. (2017) [11], DePalo et al. (2010) [23], Kryworuchko et al. (2009) [24], Burgers et al. (2003) [25], Narayanaswami et al. (2015) [26].

	References	Total studies (n, %)
	Hayes et al. (2002) [17], Mehta et al. (2002) [15]	2 (7.7%)
	Palmer et al. (2018) [6], Mehta et al. (2004) [13], Eagle et al. (2005) [18]	3 (11.5%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Tabbers et al. (2010) [4]	1 (3.8%)
	Mehta et al. (2002) [15]	1 (3.8%)
	Gagliardi (2012) [7], Eagle et al. (2005) [18],	2 (7.7%)
	Hayes et al. (2002) [17], Mehta et al. (2002) [15], Davies et al. (2008) [10], McLaws et al. (2009) [14]	4 (15.4%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Jain et al. (2006) [8], Verkerk et al. (2022) [3], Davies et al. (2008) [10]	3 (11.5%)
	Eagle et al. (2005) [18],	1 (3.8%)
	Urquhart et al. (2019) [2]	1 (3.8%)
	Urquhart et al. (2019) [2]	1 (3.8%)
	Verkerk et al. (2022) [3]	1 (3.8%)
	Palmer et al. (2018) [6]	1 (3.8%)
	Hayes et al. (2002) [17], Verkerk et al. (2022) [3]	2 (7.7%)
	Mehta et al. (2004) [13], Verkerk et al. (2022) [3]	2 (7.7%)
	Verkerk et al. (2022) [3]	1 (3.8%)

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APPENDIX 6. IMPLEMENTATION FACILITATORS REPORTED IN INCLUDED STUDIES

Implementation facilitators reported in included studies

Category (classified by CFIR)	Facilitator
Intervention characteristics	
Intervention Source	Guideline development process involved respected organizations, experts and/or healthcare professionals
Evidence Strength & Quality	Guideline's (perceived) credibility, evidence base and relevance to practice
Complexity	Limited number of recommendations makes it more feasible to stay up to date
Design Quality & Packaging	Transparent development process
	Strict criteria for handling potential conflicts of interests
	Accessibility of guideline
Outer setting	
External Policy & Incentives	Insurer supports and gives incentives for guideline implementation
Inner setting	
Structural Characteristics	Using already existing meeting structures to maximize attendance.
Networks & Communications	Efforts to improve culture, communication and teamwork
	Healthcare professionals' willingness to work together
	Advantage of trust and relationships build in prior quality improvement initiatives
	Involvement of multiple stakeholders
	Teamwork and collaboration
	Learning collaborative of local implementation leaders
	Distinct improvement teams were in it together
	Strong infrastructure of collaborative external organizations to support guideline implementation

	References	Total studies (n, %)
	Eriksen et al. (2017) [1], Gupta et al. (2021) [2]	2 (7.7%)
	Morgan et al. (2013) [3], Berenholtz et al. (2011) [4], Holroyd et al. (2004) [5], Tabbers et al. (2010) [6], Verkerk et al. (2022) [7]	5 (19.2%)
	Eriksen et al. (2017) [1]	1 (3.8%)
	Eriksen et al. (2017) [1]	1 (3.8%)
	Eriksen et al. (2017) [1]	1 (3.8%)
	Tabbers et al. (2010) [6]	1 (3.8%)
	Berenholtz et al. (2011) [4]	1 (3.8%)
	Eagle et al. (2005) [8]	1 (3.8%)
	Berenholtz et al. (2011) [4]	1 (3.8%)
	Eagle et al. (2005) [8]	1 (3.8%)
	Mehta et al. (2002) [9]	1 (3.8%)
	Davies et al. (2008) [10], Verkerk et al. (2022) [7]	2 (7.7%)
	Davies et al. (2008) [10], Gupta et al. (2021) [2]	2 (7.7%)
	Gupta et al. (2021) [2]	1 (3.8%)
	Berenholtz et al. (2011) [4]	1 (3.8%)
	DePalo et al. (2010) [11]	1 (3.8%)

Implementation facilitators reported in included studies (continued)

Category (classified by CFIR)	Facilitator
Implementation Climate	Hospital's internal readiness for change – attitudes, beliefs and intentions regarding change
	Hospital's change management capacity – structures and resources needed to implement and sustain a change (improvement committees, internal data analytics, decision support systems, case costing systems)
Compatibility	Flexibility in customizing implementation toolkit to fit their situation
Readiness for Implementation	Organizational readiness
Leadership Engagement	Engagement of hospital CEOs, managers and administration increases resources and support for implementation
Available Resources	Staff replacement time to attend educational sessions
	Availability of medical supplies to comply to guidelines
Access to Knowledge & Information	Developed toolkit reminded of guideline goals
Characteristics of individuals	
Knowledge & Beliefs about the Intervention	Knowledge of potential harm, benefit and costs
Process	
Planning	Targeting implementation strategies to identified barriers
Engaging	Healthcare professional interaction and development multidisciplinary teams
	Collaborative and motivated implementation team
	Community stakeholder involvement
	Healthcare professional implementation leadership
Opinion Leaders	Opinion leaders assisted in identifying barriers and implementation
	Recruiting opinion leaders for developing and implementing guideline gives healthcare professionals sense of ownership
	Opinion leaders' external visibility (local, national)
Champions	Identifying the stage of behavior change of their colleagues and promoting a quality improvement action plan that would be the most effective, given their colleagues' stage of change.

	References	Total studies (n, %)
	Hayes et al. (2002) [12]	1 (3.8%)
	Palmer et al. (2018) [13]	1 (3.8%)
	Mehta et al. (2002) [9]	1 (3.8%)
	Eagle et al. (2005) [8]	1 (3.8%)
	Berenholtz et al. (2011) [4], Slattery et al. (2015) [14], Eagle et al. (2005) [8], Davies et al. (2008) [10]	4 (15.4%)
	Davies et al. (2008) [10]	1 (3.8%)
	Davies et al. (2008) [10]	1 (3.8%)
	Mehta et al. (2002) [9]	1 (3.8%)
	Verkerk et al. (2022) [7]	1 (3.8%)
	Tabbers et al. (2010) [6], Verkerk et al. (2022) [7]	2 (7.7%)
	Hayes et al. (2002) [12], Eagle et al. (2005) [8], Verkerk et al. (2022) [7]	3 (11.5%)
	Tabbers et al. (2010) [6], Eagle et al. (2005) [8]	2 (7.7%)
	Eagle et al. (2005) [8]	1 (3.8%)
	Eagle et al. (2005) [8]	1 (3.8%)
	Mehta et al. (2002) [9], Eagle et al. (2005) [8]	2 (7.7%)
	Eriksen et al. (2017) [1]	1 (3.8%)
	Eagle et al. (2005) [8]	1 (3.8%)
	Hayes et al. (2002) [12]	1 (3.8%)

Implementation facilitators reported in included studies (continued)

Category (classified by CFIR)	Facilitator
	Champions' project ownership accelerated implementation
External Change Agents	External quality improvement agencies (condition-specific agencies, provincial networks) support implementation by leveraging existing relationships across the health system to identify and enable best practices, educational resources
	Searching support from congressmen
Executing	Enough time dedicated to implementation
	Effective implementation supporting material
	Effective education sessions/materials
	Support and consultation from guideline organization
Reflecting & Evaluating	Perceived valid hospital-specific feedback

Facilitators are classified according to CFIR [15]. Definitions for/examples of the CFIR concepts are presented in the additional files of Damschroder et al. (2009) [15]. Sixteen studies (61.5%) reported in total 42 implementation facilitators. Ten studies (38.5%) did not mention implementation facilitators: Higuchi et al. (2013) [16], Gagliardi (2012) [17], Jain et al. (2006) [18], Levy et al. (2010) [19], Cooney et al. (2004) [20], Mehta et al. (2004) [21], Kryworuchko et al. (2009) [22], Burgers et al. (2003) [23], Urquhart et al. (2019) [24], Narayanaswami et al. (2015) [25].

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5. Holroyd, B.R., Wilson, D., Rowe, B.H., Mayes, D.C., and Noseworthy, T. *Uptake of validated clinical practice guidelines: experience with implementing the Ottawa Ankle Rules.*

	References	Total studies (n, %)
	Eagle et al. (2005) [8]	1 (3.8%)
	Palmer et al. (2018) [13], Eagle et al. (2005) [8], Davies et al. (2008) [10]	3 (11.5%)
	DePalo et al. (2010) [11]	1 (3.8%)
	Slattery et al. (2015) [14]	1 (3.8%)
	Eagle et al. (2005) [8], Gupta et al. (2021) [2]	2 (7.7%)
	Davies et al. (2008) [10], Gupta et al. (2021) [2], Verkerk et al. (2022) [7]	3 (11.5%)
	Davies et al. (2008) [10]	1 (3.8%)
	Hayes et al. (2002) [12], Berenholtz et al. (2011) [4], Eagle et al. (2005) [8]	3 (11.5%)

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APPENDIX 7. COMPLETED COREQ (CONSOLIDATED CRITERIA FOR REPORTING QUALITATIVE RESEARCH) CHECKLIST

Completed COREQ (COnsolidated criteria for REporting Qualitative research) checklist

Topic	Guide Questions/description
Domain 1: Research team and reflexivity	
Personal characteristics	
1. Interviewer/ facilitator	Which author(s) conducted the interview or focus group?
2. Credentials	What were the researcher's credentials? (e.g. PhD, MD)
3. Occupation	What was their occupation at the time of the study?
4. Gender	Was the researcher male or female?
5. Experience and training	What experience or training did the researcher have?
Relationship with participants	
6. Relationship established	Was a relationship established prior to study commencement?
7. Participant knowledge of the interviewer	What did the participants know about the researcher? (e.g. personal goals, reasons for doing the research)
8. Interviewer characteristics	What characteristics were reported about the interviewer/ facilitator? (e.g. bias, assumptions, reasons and interests in the research topic)

	Details (manuscript page number, if reported)
	Interviews were conducted by one or two researchers: AT, TB, AG. (p. 7)
	AT: MSc. HM: PhD TB: BSc, received MSc after completing the internship that this study was part of. AG: BSc, received MSc after completing the internship that this study was part of. IvB: PhD DD: Prof.Dr. MdB: Prof.Dr.
	AT: PhD researcher HM: assistant professor TB: MSc student/intern AG: MSc student/intern IvB: advisor and researcher DD: professor and chief scientific officer MdB: professor and director
	Female: AT, HM, AG, IvB, DD, MdB Male: TB
	The interviewers (AT, TB, AG) had a background in health policy studies, were trained in interviewing techniques and had interview experience. (p. 8)
	No prior relationship was established between the researchers and participants
	Participants knew the occupations of the interviewers, where they worked and the purpose of the research.
	DD and IvB, besides their roles as researchers, are employed by Zorginstituut Nederland, a guideline organization. While this may introduce potential bias or conflicts of interest, we have mitigated this by extensively addressing and discussing the matter in our group discussions on study design and result interpretation. (p. 32)

COREQ checklist (continued)

Topic	Guide Questions/description
Domain 2: study design	
Theoretical framework	
9. Methodological orientation and theory	What methodological orientation was stated to underpin the study? (e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis)
Participant selection	
10. Sampling	How were participants selected? (e.g. purposive, convenience, consecutive, snowball)
11. Method of approach	How were participants approached? (e.g. face to face, telephone, mail, e-mail)
12. Sample size	How many participants were in the study?
13. Non-participation	How many people refused to participate or dropped out? Reasons?
Setting	
14. Setting of data collection	Where was the data collected? (e.g. home, clinic, workplace)
15. Presence of non-participants	Was anyone else present besides the participants and researchers?
16. Description of sample	What are the important characteristics of the sample? (e.g. demographic data, date)
Data collection	
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?
20. Field notes	Were field notes made during and/or after the interview or focus group?
21. Duration	What was the duration of the interviews or focus group?
22. Data saturation	Was data saturation discussed?

	Details (manuscript page number, if reported)
	The study was underpinned by 1) a review of Peters et al. (2022), 2) the 'taxonomy of strategies for achieving guideline implementation and compliance' of Mazza et al. (2013), expanded by Gagliardi & Alhabib (2015) and 3) the principles of logic models. (p. 8-11)
	Guideline organizations were eligible if they were scientific/professional organizations, knowledge institutes, governmental agencies, health insurers or other national (umbrella) organizations that developed guidelines, published them and/or actively supported their use in Dutch clinical practice. We recruited representatives from guideline organizations based on their insights into their organization's role or direct involvement in implementing guidelines. We used purposive sampling methods to recruit a broad sample of these representatives. Furthermore, representatives who were interviewed were asked if they knew additional representatives who could participate (snowball sampling). (p. 7)
	Participants were contacted via email or telephone. (p. 7)
	A total of 35 participants from 24 different guideline organizations were interviewed. (p. 13)
	Numbers of refusals were not recorded.
	Interviews were held via videoconference or in-person (e.g. at their workplace) based on participant preference. (p. 7)
	Only the researchers and participants were present.
	Occupation(s) and role in relation to guideline implementation. (p. 13)
	Interview topic guide with prompts (Appendix 2) was developed and used during the interviews. The topic guide was not pilot tested, but it was extensively reviewed within the research team. (p. 8 and Appendix 2)
	No repeat interviews were required.
	Interviews were audio-recorded. (p. 11)
	Field notes were made during the interview.
	Interviews ranged from 30-100 minutes. (p. 8)
	Data collection continued until no new themes emerged, signifying data saturation. (p. 8)

COREQ checklist (continued)

Topic	Guide Questions/description
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?
Domain 3: analysis and findings	
Data analysis	
24. Number of data coders	How many data coders coded the data?
25. Description of the coding tree	Did authors provide a description of the coding tree?
26. Derivation of themes	Were themes identified in advance or derived from the data?
27. Software	What software, if applicable, was used to manage the data?
28. Participant checking	Did participants provide feedback on the findings?
Reporting	
29. Quotations presented	Were participant quotations presented to illustrate the themes/ findings? Was each quotation identified? (e.g. participant number)
30. Data and findings consistent	Was there consistency between the data presented and the findings?
31. Clarity of major themes	Were major themes clearly presented in the findings?
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?

	Details (manuscript page number, if reported)
	Participants received an interview summary for commenting (member checking). (p. 8)
	Initially, two researchers (AT and either TB or AG) independently coded the first eight interviews to align coding. Subsequently, one researcher (TB, AG, or AT) coded the rest, cross-checked by a second researcher (AT or HM). (p. 11)
	The final coding tree is provided in Appendix 3. (p. 11 and Appendix 3)
	Both deductive and inductive coding were used. For deductive coding, the researchers developed an initial codebook, based on the aforementioned theoretical constructs. In addition, open coding was used to include interesting themes that emerged from the data. Throughout the coding process, the codebook was updated iteratively. (p. 11)
	Coding was conducted using MAXQDA (version 2022). (p. 11)
	Participants did not provide feedback on the findings.
	Participant quotes were presented to illustrate the findings throughout the results section. Each quote is identified through a participant number and his/her corresponding type of guideline organization. (p. 14-24)
	We strived to present the study findings with clarity and consistency, aiming to accurately reflect the collected data.
	Yes, major themes are clearly presented throughout the results section, both in text and in tables. (p. 14-24)
	Yes, diverse cases and minor themes are clearly presented throughout the results section, both in text and in tables. (p. 14-24)

APPENDIX 8. INTERVIEW GUIDE

Translated from Dutch

Introductory text

First of all, thank you for participating in this study. **introduce yourself and your occupation**. The subject of this research revolves around gaining insight into the processes followed by guideline organizations in the dissemination and/or implementation of guidelines. The key topics within this research include dissemination and implementation strategies and the factors that can influence the implementation process. Topics such as implementation planning and evaluation are also explored. To provide a comprehensive overview of the different roles, perspectives and experiences, representatives from various guideline organizations involved in the development, implementation planning, dissemination, implementation and/or evaluation of guidelines have been invited to participate in this research.

If you participate in this interview, you agree to the use of your answers for this study. Your data and responses will be treated confidentially and will not be shared with third parties. Throughout the transcription and analysis of the interview, responses will be handled anonymously. The interview will be recorded using an audio recorder, and the audio file will be deleted after it has been transcribed verbatim, with names of individuals anonymized. These transcripts will be stored in a secure database for a period of 15 years. After completing the transcript, I will send a summary of the interview so that you can provide any additional comments.

Do you have any questions before we begin?
Are you okay with me starting the recording? **Start the recording**
You have read the information form, and if you had any questions, they have been answered by the researcher. The consent form has been signed by both of us. Can you confirm this for me?

Introduction

We will start this interview with some general questions about your work within your organization.

Topic	Questions/constructs
Introduction	Can you tell me about your role at [organization]? Can you provide an overview of your organization's role in the process of developing, disseminating and implementing guidelines? › *Example* › *In which guidelines have you recently been actively engaged?*

Planning phase

The following questions are about elements of the implementation planning phase.

Topic	**Questions/constructs**
General	How are decisions made regarding the selection of specific dissemination and implementation strategies?
Tailoring interventions	Are methods employed to tailor dissemination and implementation strategies for better uptake in practice? › *Who is responsible for this within the organization?*
Engaging stakeholders	With which organizations do you collaborate in the process of guideline development, dissemination and/or implementation? Who are the guideline end-users? How are they/their perspectives on the guideline and implementation identified? Are end-users actively involved in planning dissemination and implementation strategies? Are dissemination and implementation strategies actually tailored to the needs of the end-users? › *How?*
Pre-identified barriers and facilitators	Do you identify potential implementation barriers or facilitators prior to tailoring the dissemination and implementation strategies? › *How are they identified and taken into account?* › *Examples from recent guidelines*
Using theories/ models/ frameworks	Does your organization make use of theories, models or frameworks to guide implementation? Which ones? If not/unclear, has the organization developed guidelines/manuals for planning dissemination and implementation strategies? › *To what extent do they provide support?* › *Are the guidelines/manuals actually utilized?* › *Could we receive these guidelines/manuals?*

Implementation phase

The following questions are about the actual dissemination and implementation of guidelines.

Topic	Questions/constructs
Dissemination and implementation strategies	Which strategies for the dissemination of guidelines are utilized by your organization? Which strategies for implementation of guidelines are utilized by your organization? › *Examples of strategies* › *Experiences with strategies* › *Resources utilized and available for implementation* **Examples of strategies** Professional: education, audit and feedback, reminders, clinical peer review, publications, media Financial: change in reimbursement, implementation grants, fines Organizational: integration of services, healthcare professional satisfaction, changes in the medical records system, changes in the healthcare setting Regulatory: change in regulation/legislation, change in licensing, credentialing or accreditation Patient: education, print material (patient summary)
Implementation barriers and facilitators	What barriers have you encountered during the process of guideline implementation? What facilitators have you encountered during the process of guideline implementation? To what extent does implementation proceed according to the preconceived plan?

Monitoring and evaluation phase

The following questions are about the monitoring and evaluation of the implementation efforts, (process), outcomes and impact.

Topic	Questions/constructs
Process, outcome and impact evaluation	What happens after the implementation activities have been completed? To what extent is your organization involved in the phase after the implementation activities are completed (monitoring and evaluation phase)? Is the implementation approach (planning and execution of implementation strategies) evaluated afterwards? › *In what way?* › *Examples of outcomes of those evaluations* Are the outcomes and impact of the implementation of the guidelines on healthcare monitored/evaluated? › *In what way?* › *Which outcome and impact indicators are being considered? (patient outcomes, health outcomes, cost-effectiveness, etc.)* › *Examples of recent outcomes*

Closing

Finally, I have some concluding questions.

Topic	Questions/constructs
Guideline	What is your opinion on guidelines as a bridge between science, policy and healthcare practice? What do you think about the current efforts in disseminating and implementing guidelines in the Netherlands? › *How would you assess the efforts of your organization in this regard?*
Good and bad examples	Can you provide an example of a guideline where the dissemination and implementation process has been successful? › *Why was it effective/successful?* Can you provide an example of a guideline where the dissemination and implementation process has not been/was less successful? › *Why was it ineffective/unsuccessful?* How can the dissemination and implementation process of guidelines be improved? › *Examples?*
Closing	Could you recommend other individuals, within your organization or other key entities like governmental organizations, who would be valuable for us to interview? Is there anything else you would like to add that we may not have covered but is relevant to the discussion? Do you have any final questions for me?

APPENDIX 9. FINAL CODING TREE

Final coding tree

Code System
Current state of implementing guidelines
Value of guidelines as bridge between science, policy & practice
Solutions/ideas for implementation problem
Roles organizations in implementation process
Roles organizations in implementation process\Role/responsibility governmental agencies
Roles organizations in implementation process\Role/responsibility NZa
Roles organizations in implementation process\Role/responsibility IKNL
Roles organizations in implementation process\Role/responsibility ZonMw
Roles organizations in implementation process\Role/responsibility NFU
Roles organizations in implementation process\Role/responsibility patient federation/patient organizations
Roles organizations in implementation process\Role/responsibility ZE&GG
Roles organizations in implementation process\Role/responsibility VWS
Roles organizations in implementation process\Role/responsibility insurers
Roles organizations in implementation process\Role/responsibility ZIN
Roles organizations in implementation process\Role/responsibility FMS/KIMS
Roles organizations in implementation process\Role/responsibility scientific/professional organizations
Roles organizations in implementation process\Role/responsibility IGJ
Roles organizations in implementation process\Role/responsibility NVZ
Roles organizations in implementation process\Role/responsibility NVVC
Roles organizations in implementation process\Role/responsibility healthcare professionals/facilities
Roles organizations in implementation process\Role/responsibility NVALT
Roles organizations in implementation process\Role/responsibility V&VN
Roles organizations in implementation process\Role/responsibility NHG
Roles organizations in implementation process\Role/responsibility ZKN

Coding tree (continued)

Code System
Organization has (no) implementation team
1. Implementation planning approach
1. Implementation planning approach\No official implementation phase
1. Implementation planning approach\No structural implementation approach currently, aspiration for one
1. Implementation planning approach\Implementation planning approach not linked to implementation strategies
1. Implementation planning approach\Emphasis on doing instead of planning first
1. Implementation planning approach\Whatever implementation strategies come to mind, unsubstantiated
1. Implementation planning approach\Based on sensitivity topic
1. Implementation planning approach\Based on urgency topic, common problem
1. Implementation planning approach\Based on available implementation grants SKMS
1. Implementation planning approach\Depending on preferences and capacity guideline committee
1. Implementation planning approach\Additional implementation research
1. Implementation planning approach\Conducting a stakeholder analysis
1. Implementation planning approach\Following an implementation course
1. Implementation planning approach\No pre-identification barriers or facilitators
1. Implementation planning approach\During guideline development thinking of implementation
1. Implementation planning approach\Choosing strategies based on easiness and costs
1. Implementation planning approach\Based on successful/impactful strategies of other guideline organizations or similar projects
1. Implementation planning approach\working with marketing agency, educational/ implementation expert
1. Implementation planning approach\Collaborating with implementation practice experts
1. Implementation planning approach\Guideline pilot testing
1. Implementation planning approach\Based on guideline characteristics
1. Implementation planning approach\Implementation plan

Coding tree (continued)

Code System
1. Implementation planning approach\Engaging stakeholders
1. Implementation planning approach\Pre-identifying facilitators
1. Implementation planning approach\Pre-identifying barriers
1. Implementation planning approach\Using theories/models/frameworks
2. Dissemination/implementation methods
2. Dissemination/implementation methods\No implementation strategies
2. Dissemination/implementation methods\Central domain
2. Dissemination/implementation methods\Central domain\Collaboration platform for distant healthcare facilities, insurers, policy advisors
2. Dissemination/implementation methods\Central domain\Request implementation plan (for approval Register)
2. Dissemination/implementation methods\Central domain\Provide education/support about implementation
2. Dissemination/implementation methods\Central domain\Share best implementation practices with guideline organizations + healthcare facilities
2. Dissemination/implementation methods\Central domain\Collaborative implementation partnerships
2. Dissemination/implementation methods\Central domain\National implementation agenda
2. Dissemination/implementation methods\Central domain\Quality discussions insurers and healthcare facilities
2. Dissemination/implementation methods\Central domain\Peer-learning sessions
2. Dissemination/implementation methods\Central domain\Request healthcare facilities to submit improvement plan
2. Dissemination/implementation methods\Regulatory domain
2. Dissemination/implementation methods\Regulatory domain\Change legislation or regulation
2. Dissemination/implementation methods\Regulatory domain\Change in licensing, credentialing or accreditation
2. Dissemination/implementation methods\Regulatory domain\Change in licensing, credentialing or accreditation\guideline organization publishes white list of healthcare facilities that have proven to meet the quality criteria

Coding tree (continued)

Code System
2. Dissemination/implementation methods\Regulatory domain\Change in licensing, credentialing or accreditation\guideline developer manages network of recognized quality consultants
2. Dissemination/implementation methods\Regulatory domain\Change in licensing, credentialing or accreditation\guideline developer manages network of peripheral accreditation employees
2. Dissemination/implementation methods\Organizational domain
2. Dissemination/implementation methods\Financial domain
2. Dissemination/implementation methods\Financial domain\Provide budget for implementation research/project
2. Dissemination/implementation methods\Financial domain\Change in reimbursement
2. Dissemination/implementation methods\Financial domain\Incentive (group or institutional financial reward or benefit)
2. Dissemination/implementation methods\Patient domain
2. Dissemination/implementation methods\Patient domain\Advertise guideline materials to patients
2. Dissemination/implementation methods\Patient domain\Advertise guideline materials to patients\Patient organization website publication
2. Dissemination/implementation methods\Patient domain\Advertise guideline materials to patients\Patient version of guideline/patient information form
2. Dissemination/implementation methods\Patient domain\Advertise guideline materials to patients\Patient website publication
2. Dissemination/implementation methods\Professional domain
2. Dissemination/implementation methods\Professional domain\Distribute guideline materials
2. Dissemination/implementation methods\Professional domain\Distribute guideline materials\ Issue draft guideline for commenting
2. Dissemination/implementation methods\Professional domain\Distribute guideline materials\ Mass mailing (electronic) final guideline
2. Dissemination/implementation methods\Professional domain\Provide feedback on guideline compliance and information
2. Dissemination/implementation methods\Professional domain\Enable self-audit
2. Dissemination/implementation methods\Professional domain\Present guideline materials at meetings
2. Dissemination/implementation methods\Professional domain\Present guideline materials at meetings\Conference presentation

Coding tree (continued)

Code System
2. Dissemination/implementation methods\Professional domain\Clinical peer review
2. Dissemination/implementation methods\Professional domain\Recruit champions
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits\Workshop
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits\(Online) education material
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits\Webinar
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits\Micro learning quiz
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits\Instruction video's
2. Dissemination/implementation methods\Professional domain\Educate groups about guideline intent/benefits\E-learnings
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\ Publish (in) book
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\ Animated short film
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\ Social media releases
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\ Media release
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\Podcast
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\ Submit guideline to guideline clearinghouse/database
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\ App with guideline content

Coding tree (continued)

Code System
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\Publish in newsletter
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\Mass media campaign
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\Publish in journal
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\Publish formulary
2. Dissemination/implementation methods\Professional domain\Advertise guideline materials\Website publication(s)
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Patient pathway
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Toolkit
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Visuals
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Conversation guide
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\English version of guideline
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Powerpoint
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Provide presentation with guideline summary
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Clinical decision support tools
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Guideline summary
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Pocket cards summarizing guideline

Coding tree (continued)

Code System
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Triage guide
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Infographics
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Practice manuals
2. Dissemination/implementation methods\Professional domain\Provide additional implementation supporting materials\Guideline factsheet/summary
3. Implementation evaluation
3. Implementation evaluation\No implementation evaluation
3. Implementation evaluation\Does not evaluate but is positive towards potential/has plans
3. Implementation evaluation\Does not perform evaluation, leaves it to other organizations
3. Implementation evaluation\Difficult to define desired implementation goal
3. Implementation evaluation\Evaluation is a difficult task
3. Implementation evaluation\Difficult to finance implementation evaluation
3. Implementation evaluation\Renewing working methods based on evaluation
3. Implementation evaluation\Outcomes evaluation Appropriate Care Program
3. Implementation evaluation\Process evaluation
3. Implementation evaluation\Process evaluation\Evaluation implementation at staff meeting scientific/professional organization
3. Implementation evaluation\Process evaluation\Visitor numbers guideline materials
3. Implementation evaluation\Process evaluation\Evaluative questions at members meeting
3. Implementation evaluation\Process evaluation\Organization asked hospitals whether they did something with guidelines
3. Implementation evaluation\Process evaluation\Organization asks for guideline feedback but does not receive much
3. Implementation evaluation\Process evaluation\Input from healthcare professionals about guideline
3. Implementation evaluation\Process evaluation\Workgroup that visits and retrieves info from healthcare professionals (focus group)

Coding tree (continued)

Code System
3. Implementation evaluation\Outcome evaluation
3. Implementation evaluation\Outcome evaluation\Patient organizations do not have capacity to evaluate
3. Implementation evaluation\Outcome evaluation\Research into use of guidelines
3. Implementation evaluation\Outcome evaluation\Guideline developer makes audit & feedback
3. Implementation evaluation\Outcome evaluation\Audit and feedback/benchmarking program national organization
3. Implementation evaluation\Outcome evaluation\Assessment/accreditation through external organization
3. Implementation evaluation\Outcome evaluation\Inspectorate monitors and evaluates
3. Implementation evaluation\Outcome evaluation\Clinical peer review
3. Implementation evaluation\Impact evaluation
3. Implementation evaluation\Court of Audit report about Appropriate Care Program
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact\Appropriate Care Program
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact\Insurers evaluate calamities/cases/letters of insured persons
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact\ Insurers monitor through implementation agenda improvement plan
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact\Insurers evaluate based on transparent indicators
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact\Governmental agency monitors and reports impact projects
3. Implementation evaluation\Combination of implementation process, outcomes and/or impact\ Impact report based on declaration data to VWS and guideline organizations

APPENDIX 10. COMPLETED COREQ (CONSOLIDATED CRITERIA FOR REPORTING QUALITATIVE RESEARCH) CHECKLIST

Completed COREQ (COnsolidated criteria for REporting Qualitative research) checklist

Topic	Guide Questions/description
Domain 1: Research team and reflexivity	
Personal characteristics	
1. Interviewer/ facilitator	Which author(s) conducted the interview or focus group?
2. Credentials	What were the researcher's credentials? (e.g. PhD, MD)
3. Occupation	What was their occupation at the time of the study?
4. Gender	Was the researcher male or female?
5. Experience and training	What experience or training did the researcher have?
Relationship with participants	
6. Relationship established	Was a relationship established prior to study commencement?
7. Participant knowledge of the interviewer	What did the participants know about the researcher? (e.g. personal goals, reasons for doing the research)
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? (e.g. bias, assumptions, reasons and interests in the research topic)

	Details (manuscript page number, if reported)
	Interviews were conducted by one or two researchers: AT, TB, AG. (p. 8)
	AT: MSc. AG: BSc, received MSc after completing the internship that this study was part of. TB: BSc, received MSc after completing the internship that this study was part of. IvB: PhD DD: Prof.Dr. MdB: Prof.Dr. HM: PhD
	AT: PhD researcher HM: assistant professor TB: MSc student/intern AG: MSc student/intern IvB: advisor and researcher DD: professor and chief scientific officer MdB: professor and director
	Female: AT, HM, AG, IvB, DD, MdB Male: TB
	The interviewers (AT, TB, AG) had a background in health policy studies, were trained in interviewing techniques and had interview experience. (p. 8)
	No prior relationship was established between the researchers and participants
	Participants knew the occupations of the interviewers, where they worked and the purpose of the research
	DD and IvB, besides their roles as researchers, are employed by Zorginstituut Nederland, a guideline organization. While this may introduce potential bias or conflicts of interest, we have mitigated this by extensively addressing and discussing the matter in our group discussions on study design and result interpretation. (p. 30)

COREQ checklist (continued)

Topic	Guide Questions/description
Domain 2: study design	
Theoretical framework	
9. Methodological orientation and theory	What methodological orientation was stated to underpin the study? (e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis)
Participant selection	
10. Sampling	How were participants selected? (e.g. purposive, convenience, consecutive, snowball)
11. Method of approach	How were participants approached? (e.g. face to face, telephone, mail, e-mail)
12. Sample size	How many participants were in the study?
13. Non-participation	How many people refused to participate or dropped out? Reasons?
Setting	
14. Setting of data collection	Where was the data collected? (e.g. home, clinic, workplace)
15. Presence of non-participants	Was anyone else present besides the participants and researchers?
16. Description of sample	What are the important characteristics of the sample? (e.g. demographic data, date)
Data collection	
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?
20. Field notes	Were field notes made during and/or after the interview or focus group?

	Details (manuscript page number, if reported)
	We employed framework analysis, using the updated Consolidated Framework for Implementation Research (CFIR), and thematic analysis to guide our data analysis and synthesis. (p. 9)
	The study population consisted of representatives of Dutch guideline organizations. We used purposive sampling methods to recruit a broad sample of these representatives. Eligible guideline organizations were scientific/professional organizations, knowledge institutes, governmental agencies, health insurers, patient organizations and other national (umbrella) organizations that developed guidelines, published them and/or actively supported their use in clinical practice. Representatives were recruited based on their understanding of their organization's role or their own direct involvement in guideline implementation. We recruited potential participants through contact information obtained from guideline organization websites, contacts of the research team, as well as snowball sampling, where interviewed representatives recommended others. (p. 7-8)
	Participants were contacted via email or telephone. (p. 8)
	A total of 35 participants from 24 different guideline organizations were interviewed. (p. 11)
	Numbers of refusals were not recorded.
	Interviews were held via videoconference or in-person (e.g. at their workplace) based on participant preference. (p. 8)
	Only the researchers and participants were present.
	Guideline organization, occupation(s) and role in relation to guideline implementation. (p. 11)
	Interview topic guide with prompts (Appendix 2) was developed and used during the interviews. The topic guide was not pilot tested, but it was extensively reviewed within the research team. (p. 8 and Appendix 2)
	No repeat interviews were required.
	Interviews were audio recorded. (p. 8)
	Field notes were made during the interview.

COREQ checklist (continued)

Topic	Guide Questions/description
21. Duration	What was the duration of the interviews or focus group?
22. Data saturation	Was data saturation discussed?
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?
Domain 3: analysis and findings	
Data analysis	
24. Number of data coders	How many data coders coded the data?
25. Description of the coding tree	Did authors provide a description of the coding tree?
26. Derivation of themes	Were themes identified in advance or derived from the data?
27. Software	What software, if applicable, was used to manage the data?
28. Participant checking	Did participants provide feedback on the findings?
Reporting	
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? (e.g. participant number)
30. Data and findings consistent	Was there consistency between the data presented and the findings?

	Details (manuscript page number, if reported)
	Interviews lasted between 30-100 minutes. (p. 8)
	Data collection continued until no new themes emerged, signifying data saturation. (p. 8)
	Participants received an interview summary for commenting (member checking). (p. 8)
	Initially, two researchers (AT and either TB or AG) independently coded the first eight interviews to align coding. Subsequently, one researcher (TB, AG, or AT) coded the rest, cross-checked by a second researcher (AT or HM). (p. 9)
	The final coding tree is provided in Appendix 3. (p. 9 and Appendix 3)
	Interview transcripts were analyzed using the principles of framework analysis. The updated Consolidated Framework for Implementation Research (CFIR) guided our analysis. We applied deductive coding to the data. We developed an initial codebook based on the implementation domains and determinants from the updated CFIR to categorize the barriers and facilitators that representatives identified. Furthermore, open coding was used to capture interesting aspects that emerged from the data, such as additional barriers and facilitators. The codebook was updated iteratively throughout the process. After systematically categorizing the identified barriers and facilitators using the updated CFIR and organizing them in a data extraction template (Excel), we conducted a further analysis to explore their interactions and dynamics. This involved examining patterns, connections and influences between barriers and facilitators, as well as across different stakeholders and CFIR domains. Through this additional thematic analysis, we identified seven themes of barriers and facilitators, extending beyond the original CFIR domains. To provide a clearer understanding of the interactions and dynamics between determinants, the results are presented according to these themes. (p. 9-10)
	Coding was conducted using MAXQDA (version 2022). (p. 9)
	Participants did not provide feedback on the findings. All representatives received a summary of their interview for member checking afterward. (p. 8)
	Participant quotes were presented to illustrate the findings throughout the results section. Furthermore, Appendix 4 provides a comprehensive list of the barriers and facilitators, supported by illustrative quotes. Each quote is identified through a participant number and his/her corresponding type of guideline organization. (p. 12-22 and Appendix 4)
	We strived to present the study findings with clarity and consistency, aiming to accurately reflect the collected data.

COREQ checklist (continued)

Topic	Guide Questions/description
31. Clarity of major themes	Were major themes clearly presented in the findings?
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?

	Details (manuscript page number, if reported)
	Yes, major themes are clearly presented throughout the results section, both in text (headings) and in a table. (p. 11-22, Table 2)
	Yes, diverse cases and minor themes are clearly presented throughout the results section, both in text and in a table. (p. 11-22, Table 2)

APPENDIX 11. FINAL CODING TREE

Code System

Final coding tree
Current state of implementing guidelines
Value of guidelines as bridge between science, policy & practice
Solutions/ideas for implementation problem
Barriers
Implementation process domain
Planning - implementation plan concise/not concrete/copied
Bad quality of pilot implementation
Planning - implementation plan not realized
Results pilot implementation not used for actual implementation
Planning – implementation is last step, not throughout development process
Tailoring strategies - implementation strategies don't match end users
Innovation/strategy doesn't fit with workflow
Tailoring strategies - guideline database not practical/user friendly
Developers submit guidelines to different databases
Register is too bureaucratic
Engaging - forgotten/too late engagement stakeholders
Doing - no standardized development + implementation process
Reflecting & evaluating - lack of good/transparent implementation data
Reflecting & evaluating – audit & feedback quality vs registration burden
Individuals domain
Implementation team x opportunity - members don't have capacity/time to plan/execute strategies
Experience/perception that implementation costs too much time

Coding tree (continued)

Implementation team x capability - Guideline committee does not consider implementability
Insufficient attention to consequences implementation for organization of care
Implementation team x capability - insufficient expertise in planning/execution implementation
Implementation team x motivation - committee members are not motivated to implement
Innovation deliverers x capability - professions are not used to using guidelines
Innovation deliverers x capability - fear of patient harm/defensive medicine
Innovation deliverers x capability - professionals' lack of implementation knowledge/expertise
Innovation deliverers x capability – healthcare professional's lack of confidence/skill to execute guideline
Innovation deliverers x capability - fear of going against patients' expectations/wishes
Innovation deliverers x opportunity - too many guidelines to keep track of/implement
Insufficient health professionals' time
Innovation deliverers x motivation - guideline fatigue
Innovation deliverers x motivation - old habits and routines
Innovation deliverers x motivation - cognitive dissonance healthcare professionals
Innovation deliverers x motivation - notion that guidelines limit practice freedom
Inner setting domain
Communications - open feedback across hierarchies perceived as difficult
Relative priority - end users need to prioritize between quality initiatives
Too many programs for healthcare facilities to comply with
Too many guidelines to implement
Healthcare professionals have insufficient implementation and execution capacity and funding
Outer setting domain
Local attitudes - notion implementation happens fast/automatically
Local conditions - increasing care demand & limited resources

Coding tree (continued)

Partnerships & connections - no collaboration between guideline organizations about similar guidelines
Partnerships & connections - lack of trust/collaboration between stakeholders
Partnerships & connections – guideline organizations do not use all opportunities to inform stakeholders about guidelines
Partnerships & connections - not all guideline organizations are in agreement about guideline
Policies & laws - conflict guidelines and volume standards
Policies & laws - conflict between different guidelines
Financing
Fear of reduced revenue
No standard budget for implementation
Financiers impose different requirements about implementation
No sustainable resources/projects for number of years
Maintenance plan implementation products not parallel to guideline
No resources/difficult to de-implement obsolete guideline
Care quality and reimbursement are currently not/hardly linked
What to do with mildly substantiated guidelines
Need to be able to deviate when substantiated
External pressure - guideline organization doesn't have implementation instrument of power
External pressure - relative priority development vs implementation guideline
External pressure - great professional autonomy healthcare professionals
Capacity/resources (+)
Stakeholders (are) not (able to) make use of commentary round
Innovation domain
Innovation source - guideline predominantly reflects medical/professional/academic perspective
Innovation source - guideline committee does not reflect actual user

Coding tree (continued)

Implementation team – guideline developer doesn't reflect members
Innovation evidence-base - guidelines are outdated
Innovation evidence-base - lack of evidence so weak guideline
Innovation complexity - multidisciplinary guideline harder to implement
Innovation design - caution to formulate strong recommendations
Innovation design - GRADE makes process and guidelines complex
Innovation design - guideline extensive, complex document
Facilitators
Implementation process domain
Assessing needs – through close engagement with stakeholders, better understanding of needs
Planning - develop structured implementation process description
Planning - thinking in advance about implementation
Tailoring strategies - Ensuring easy access to guideline content for end users (through guideline database and patient information)
patient information stimulates implementation
Engaging - patient empowerment via patient-centered guideline information
Engaging - implementation support - communication advisor advises implementation team
Reflecting & evaluating – audit & feedback supports implementation
Individuals domain
Implementation leads x motivation - dedicated project leader needed
Innovation deliverers x need - demand for guideline
Innovation deliverers x capability - train implementation science practitioners to improve expertise
Innovation deliverers x motivation - intrinsic motivation/passion/drive to deliver good care
Inner setting domain
Structural characteristics - information technology infrastructure alignment

Coding tree (continued)

Structural characteristics – healthcare professionals challenge each other at network meetings
Relational connections - short lines between healthcare professionals, managers, ICT
Culture – healthcare facility and professionals are learning centered
Culture – culture of acting according to the guideline ingrained within profession
Available resources - funding available to implement guideline
Access to knowledge & information - implementation agenda raises awareness for the need for change
Outer setting domain
Local attitudes - implementation momentum/attention
Implementation named in quality policy vision
Organizations feel increased urgency
Local conditions - resources to guidelines because of proven added value
Shared beliefs that care quality + accessibility is important
Partnerships & connections - bond of trust between guideline organizations
Partnerships & connections: guideline organization's alignment/agreements are basis for implementation execution
Cooperation guideline organizations
Passende zorg/IZA
Landelijke transmurale afspraken
Contract health insurer and NVZ
ZE&GG efforts
Partnerships & connections - alignment between guideline sources
Policies & laws- healthcare professional has to justify actions to medical board
Financing - financial compensation in return for implementation action plan
Financing – guideline financiers impose different requirements regarding implementation
External pressure – IGJ presses implementation

Coding tree (continued)

Innovation domain
Innovation source - guidelines developed/endorsed by healthcare professionals and scientific organizations
Scientific associations support implementation agenda
Innovation source - guideline source good reputation improves acceptability among users
Innovation evidence-base – guideline's (perceived) credibility and evidence-base
Innovation complexity - Guideline recommendations that are concrete, practical, and straightforward, without unnecessary complexity
Concrete formulation recommendations
Guidelines perceived relevance to practice
Innovation design - modular maintenance saves more energy for implementation + easier dissemination
Innovation design - recurring fixed guideline publication moment
Innovation design - guideline described from patient perspective

APPENDIX 12. IMPLEMENTATION BARRIERS AND FACILITATORS

Implementation barriers and facilitators identified by representatives of guideline organizations, classified according to the updated CFIR framework

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Innovation domain		
Innovation source	Guideline, guideline committee and/or guideline developer predominantly reflect an (academic) professional/ medical perspective, giving less consideration to other interests, stakeholder perspectives and contexts (e.g. patient or general hospital perspective)	'... Good care is now primarily described from a certain angle, so from the [viewpoint of the] medical specialist ... And we believe that good care should be much more described from the condition or from the patient's perspective and that you should consider the entire spectrum.' – Representative 26, governmental agency
Innovation evidence-base	Guidelines quickly become outdated due to the constant influx of new evidence and the lengthy development process	'That such a guideline may already be outdated by the time it is used, because it contains knowledge from 3 or 4 years ago. At the time of authorization, it can actually be revised again.' – Representative 23, governmental agency
	Insufficient conclusive evidence, resulting in weak guideline recommendations	'... Then the risk is that they find guidelines too abstract and unspecific. That they say: 'it says: consider doing this or that. I just want to know: what should I do?' Sometimes they prefer more of a protocol than a guideline.' – Representative 4, guideline developer
Innovation complexity	Multidisciplinary guidelines are harder to develop and implement due to the involvement of multiple stakeholders with different interests	'Now there's, for example, a guideline ... About physical fitness in oncological patients. That's obviously a highly multidisciplinary subject. But that also makes it very challenging. In that workgroup, they did indeed encounter the issue of: how do you implement that? – Representative 18, guideline developer

Facilitator	Exemplary quote corresponding to the facilitator
Guidelines developed by peers and endorsed by scientific organizations foster consensus and support for their use among healthcare professionals	'Those medical guidelines are naturally developed by medical specialists. We support them in that, so they are kind of owners of those guidelines and that naturally aids with implementation. It's not like we've made them and say: 'you have to do it this way'. So in that sense, you could consider it as a kind of implementation strategy that is underlying there.' – Representative 10, guideline developer
Acceptance of the guideline is influenced by the favorable reputation that scientific/ professional organizations maintain among their associated healthcare professionals	'If you have a good reputation in that regard, parties think: 'hey, but if it's facilitated by [guideline organization], then it's beneficial for us.' Or: 'they understand us, or those kind of matters.' That also helps a lot, of course.' – Representative 29, guideline developer
Guideline's (perceived) credibility and evidence-base	'The guidelines that implement most easily are simply the ones where the evidence is very clear. Where it's just very clear: that's the effect, that's better. Then you don't even need to create a guideline, so to speak. If the outcome is clear, then there is no problem at all in implementing the guideline. None at all.' – Representative 31, guideline developer
Guideline recommendations that are concrete, practical, and straightforward, without unnecessary complexity	'We receive a lot of criticism, including about how [guidelines] have become so complicated. So I find it very important that we put more effort into making things easier to apply. The easier it is, the smaller the chance of errors. And it could involve improving the presentation, or improving the format, like a card or a simple summary. But it could also be in the nature of the advice you give. If you give very complex advice, the risk of errors increases.' – Representative 2, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Innovation design	Guidelines are extensive documents, difficult to understand for some end users	'...That guideline on informal caregiving, for example, simply didn't resonate. It just didn't come across well, and that was largely due to how lengthy and complex it was.' – Representative 4, guideline developer
	Guideline recommendations are formulated vaguely, as guideline committees are cautious about formulating strong recommendations, to preserve professional autonomy and avoid being held accountable by peers	'… You notice that there can sometimes be hesitancy in writing recommendations because they think, 'well, that means we're now imposing on our peers to do a certain thing. We'll be held accountable for it.' So you notice that sometimes it's also challenging when formulating recommendations. They may want to remain a bit vague to maintain freedom.' – Representative 10, guideline developer
Outer setting domain		
Local attitudes	Belief that implementation occurs swiftly/automatically once a guideline is published and requires minimal resources	'Additionally, there is a need for greater awareness in the field that implementation does not happen automatically. I think that if you ask an average physician: 'how do you implement or how does your department implement new knowledge into practice?', they would say: 'We give a presentation, and then it's implemented'. So, there is still much progress to be made in this regard.' – Representative 1, national organization

Facilitator	Exemplary quote corresponding to the facilitator
Modular updating and structuring of guidelines save the guideline committee energy/time which they can re-allocate towards implementation efforts, enable faster incorporation of new insights, and make the recommendations more manageable to disseminate/implement	'That's why it's good that modular maintenance exists. ... Yes, because when you think in modules, you're no longer dealing with writing a 600-page guideline first ... Whereas if it's in smaller steps, then you're indeed making good progress. You've worked on it together for about a year, and it results in something of which you think: we can work with that. Then you can allocate the energy you've saved much more towards those other steps. So I think that's super important.' – Representative 32, guideline developer
Recurring fixed guideline publication moment	'You know exactly when they are released; it's always at the September conference. So, they have a very powerful implementation tool and structure that is very reliable.' – Representative 33, guideline developer
Guideline described from patient perspective	'What I do find positive about our quality standards, care standards, and generic modules is that they are written from the patient journey perspective. Because by putting that at the center, you create a kind of 'we are all going to work on this together' feeling. ... This also somewhat shifts the focus away from the professionals themselves, perhaps encouraging them to think, you know, what is important for that patient? ... By framing and labeling them like this, it's also something like, 'oh yes, this is what we, together with patients, have come up with as important for the patient'. Instead of, 'what do I need to do?' And of course, that latter part is in there as well, but it's the framing that makes you think and act. I think that really helps.' – Representative 29, guideline developer
Increased implementation momentum/ urgency/more attention to implementation	'And that, that's really going to change now, because I think there is a need from scientific organizations to do something about it. There is much more attention for it now. Just like we thought a while ago, we should do something about it, others are thinking the same now.' – Representative 32, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Local conditions	Due to the increasing demand for care and limited care provision resources, concessions must be made regarding quality, accessibility, and affordability, which means that not all guideline recommendations can be implemented	'But due to the increasing demand for care and limited resources to provide that care, many concessions will have to be made regarding quality. And regarding accessibility and affordability.' – Representative 35, governmental agency
Partnerships & connections	Guideline organizations do not have a clear view of the similarities and collaboration opportunities regarding each other's quality initiatives	'If one club has improvement reports, the other has improvement goals, and they both relate to something cardiological, yes, then you should merge them into one narrative. … And having the right conversation about it, we haven't quite gotten there yet. We simply haven't fully clarified where the intersection lies.' – Representative 35, governmental agency
	Central and local stakeholders (e.g. insurers, healthcare professionals, healthcare facilities' board of directors) do not collaborate effectively due to mutual distrust	'That's a bit how they look at each other. Yeah, and if I trust you, then I want to help you get that done. ... Collaborating isn't saying, 'you have to do that'. Collaborating is thinking together, 'what do we have, what needs to happen, and what can I do?' And we're really not there yet, are we? ... That lack of collaboration, lack of trust, it's in all parties.' – Representative 32, guideline developer

Facilitator	Exemplary quote corresponding to the facilitator
Due to the increasing demand for care and limited care provision resources, more attention is given to implementing appropriate care described in guidelines	'We face challenges in healthcare on all fronts, including accessibility, staffing, and affordability. When it comes to making critical decisions about where to allocate our limited workforce, we prefer to focus on care that we know adds value for the patient.' – Representative 1, national organization
The bond of trust between specific (representatives of) guideline organizations strengthens implementation efforts	'Because we collaborate quite intensively, a bond of trust has developed among us, reflecting and shaping our shared commitment.' – Representative 32, guideline developer
Critical sources/ websites containing guideline information (e.g. Thuisarts and websites of scientific/ professional organizations) are interconnected	'Yes, and besides that, I also think [a facilitating factor] is the reference to other guidelines, and guidelines also refer back to us.' – Representative 18, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
	Guideline organizations do not use all collaborative opportunities to inform stakeholders about guidelines	'And I think we could do even more in informing healthcare facilities, because we do have a network, but we don't have all hospitals exactly in sight, knowing what they all do or don't do. You expect your stakeholders to inform each other and their colleagues elsewhere in the country. But, that often doesn't happen. As [guideline organization] we do have the policy, which I actually don't fully agree with, that we don't send our reports to the hospitals' Boards of Directors. Then you can't assume that every hospital is aware that something needs to be done.' – Representative 6, governmental agency
	Not all (guideline) organizations agree with certain guideline recommendations	'So the scientific organizations may believe that substantive improvements are necessary. However, the hospitals, together with their medical staff, must implement it, and if the Dutch Hospital Association (NVZ) has not agreed to it, then it is not so easy to proceed with it.' – Representative 6, governmental agency
Policies & laws	Regulations (e.g. volume standards, rules about fair cooperation between healthcare facilities from the Authority for Consumers and Markets (ACM)) hinder implementation	'The fact that there are volume standards. It can be hugely inhibiting... It may be that by applying [the guideline], you fall below your volume standards. And then you can no longer provide care, and then care needs to be relocated elsewhere or you need to collaborate... And then someone says, 'well, let's check this with the Authority for Consumers and Markets. Oh, no, that's a form of collaboration that is not allowed'... So you may very well have conflicting interests, regulatory issues.' – Representative 32, guideline developer
	Conflicts between different guidelines/protocols on the same topic	'If you compare standards now, you can also see the discrepancies. So as a healthcare professional, you have to figure out what to do with it: 'oh, this [standard] prescribes this and that [standard] prescribes that. What on earth am I supposed to do with that?" – Representative 26, governmental agency

Facilitator	Exemplary quote corresponding to the facilitator
Formal collaborative agreements between guideline organizations (e.g., ZE&GG program) ensure a collective commitment to implementation and provide opportunities to more easily reach multiple stakeholders	'Know that there is increasingly more commitment at this moment among all relevant parties essential for translating the developed knowledge into implementation. And this is not the responsibility of just one party. It involves all parties. And that's what the ZE&GG program is currently striving to achieve: to emphasize that everyone has a role to play in this endeavor.' – Representative 14, governmental agency
Healthcare professionals must justify themselves to a disciplinary or incident review board due to an incident/complaint and undergo assessment to determine if they have worked in accordance with the professional standard	'A negative situation is when you experience a complication and you have to appear before the disciplinary board or incident review board because you need to justify yourself. Yes, those who have experienced it once will definitely read the guidelines the next time. But that's only one in so many cases. You can't wait for everyone to close the stable door after the horse has bolted.' – Representative 17, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Financing	Many guideline organizations lack standard budgets for implementation and instead depend on supplementary external funding	'But that often relies on additional subsidy funds, so it's not standardly included. … There are some tools and projects where, for example, an extra workgroup focuses on implementation, but all of those are things that have been specifically requested as extras.' – Representative 10, guideline developer
	The connection between quality of care and care reimbursement/ financial incentives is weak and challenging to establish in the current healthcare system	'You actually want to move away from incentives, money, and focus more on quality, so efforts are being made on various fronts to achieve that. However, it doesn't change the fact that market dynamics inherently have incentives that make money important, I think.' – Representative 23, governmental agency
	Fear of reduced revenue due to the de-implementation or relocation of certain care practices as recommended in the guideline	'Yes, because that often involves livelihoods, right? ... It means more people going to the hospital and fewer being treated in primary care. That comes at the expense of the wallet of those in primary care. And people naturally don't like that. Well, those kinds of things all come into play there.' – Representative 31, guideline developer
	Implementation projects/ programs and their funding are temporary and lack structural updates, leading to unsustainable implementation or continued use of outdated guidelines/ implementation tools	'... But that's also linked to a guideline from 2011 or 2013, that program. And then the funding stops, but there's no budget left to revise or revisit it. … But it's also good to de-implement choosing wisely recommendations if they're no longer valid, or to review them.' – Representative 33, guideline developer

Facilitator	Exemplary quote corresponding to the facilitator
Various funders of guidelines require guideline developers to meet implementation criteria as a prerequisite for funding the development of guidelines	'That varies, you know, because with [guideline organization A] it's really a side issue, and with [guideline organization B] it's also somewhat important, but if it's funded by [guideline organization C], then implementation becomes more significant, and they often have to conduct pilot implementations.' – Representative 27, national organization
Healthcare facilities receive financial compensation in exchange for creating an implementation action plan	'So, there's an obligation to make efforts. ... So, each hospital must create an implementation plan for the Implementation Agenda, and in return, they receive a 1.62% increase in all prices to compensate for wage increases and similar expenses. That's a bit of a motivator: you get a bit more money from the healthcare insurers, however, you must make a plan for ZE&GG every year at the very least. That's a very strong promoting factor.' – Representative 1, national organization

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
External pressure	Guideline organizations have insufficient mandate/power to push implementation, compared to significant healthcare professional autonomy	'I think that might also be one of the biggest obstacles we face as [guideline organization], that we provide a lot of advice, deliver reports, facilitate, but actually, we can't do much when it comes to implementation. You see, if it doesn't happen, we don't really have leverage. That sounds very negative, but yeah, then it kind of stops there. So we are mainly facilitative and directional.' – Representative 23, governmental agency
	Priority towards developing/ revising guidelines rather than disseminating/implementing them	'A barrier is the competition between the time spent on revising the guideline versus the time spent on dissemination and implementation.' – Representative 15, guideline developer
Available capacity/ resources	Guideline organizations lack the capacity/resources to handle the multitude of (quality) tasks, including implementation of guidelines, and therefore have to determine which quality initiatives to prioritize	'I think what's very important is: there are no resources available. A lot is being demanded from scientific organizations, also by the government. Through agreements and through guidelines, and yeah, it's not possible to do everything. ... So it's really just resources and time.' – Representative 33, guideline developer
Inner setting domain		
Structural characteristics	*No barriers were mentioned in this category.*	

	Facilitator	Exemplary quote corresponding to the facilitator
	Health and Youth Care Inspectorate (IGJ) can use its authority/power to push implementation in healthcare facilities	'Only, [the IGJ] had enforcement power. On the other hand, [the IGJ] also relied on what the doctors had decided because the Inspectorate doesn't come up with anything new. It doesn't say: 'you must do this or that'. But if the doctors say: 'this is the best practice and it's not happening', then the Inspectorate can enforce it at some point: 'Sir or Madam, why are you doing something different? Because we've all agreed on this'. That was a very good collaboration, keeping each other informed of what we're doing ... So we moved forward together. But it does indicate: it's a strong driver when the IGJ says something must be done.' – Representative 17, guideline developer
	No facilitators were mentioned in this category.	
	Aligning information technology infrastructure with the guideline	'What I believe works even better, and that's currently happening with the fracture prevention project: there's a new guideline. Now, an [electronic health record software] module is also being adapted and implemented. ... So if you present it ready-made, such a system they can easily adopt, then it does happen.' – Representative 6, governmental agency
	Structural attention to guidelines in healthcare professional practice meetings (e.g. handovers, multidisciplinary consultations)	'At the moment, the most you can do is hold each other accountable. For example, large interdisciplinary meetings or handover moments can help. Like the morning handover where admitted patients are discussed, or during a case discussion where someone says, hold on, don't we have guidelines for this? It says this and that.' So, holding each other accountable in that way. Those are the tools that work best.' – Representative 17, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Relational connections	*No barriers were mentioned in this category.*	
Communications	Open communication across hierarchical structures (e.g. work experience, nurse-physician relationship) about changing practice is perceived as challenging	'Then a nurse, fresh from training, arrives. They come with new knowledge to a department, and a nurse who has been working there for many years might say, 'we simply don't do this here', for example, or 'we do this, but in a different way'. And we see that for instance younger nurses find it very challenging to have these kinds of conversations with their colleagues.' – Representative 12, national organization
Culture	*No barriers were mentioned in this category.*	

	Facilitator	Exemplary quote corresponding to the facilitator
	Healthcare facilities with short communication lines between healthcare professionals, IT, and management adapt to guidelines more quickly	'In a clinic, when they say: we need to adjust the process, they adapt the entire process, and it's usually done quite quickly. Because communication lines are very short in clinics, things can happen very quickly. The medical director is often also a physician and a manager, and they often still see patients. So, if they understand that changes need to be made, they adjust their processes, and the entire clinic follows suit all at once.' – Representative 7, national organization
	No facilitators were mentioned in this category.	
	Healthcare facility and healthcare professionals are learning-centered	'As a physician, you tend to do things automatically because it's how you've always done them. So, it's important to stay updated on the latest insights, to value the innovation of your field, to prioritize lifelong learning, to maintain interest in both the individual patient and the broader population. It's not just about performing actions that are deemed correct, but also considering the impact of those actions on the patient and beyond the facility. All these aspects play a role in implementation. It's not just about writing down and saying: 'This is how we'll do it now.' It's about taking action, changing behaviors, and learning new things.' – Representative 27, national organization
	Culture of adhering to guidelines ingrained within the profession	'I don't have specific numbers, but I believe we have a relatively high level of guideline implementation. I can't provide specific success stories off the top of my head, but I think within [specialist profession], and also from what I gather from medical training, there's a strong adherence to the guidelines. Deviation is always allowed, but the guidelines have been quite well integrated within the professional group.' – Representative 2, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Relative priority	Healthcare facilities need to determine which quality initiatives (e.g. programs, guidelines) to prioritize and implement, given the abundance of initiatives, limited capacity/funding and the compatibility of the requested organizational changes	'But it would be good if [quality initiatives] were more connected to each other, because you see hospitals being overwhelmed with programs ... Laws, regulations, and guidelines are things you really have to comply with, and external accountability of quality figures, for example... But we simply don't have time to do all that.' – Representative 5, national organization
Available resources	*No barriers were mentioned in this category.*	
Access to knowledge & information	*No barriers were mentioned in this category.*	
Individuals domain (roles subdomain / characteristics subdomain)		
Implementation leads / motivation	*No barriers were mentioned in this category.*	
Implementation team members / capability	Guideline committee insufficiently considers or lacks the necessary expertise to address the implementability of the guideline during its development process	'The success of implementation also depends on how well the guideline is constructed. Has implementability been adequately considered in that guideline? Is there sufficient capacity to make changes? Is the physician population ready to tackle things differently? Is there enough funding? Is the hospital willing to invest? So, those are all aspects that you actually need to discuss very thoroughly when [developing] a guideline. And I see that that is not always the case.' – Representative 27, national organization

Facilitator	Exemplary quote corresponding to the facilitator
No facilitators were mentioned in this category.	
Healthcare facility has allocated funding to enable healthcare professionals to dedicate time to implementation	'The nurses who are working on it, also receive time for it from the hospital. So they get a few hours per week to dedicate to [program]. Because ultimately, it should also save time for the nurse, as they are omitting various tasks that do not add value for the patient.' – Representative 1, national organization
Implementation Agenda raises awareness within healthcare facilities about the need for implementation and their responsibility in the process	'The health insurers and hospitals have made an agreement that they will have implemented a certain percentage of the Implementation Agenda in hospitals within a certain timeframe. This has made hospitals aware of their responsibility in implementation.' – Representative 32, guideline developer
Dedicated implementation leader	'But there must be passionate healthcare professionals who are willing to help other hospitals implement something. Because you also see that with implementation research, there really needs to be a project leader who needs to be freed up to implement something. ... So there must be a program leader or project leader who initiates things, as with 'Choosing Wisely', and then you get things done.' – Representative 6, governmental agency
No facilitators were mentioned in this category.	

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
	Guideline committee lacks adequate expertise in planning/executing implementation strategies	'But the people who sit on the guideline committee, they are a different type of people. They are not people who are engaged in actively moving things forward, but rather on researching or searching the literature. … But they are not the type of people who say, 'Hey, why haven't you done that yet?'' – Representative 17, guideline developer
Implementation team members / opportunity	Guideline committee has insufficient capacity/ time to plan/execute implementation strategies	'There is substantial brainstorming about creating podcasts, webinars, micro learning quizzes, all these methods to get guidelines to the user. ... However, this often depends heavily on the commitment of guideline committee members. Whether such ideas actually materialize depends on factors like budget and time availability. But very often, it seems like voluntary work from the committee members to engage in these extra activities.' – Representative 18, guideline developer
Implementation team members / motivation	Guideline committee lacks motivation to plan/execute implementation strategies	'Well, one thing is whether a committee member wants to do it. I think that's actually quite important. For example, if you look at creating educational material, if no one feels compelled to create or write it, well, then it doesn't happen. Because I'm not going to do it. I don't have the subject matter expertise.' – Representative 15, guideline developer
Innovation deliverers / need	*No barriers were mentioned in this category.*	

Facilitator	Exemplary quote corresponding to the facilitator
No facilitators were mentioned in this category.	
No facilitators were mentioned in this category.	
There is a strong demand among healthcare professionals for a specific guideline (e.g. there is a high level of uncertainty)	'For example, that guideline on asthma and pregnancy is highly appreciated, I know. I think it's because everything wasn't quite well-known yet, and people were really searching for some certainty and something to rely on. So, there was just a great desire for such a guideline, you can really feel it.' – Representative 34, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Innovation deliverers / capability	Certain medical professional groups are not yet accustomed to using guidelines	'... I think that for example, for medical specialists, it is very natural that there is a guideline and they also know what is in that guideline and act accordingly. However, I think that's not necessarily the case for our professional group. I think we are becoming increasingly aware of this and figuring out how we are going to approach it. We can develop beautiful things, but we also need to ensure that this awareness is established in the first place.' – Representative 3, guideline developer
	Healthcare professionals are hesitant to (de-)implement out of fear of causing harm to patients	'Everyone is more inclined towards the paradigm of always doing something because it might help, rather than doing nothing, because then you don't know. ... And perhaps then I have to face the disciplinary judge, and then all of the Netherlands will come down on me.' – Representative 25, health insurer
	Healthcare professionals have insufficient implementation expertise	'Yes, especially the expertise in implementing within the field. At the moment, that's a very important component, which we currently see is insufficient.' – Representative 14, governmental agency
	Healthcare professional's lack of confidence/ knowledge/skills to execute guideline	'So, that also reveals another barrier, namely skills, and also sometimes the lack of self-confidence. That a guideline is just very high in information and complex to understand.' – Representative 4, guideline developer
	Healthcare professionals' fear of going against patients' expectations/wishes	'But when a patient makes a request to you, it's very difficult to say no.' – Representative 25, health insurer
Innovation deliverers / opportunity	Healthcare professionals struggle with keeping track of and implementing the multitude of guidelines due to limited capacity and time constraints	'I think there are just a lot of guidelines, and I wonder how anyone could possibly have all of them memorized in intricate detail. It makes me wonder, guys: it's simply not humanly possible to adhere to all of them.' – Representative 26, governmental agency

	Facilitator	Exemplary quote corresponding to the facilitator
	Train implementation science practitioners to improve implementation expertise	'We have developed a 1.5-year training program for implementation coaches. Bachelor-level nurses have completed this program, where they learn the knowledge and skills needed to implement a guideline within their organizations.' – Representative 3, guideline developer
	No facilitators were mentioned in this category.	

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Innovation deliverers / motivation	Healthcare professionals experience guideline fatigue	'There is also something called change fatigue, so that something new keeps coming up and people are fed up with it. ... There are simply limits to what people can handle.' – Representative 11, national organization
	Healthcare professionals cling to old habits and routines	'You are still open to learning new things now, but if you've been at it for 30 years already, doing it for 30 years based on a certain belief and with a certain experience. Yes, then it's more difficult to change your behavior than if you're still open to learning.' – Representative 25, health insurer
	Healthcare professionals experience cognitive dissonance between their past/current practices and the guideline-recommended practices	'Cognitive dissonance. ... Before you overcome that, it really requires you to be open to the question: I used to do it right, but maybe today things are different and better. ... That's quite an insight to have, and I imagine it's not really pleasant." – Representative 17, guideline developer
	Healthcare professionals perceive guidelines as restricting their professional autonomy	'Another inhibiting factor is that many professionals believe that protocols, guidelines, and standards limit their [practice] freedom. They think that this prevents them from delivering personalized care effectively. … They consider it important to deliver good and personalized care based on the patient's needs, viewing guidelines and standards as constraints.' – Representative 29, guideline developer
Implementation process domain		
Assessing needs	*No barriers were mentioned in this category.*	

Facilitator	Exemplary quote corresponding to the facilitator
Healthcare professionals are intrinsically motivated to improve and deliver good care	'... Nurses feel the responsibility very strongly. 'If I don't do it right, I put my patient in danger, so I want to know exactly what I need to do.' That's really beneficial because it means they're also willing to look at that guideline, or at least willing to listen when we say, 'listen, with this or that topic, things aren't going quite smoothly. So we've developed a guideline.' They feel that necessity.' – Representative 4, guideline developer
Through close engagement with stakeholders, guideline organizations can better understand their implementation needs and effectively facilitate them	'So I think it's especially the very close contact with the intended target audience. In that regard, I believe we deviate somewhat from what other policy organizations do. Instead of sitting in an ivory tower, coming up with what the field needs, we genuinely try to gather from the field itself what they need and facilitate them in that.' – Representative 1, national organization

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Planning	Guideline implementation plan is very concise, not concrete and/or copied from a previous guideline	'That's really an issue that needs much more attention. You see all the umbrella organizations throwing themselves with all their verve, energy, and resources into developing guidelines. And then, in essence, the implementation is just a standard A4 sheet, where they, so to speak, put the guideline title on top, fill in a few empty text fields, and hang it in the guideline database. And then hope that the doctor finds that guideline and applies it.' – Representative 27, national organization
	No adequate attention/ follow-up/action to guideline implementation plan/pilot implementation	'There should be an implementation plan. That is delivered within the guideline, but actually, very little is done in executing the plan, and that's really the step that still needs to be taken, for quite some time now.' – Representative 21, guideline developer
	Implementation is not addressed throughout the process, but only in the last phase	'It's also somewhat the case that with a guideline, implementation is the final piece, so it's the last thing people do. 'Oh, you also need to make an implementation plan' and then there's relatively little attention given to it.' – Representative 32, guideline developer
Tailoring strategies	Guidelines are published in different guideline databases which makes it less user-friendly and creates uncertainty about guideline currency and quality	'And we see that a number of organizations [lists organizations] actually do not use the Registry. And that leads to contamination. This results in outdated quality standards being included in the Registry of the National Health Care Institute. This leads to a lack of transparency. That was a goal in itself of the Registry, that it is transparent what is considered good care. That is not the case when every professional group maintains its own guidelines database.' – Representative 26, governmental agency

Facilitator	Exemplary quote corresponding to the facilitator
Creating a detailed step-by-step plan for the implementation process	'We described the patient information process very well, detailing how we would proceed. We did this for summary cards. And for other things. Like news items. So, we've created several good process descriptions. I find that beneficial.' – Representative 15, guideline developer
Addressing implementation and engaging stakeholders early on, already in the guideline development process	'Thinking ahead about how you can potentially map things out with benchmarking data, which we know can be very useful for implementation. If you're already thinking about this in the way you develop the guideline. And involving relevant stakeholders in a timely manner. … So that you can address any obstacles upfront instead of trying to patch things up afterwards. – Representative 1, national organization
Ensuring easy access to guideline content for end users (through guideline database and patient information)	'Well, a significant step has already been taken with the guideline database, ensuring it's located in a central place and not kept behind restricted access websites.' – Representative 9, guideline developer

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
	Implementation strategies are not tailored to guideline end users	'Furthermore, these guidelines are published in the guideline database of the Dutch Association of Medical Specialists. … I just notice that they are less easily accessible for our target audience there, as it doesn't entirely align with the information needs system of [medical specialist], and perhaps other medical specialists as well.' – Representative 33, guideline developer
Engaging	Forgotten/late engagement of stakeholders in the implementation planning/execution	'Yes, but then it's important that [guideline organization] is involved as early as possible, to ensure that the entire document, along with all recommendations, isn't finalized prematurely, leading to the subsequent discovery that it's not feasible. It's better to discuss that at the beginning of the process.' – Representative 5, national organization
Doing	No standardized guideline development and implementation process	'Then you should really take a moment to consider: how can we ensure that we streamline it as much as possible? So that it's easier for everyone to understand. All those different definitions of guideline types, the entire process, all those different entities involved. It should be more standardized.' – Representative 5, national organization

Facilitator	Exemplary quote corresponding to the facilitator
Empowering patients through the development of guideline information specifically for patients	'But the patient in the waiting room says, 'Hello. I've read that guideline, you know, because I received it from my patient association, which has translated it into text that we understand. Why haven't you mentioned that treatment option?' Yes, it can also be justified for the doctor to say, 'you have a completely different diagnosis, but please explain.' This also keeps the doctor sharp.' – Representative 17, guideline developer
A communication advisor is involved and assists implementation	'Well, I find it helpful that a communications advisor is very closely involved with us. ... They sometimes see opportunities that we might not notice ourselves. Like, 'Oh, here's a good opportunity for a news item', and then you think, 'Oh yeah, that's newsworthy too'. ... I find it helpful that she observes, reads, asks questions, gives advice; I find that beneficial.' – Representative 15, guideline developer
No facilitators were mentioned in this category.	

Implementation barriers and facilitators (continued)

Categories of implementation determinants (classified by the updated CFIR)	Barrier	Exemplary quote corresponding to the barrier
Reflecting & evaluating	Insufficient good quality data on the success of implementation	'What we really miss in these kinds of discussions is data. How does it actually work in practice? How often do we go left? How often do we go right? How significant is the practice variation? What else do we need to achieve implementation? So, we're really missing data. We would really like to have that.' – Representative 32, guideline developer
	Balancing the need for data collection for measuring implementation success against the perceived burden of administration is challenging	'In an ideal world, you would collect precise data for the specific topics on the Implementation Agenda. So literally, people would have to input how often they still do something. Because then you can uniformly extract from each system how people are doing with implementation. But, of course, that imposes a massive administrative burden, which is not desirable at all. Because ultimately, people should be able to provide care and not spend the whole day behind a computer.' – Representative 1, national organization

Implementation determinants are classified according to the updated CFIR [1]. Definitions and detailed descriptions of the updated CFIR concepts are presented in the additional files of Damschroder et al. (2022).
Quotes are translated from Dutch.
Implementation determinants that did not fit in the original updated CFIR were classified and added in *italicized* text.

REFERENCE

1. Damschroder, L.J., Reardon, C.M., Widerquist, M.A.O., and Lowery, J. *The updated Consolidated Framework for Implementation Research based on user feedback*. Implement Sci, 2022. **17**(1): p. 75. DOI: 10.1186/s13012-022-01245-0.

Facilitator	Exemplary quote corresponding to the facilitator
Audit & feedback benchmark information is useful to support implementation and evaluation	'Measuring certain outcomes allows you to say, 'wait a moment, these outcomes could be better, what is the problem?' And then you come back to the guideline: 'oh yes, others do this differently and that's why it's better'. So, in addition to education, also evaluating what you have done. So, looking back, sometimes setting up dashboards to see how you are doing. Anyway, providing feedback helps.' – Representative 17, guideline developer

APPENDIX 13. COMPLETED COREQ (CONSOLIDATED CRITERIA FOR REPORTING QUALITATIVE RESEARCH) CHECKLIST

Completed COREQ (COnsolidated criteria for REporting Qualitative research) checklist

Topic	Guide Questions/description
Domain 1: Research team and reflexivity	
Personal characteristics	
1. Interviewer/ observator	Which author(s) conducted the interviews and observations?
2. Credentials	What were the researcher's credentials? (e.g. PhD, MD)
3. Occupation	What was their occupation at the time of the study?
4. Gender	Was the researcher male or female?
5. Experience and training	What experience or training did the researcher have?
Relationship with participants	
6. Relationship established	Was a relationship established prior to study commencement?
7. Participant knowledge of the interviewer	What did the participants know about the researcher? (e.g. personal goals, reasons for doing the research)
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? (e.g. bias, assumptions, reasons and interests in the research topic)
Domain 2: study design	
Theoretical framework	
9. Methodological orientation and theory	What methodological orientation was stated to underpin the study? (e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis)

	Details (manuscript page number, if reported)
	Observations and interviews were conducted by one author: AT (p. 11)
	AT: MSc IvB: PhD DD: Prof.Dr. MdB: Prof.Dr. HM: PhD
	AT: PhD researcher HM: assistant professor IvB: advisor and researcher DD: professor and chief scientific officer MdB: professor and director
	All researchers were female
	The author that conducted observations and interviews had a background in health policy studies, was trained in interviewing techniques and had interview and observation experience
	The author met the project leader of the asthma team once before the start of the study
	Participants knew the occupations of the observing/interviewing researcher, where she worked and the purpose of the research
	DD and IvB, besides their roles as researchers, were at the time of the study employed by the National Health Care Institute - the object of this study and the funder of the research project. Neither was involved in the Appropriate Care program during the study period. Although their affiliation may present a potential conflict of interest, this was mitigated through extensive group discussions on study design and interpretation of the findings. (p. 37)
	We employed framework analysis, using the updated Consolidated Framework for Implementation Research (CFIR), and thematic analysis to guide our data analysis and synthesis. (p. 9)

COREQ checklist (continued)

Topic	Guide Questions/description
Participant selection	
10. Sampling	How were participants selected? (e.g. purposive, convenience, consecutive, snowball)
11. Method of approach	How were participants approached? (e.g. face to face, telephone, mail, e-mail)
12. Sample size	How many participants were in the study?
13. Non-participation	How many people refused to participate or dropped out? Reasons?
Setting	
14. Setting of data collection	Where was the data collected? (e.g. home, clinic, workplace)
15. Presence of non-participants	Was anyone else present besides the participants and researchers?
16. Description of sample	What are the important characteristics of the sample? (e.g. demographic data, date)
Data collection	
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?
20. Field notes	Were field notes made during and/or after the interview or focus group?

	Details (manuscript page number, if reported)
	We selected the asthma care project, as the recommendations included were projected to enhance care for a large group of patients and yield substantial financial impact. Additionally, the program involved a broad coalition of stakeholder organizations including scientific/professional organizations from primary and secondary care, as well as health insurers and patient organizations. Examining the Institute's collaboration with these stakeholders was particularly interesting given their potentially differing interests. Timing also played a role: at the time of selection, the Room for Improvement report had just been published and the implementation phase was about to begin. The choice for the asthma care project was made in consultation with the Institute's Review Group, a panel overseeing and representing ongoing Appropriate Care projects. (p. 8) For the triangulation interviews, 7 key persons were selected through 'purposive' sampling [42] of information-rich informants. (p. 11)
	We contacted the asthma team via the Institute's Review Group/the authors working at the Institute. (p. 8)
	In the observations, 6 members of the Institute's asthma team and 28 representatives of stakeholder organizations were observed. For the triangulation interviews, 7 key persons were selected. (p. 11)
	No participants refused to participate or dropped out
	Observations were conducted in-person at the Institute or when meetings were online, via videoconference. Interviews were held via videoconference or at the Institute
	Only the researchers and participants were present.
	Roles in the organizations that they represent and occupation(s) (p. 11)
	An interview topic guide with prompts (Appendix 2) was developed and used during the interviews. The topic guide was not pilot tested, but iteratively adapted (Appendix 2)
	No repeat interviews were required.
	Interviews were audio recorded. (p. 11)
	Field notes were made during the interview.

COREQ checklist (continued)

Topic	Guide Questions/description
21. Duration	What was the duration of the interviews or focus group?
22. Data saturation	Was data saturation discussed?
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?
Domain 3: analysis and findings	
Data analysis	
24. Number of data coders	How many data coders coded the data?
25. Description of the coding tree	Did authors provide a description of the coding tree?
26. Derivation of themes	Were themes identified in advance or derived from the data?

	Details (manuscript page number, if reported)
	Interviews lasted between 30-80 minutes.
	Data saturation was not applicable.
	Selected quotes were verified through member checking by the respective representatives. (p. 11)
	The first author coded the data. Her work was cross-checked by the second author (p. 12)
	The authors did not provide a description of the coding tree, but it is available on request.
	Field notes and interview transcripts were analyzed using thematic analysis [45] and framework analysis [46]. Data were thematically analyzed by the first author while sensitizing on the roles, implementation planning approaches, implementation strategies and experiences of the Institute in relation to those of the involved stakeholder organizations and the determinants that influenced implementation success. We also compared the implementation practices with the Appropriate Care program theory [16, 27, 29] and with established scientific implementation theories and frameworks using framework analysis. The latter comparison was guided by various theoretical constructs. In terms of implementation planning, previous research suggests that selecting and tailoring implementation strategies using three specific approaches can enhance the implementation of recommendations [47-51]. Dissemination and implementation strategies that are (1) designed in engagement with relevant stakeholders and (2) selected and tailored to address existing barriers are more likely to improve professional practice [48, 49, 52]. (3) applying principles from implementation theories, models and frameworks (TMFs) to guide and shape these strategies can further enhance implementation outcomes [50, 51]. In our investigation of implementation planning approaches, we, therefore, conducted an in-depth exploration of whether the Institute and stakeholder organizations used pre-identified barriers, stakeholder engagement and implementation TMFs. The updated Consolidated Framework for Implementation Research (CFIR) [53] guided our analysis of the determinants that influenced the implementation process. CFIR is a widely used framework for characterizing and classifying implementation determinants of healthcare innovations [54]. The 2022 CFIR update incorporates various recognized implementation theories, such as the COM-B constructs of the Behavior Change Wheel [55]. It organizes determinants into five domains: 1) innovation (the recommendations being implemented), 2) inner setting (the setting in which the recommendations are implemented, e.g., healthcare facilities), 3) outer setting (the environment in which the inner setting exists, e.g., the health system), 4) individuals (the roles and characteristics of individuals, e.g., asthma team members, representatives of stakeholder organizations, healthcare professionals and patients) and 5) implementation process (the activities and strategies used for implementing the recommendations) [53]. The first author coded the data. Both deductive and inductive coding were applied. An initial codebook was developed based on the aforementioned (theoretical) constructs. The codebook was refined through open coding to incorporate emergent interesting themes from the data. (p. 12)

COREQ checklist (continued)

Topic	Guide Questions/description
27. Software	What software, if applicable, was used to manage the data?
28. Participant checking	Did participants provide feedback on the findings?
Reporting	
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? (e.g. participant number)
30. Data and findings consistent	Was there consistency between the data presented and the findings?
31. Clarity of major themes	Were major themes clearly presented in the findings?
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?

	Details (manuscript page number, if reported)
	Coding was done by hand and using MAXQDA (version 2022).
	In order to triangulate the observations and documentary research findings, the first author conducted interviews. Selected quotes from the interviews were verified through member checking by the respective representatives. (p. 11)
	Participant quotes were presented to illustrate the findings throughout the results section. Furthermore, Each quote is identified through a participant number and his/her role: 'asthma team member' or 'representative' of a stakeholder organization. (p. 14-31)
	We strived to present the study findings with clarity and consistency, aiming to accurately reflect the collected data.
	Yes, major themes are clearly presented throughout the results section, both in text (headings) and in a table. (p. 14-31 and Table 2)
	Yes, diverse cases and minor themes are clearly presented throughout the results section, both in text and in a table. (p. 14-31 and Table 2)

APPENDIX 14. INTERVIEW GUIDE

Translated from Dutch.

Introductory text

First of all, thank you for participating in this interview.

If you participate in this interview, you agree to the use of your answers for this study. I would like to ask for your permission to make an audio recording of this interview. I want to emphasize that the interview will remain confidential and that all data will be stored securely and encoded. The audio file will be deleted after it has been transcribed verbatim, with names of individuals anonymized. We adhere to the code of conduct for academic research and comply with applicable laws and regulations. Once the transcript is complete, I will send you the quotes we intend to use in our scientific article, so you can review and approve them.

Do you have any questions before we begin?

Are you okay with me starting the recording? **Start the recording**

Introduction

We will start this interview with some general questions about your work within your organization.

Topics and interview questions

Topic	Questions
Introduction	› Can you describe how and when you became involved in the asthma care project? › How many hours per week were you scheduled to work on the asthma care project? Did that change over time? › What were your expectations regarding the implementation of the improvement report? › Looking back, how have you experienced the past years of your involvement? › Has this changed over time? If so, what caused that?

Topics and interview questions (continued)

Topic	Questions
Involvement, role, responsibility, positioning	The implementation phase begins with a shift in responsibility between parties. Up until that point, the National Health Care Institute/asthma team members have been responsible for drafting the Room for Improvement report. For this, they engaged relevant stakeholders. For the implementation, responsibility is shifted to the 'parties in healthcare'. The idea is that they are responsible for implementing and realizing the improvement agreements - in line with the distribution of responsibilities within the healthcare system.
	The idea is that the National Health Care Institute plays a facilitative, supporting and connecting role, for example by facilitating meetings to share experiences and good practices, discuss barriers and facilitators for implementation and involve other relevant partners. › What do you think of this shift in responsibility? How has it worked out in practice? › What do you think of the role the National Health Care Institute has taken? › What do you think of the role the other parties have taken? › What is your opinion on how the role of lead organization has been fulfilled?
Voluntariness / collaborative basis	The implementation of the asthma care recommendations does not carry the same 'mandatory character' as, for example, an insurance package recommendation. Moreover, it is not supported by a formal agreement between parties, as is the case with for example the ZE&GG program and HLA agreements. › What impact has this had? (e.g. in terms of ownership, commitment, sense of urgency, compared to other tasks of the Institute) › How might the outcomes have differed if a more directive governance approach had been adopted?
Implementation planning and execution	› What is your opinion on how implementation was ultimately approached? › What do you think of the way implementation activities were selected? » Which factors played a role in choosing the implementation strategies? › For representatives: have you undertaken any additional implementation activities yourselves? *For example, circulate the report among members, publish articles or present the work at conferences* › What is your view on the implementation activities that were eventually undertaken?

Topics and interview questions (continued)

Topic	Questions
Barriers and facilitators	I would now like to discuss the factors that either facilitated or hindered the implementation of the asthma care recommendations. › What bottlenecks or barriers have you encountered in the implementation process? What problems did you face? Which factors have hindered implementation? » *For example: factors related to the characteristics of the recommendations, healthcare professionals, patients, involved stakeholders and organizations, required resources, capacity for organizational change, or social/political/legal factors.*
	› Which factors have actually facilitated implementation? » *For example: factors related to the characteristics of the recommendations, healthcare professionals, patients, involved stakeholders and organizations, required resources, capacity for organizational change, or social/political/legal factors.* › How do these factors influence the implementation of the asthma care recommendations, behavioral change among the target group, or the eventual healthcare outcomes?
Evaluation and perceptions of the implementation process	Looking back on the implementation process so far: › How do you feel the implementation process has gone up to this point? › What went well during the implementation process? › What did not go well or could have gone better? › If you could redesign the Appropriate Care program, would you do anything differently? If so, what? › What advice would you give to the National Health Care Institute? › What opportunities for improvement do you see? › What has been the added value of the improvement report?
Influence of the researcher	For asthma team members: › What do you think has been my influence as a participatory researcher on the implementation process?
Closing	› Are there any topics we haven't discussed that you believe are still relevant? › Do you have any questions for me? Thank you very much for participating in this interview.

SUMMARY

General introduction and aim

Today's healthcare systems are under significant strain from rising care demands, aging populations, costly treatments, workforce shortages and negative environmental impact of care delivery. Despite the vast potential to deliver effective care, both overuse of low-value services and underuse of high-value interventions remain common, with 10–30% of care in high-income countries estimated to be wasteful. Such inefficiencies compromise care-quality, accessibility and sustainability and cost billions.

To deliver appropriate care, healthcare decision-makers must assess the value of care services based on scientific evidence, clinical expertise, patient needs, contextual feasibility and costs. Given the exponential growth in scientific literature and the rapid evolution of care practices and alternative treatment options, it is no longer feasible for individual healthcare professionals to stay fully up to date on their own.

One way to address this challenge is through the use of clinical practice guidelines and health technology assessments (HTAs). These are evidence-based care recommendations that support evidence-based decision-making. Guidelines provide recommendations for appropriate care pathways based on scientific evidence, clinical expertise and patient values. They primarily guide healthcare professionals in medical decision-making. HTA evaluates the medical, economic, social and ethical implications of health technologies to inform policymakers, payers and healthcare administrators in making decisions regarding reimbursement, procurement and, in some cases, clinical practice.

The value of these evidence-based care recommendations lies not only in their rigorous development, but also in their effective implementation. Yet, we know from previous studies that implementation of recommendations in daily healthcare practice can be slow and complex.

Central organizations play a vital role in developing, authorizing and promoting the use of recommendations. This group includes scientific and professional organizations, knowledge institutes, patient organizations, governmental agencies, health insurers and other (inter)national or regional (umbrella) organizations. Improving uptake of evidence-based care requires support from these central bodies. They influence healthcare professionals' awareness, acceptability and applicability of care recommendations and their ability to carry out the recommendations. Furthermore, they can actively stimulate local implementation by selecting, tailoring and applying dissemination and implementation strategies. However, central organizations face implementation challenges. Many rely on local healthcare professionals and facilities to enact change.

The Dutch healthcare system, despite its high quality and structured approach, also faces challenges with inappropriate care and suboptimal implementation of recommendations. Dutch central organizations play a crucial role in addressing this gap. However, their implementation roles are under-researched.

This thesis examines the role of central organizations in the implementation of evidence-based care recommendations to advise on how to optimize their implementation efforts and ultimately improve healthcare outcomes. The research objectives of this thesis are:

- To gain insight into how central organizations can stimulate the implementation of recommendations in healthcare.
- To explore the determinants that central organizations perceive as influencing the implementation of recommendations.

Reviewing the role of central organizations in the implementation of guidelines in hospital care

In the first study presented in **Chapter 2**, we systematically reviewed how central organizations worldwide planned and executed dissemination and implementation strategies to stimulate the implementation of guidelines in hospital care. We analyzed the impact of these efforts and examined the determinants influencing implementation.

Of the 26 empirical studies that we included in the review, only 16 studies reported how they selected and tailored their dissemination and implementation strategies. Thirty-nine percent of the studies used implementation theories, models or frameworks, 23% reported engaging patients or healthcare professionals in the planning process and 19% of the studies pre-identified barriers (and facilitators) to implementation. These are planning approaches that are known to enhance guideline uptake and impact. The included studies reported 62 different implementation strategies, used in different combinations, ranging between 1 and 16 strategies per initiative. The most frequently reported implementation strategies were 1) educational sessions, 2) provision of additional implementation supporting materials, and 3) website publications. Eighty-five percent of initiatives that measured impact achieved improvements in adoption, knowledge, behavior and/or clinical outcomes. Eighteen studies reported in total 72 implementation barriers. The most frequently reported barrier was insufficient healthcare professionals' time and resources. Sixteen studies reported in total 42 implementation facilitators. The most frequently mentioned facilitator concerned guideline's (perceived) credibility, evidence base and relevance to practice.

No clear optimal approach for improving guideline uptake and impact was found. However, we found indications that using multiple interactive implementation strategies – particularly 'provide or request a protocol from hospitals aligned with

guidelines' and 'involve or inform hospital management in implementation' – may support better implementation. Additionally, the presence of facilitators such as support from internal hospital colleagues or departments (e.g. management and IT) or external organizations appears to be associated with improvements.

The role of Dutch central organizations in nationwide guideline implementation

In the second study in **Chapter 3**, we examined how Dutch central organizations plan, execute, monitor and evaluate guideline dissemination and implementation. We interviewed 35 representatives from 24 Dutch central organizations, including scientific and professional organizations, knowledge institutes, governmental agencies, health insurers, patient organizations and other national (umbrella) organizations.

Most central organizations made limited use of pre-identified implementation barriers, stakeholder input, and implementation theories, models, or frameworks when selecting and tailoring their dissemination and implementation strategies. Instead, they primarily relied on a standard set of predominantly dissemination and occasional implementation strategies known to be practical in terms of ease, cost and time. Commonly used strategies included the distribution, advertisement and presentation of guideline materials, as well as providing additional implementation supporting materials. Regarding monitoring and evaluation methods, few organizations assessed the process, outcome or impact of their guideline implementation efforts. Those that did, primarily relied on clinical peer review and benchmark information for their assessments.

While central organizations recognized and endorsed the importance of implementation, this did not consistently translate into tailored implementation actions. Most central organizations did not have an integrated, structural and well-thought-out plan for implementation or had a plan but did not execute it. The lack of regular, structured monitoring and evaluation raised uncertainties about the effectiveness of guidelines and implementation in supporting end users and improving patient outcomes. We recommend increasing institutional support and dedicated funding for implementation, adopting a systematic, evidence-based approach to implementation planning, and developing a national implementation agenda to prioritize the implementation of high-impact guidelines.

Implementation barriers and facilitators encountered by Dutch central organizations

The third study, presented in **Chapter 4**, explored the barriers and facilitators that the representatives of central organizations (the same as referenced in **Chapter 3**) perceived in nationwide guideline implementation, using interviews.

We found 45 different implementation barriers and 35 implementation facilitators. We identified seven overarching themes of interrelated barriers and facilitators that spanned across levels of the healthcare system and stakeholders involved:

1. Healthcare demand and resource availability – e.g. limited time and resources for both care delivery and implementation, compounded by rising care demands and the multitude of quality recommendations, initiatives and tasks.
2. Implementation knowledge and expertise – e.g. the gap in implementation knowledge and expertise among guideline committees, healthcare professionals and facilities.
3. Guideline characteristics: representation, evidence base and design – e.g. the extent to which guidelines reflected stakeholder interests and contexts and were supported by strong evidence.
4. Partnerships and collaboration – e.g. the level of collaboration and trust between stakeholders and the presence of formal collaborative agreements.
5. Characteristics of guideline implementation planning, execution and evaluation strategies – e.g. whether implementation was considered early in the guideline development process.
6. Characteristics of healthcare professionals: need, capability, opportunity and motivation – e.g. a bottom-up demand for guidance and healthcare professionals' knowledge, confidence and skills to execute the recommended care.
7. Legal and regulatory compliance – e.g. the presence of conflicting guidelines and regulations and the extent to which organizations had mandate to push implementation.

These findings help explain why healthcare professionals and facilities may (not), slowly or inconsistently adhere to guidelines in practice. Embedding implementation as a core objective of guideline development, supported by dedicated resources as well as better use of AI and modular updates to efficiently develop guidelines could free up time for and strengthen implementation.

A public HTA agency's role in nationwide implementation of asthma appropriate care recommendations

Chapter 5 entails an ethnographic case study. The study examines the role of a public HTA agency in stimulating the implementation of its appropriate care recommendations in practice and the determinants perceived to influence this process. We used the Dutch National Health Care Institute's Appropriate Care program asthma as a case study.

The Institute initially positioned itself in a facilitative role, delegating implementation responsibilities to healthcare professionals, facilities, patients, health insurers and their representative organizations. Due to factors such as limited capacity, competing improvement initiatives, insufficient commitment and co-dependency among stakeholders,

the process evolved into a more collaborative effort between the Institute and stakeholder organizations. Implementation strategies were partially selected and tailored based on pre-identified barriers and developed in close collaboration with stakeholders. However, implementation activities were not systematically guided by implementation theories, models and frameworks. The asthma care project primarily used dissemination strategies, with limited use of more interactive implementation strategies.

This study shows the complexity of national multi-stakeholder implementation initiatives. It highlights the importance of evidence-based, flexible and proactive implementation planning and cross-organizational coordination of roles, possibilities and actions. This includes integrating implementation considerations from the start and selecting and tailoring implementation strategies based on pre-identified barriers, collaboration with stakeholders, and implementation theories, models and frameworks. Future research could compare whether a more intensive collaborative approach and collective agenda-setting for nationwide quality improvement lead to more efficient and effective efforts and improved healthcare outcomes.

General discussion

In this thesis we examined the role of central organizations in the implementation of evidence-based care recommendations. The results of our research show that although central organizations recognized their responsibility in stimulating implementation, implementation efforts were not structurally prioritized, professionalized, embedded, nor supported by dedicated resources.

Implementation planning practices varied widely. While some central organizations used proven planning approaches to select and tailor their dissemination and implementation strategies, others primarily relied on replicating previously used strategies, strategy preferences of the recommendation committee or perceived practicality of strategies. Findings regarding the used dissemination and implementation revealed that central organizations employed a wide range of strategies, often combining multiple strategies. Central organizations mainly relied on dissemination strategies, and limitedly used interactive implementation strategies.

We also explored the determinants that central organizations perceived as influencing the implementation of recommendations. Studies revealed a consistency in the identified determinants, highlighting similarities between international initiatives and the Dutch implementation context. Key determinants included implementation resources and competing improvement initiatives; interdependence of organizations and coordination and alignment of policies and practices; strength of the evidence base and the perceived relevance and credibility of the recommendations; and factors related to central organizations' implementation approaches.

With regards to the limitations of this thesis, we primarily focused on the perspectives of central organizations. Also, we did not assess the direct impact of recommendations on clinical practice or patient outcomes. Furthermore, we could not ensure that our findings are representative of all Dutch central organizations.

In terms of implications for practice, policy and research, we conclude that implementation can be improved by more systematically pre-identifying barriers, engaging stakeholders, and applying implementation theories, models and frameworks to guide the design of strategies. Second, embedding implementation throughout the development process, supported by expert input and dedicated resources, is essential. Third, regularly evaluating what recommendations and approaches ultimately reach and resonate with end users can provide valuable insights for effective refinement of implementation efforts. Fourth, a coordinated national strategy and implementation agenda could be useful to prioritize high-impact recommendations and align implementation efforts across organizations. Fifth, central organizations could explore using transparent AI models to streamline and update evidence-based care recommendations in real time and provide clinical decision support based on guidelines. This could potentially allow them to focus more on contextualizing and implementing their recommendations and could significantly accelerate the adoption of real-time recommendation updates. Finally, integrating clear, actionable guidance into clinical decision support systems at the point of care can enhance usability and accelerate adoption of recommendations.

Overall, the findings highlight the need for a shift toward proactive, resource-supported and strategically guided implementation, with central organizations acting as navigators to support local healthcare professionals and facilities.

SAMENVATTING

Algemene introductie en doelstelling

Zorgsystemen staan onder grote druk door een toenemende zorgvraag, vergrijzing, dure behandelingen, personeelstekorten en de negatieve impact van zorg op het klimaat. Hoewel de potentie om hoge kwaliteit zorg te leveren groot is, zijn zowel overgebruik van zorg met lage waarde als ondergebruik van bewezen effectieve en waardevolle interventies aan de orde van de dag. Geschat wordt dat 10–30% van de geleverde zorg in hoge-inkomenslanden als verspilling kan worden beschouwd. Deze inefficiëntie ondermijnt de kwaliteit, toegankelijkheid en duurzaamheid van zorg en kost miljarden.

Om passende zorg te kunnen leveren, moeten stakeholders, zoals zorgprofessionals en zorginstellingen, de waarde van specifieke behandelingen beoordelen. Dit doen ze op basis van een aantal belangrijke beslissingscriteria, waaronder wetenschappelijk bewijs, klinische expertise, patiëntbehoeften, haalbaarheid en kosten. Door de exponentiële groei van wetenschappelijke literatuur, de snelle ontwikkeling van zorgmogelijkheden en de verscheidenheid aan alternatieve behandelopties, is het inmiddels niet meer haalbaar voor individuele stakeholders om van al deze ontwikkelingen op de hoogte te blijven.

Een manier om met deze uitdaging om te gaan is door klinische richtlijnen en Health Technology Assessment (HTA) te gebruiken. Dit zijn kwaliteitsadviezen die medische besluitvorming op basis van wetenschappelijk bewijs ondersteunen. Richtlijnen geven richting voor zorgverlening en komen tot stand op grond van een analyse van het best beschikbare bewijs, klinische expertise en patiëntervaringen. Ze zijn primair bedoeld om zorgprofessionals te ondersteunen bij medische besluitvorming. HTA beoordeelt de medische, economische, sociale en ethische implicaties van gezondheidstechnologieën om beleidsmakers, zorgverzekeraars en zorgbestuurders te informeren bij het nemen van beslissingen over vergoeding, inkoop en, in sommige gevallen, medische behandelingen.

De waarde van deze evidence-based kwaliteitsadviezen hangt niet alleen af van hun zorgvuldige ontwikkeling, maar ook van de mate waarin ze daadwerkelijk worden geïmplementeerd in de zorg. Uit eerdere wetenschappelijke studies weten we dat de implementatie in de dagelijkse praktijk vaak complex is en traag kan verlopen.

Naast zorginstellingen en zorgprofessionals spelen centrale organisaties een cruciale rol in het ontwikkelen, autoriseren en stimuleren van het gebruik van kwaliteitsadviezen. Deze groep bestaat uit wetenschappelijke verenigingen, beroepsorganisaties, kennisinstituten, patiëntenorganisaties, overheidsinstanties, zorgverzekeraars en andere (inter)nationale of regionale (koepel)organisaties. Het verbeteren van de implementatie van kwaliteitsadviezen vereist actieve betrokkenheid en ondersteuning van deze centrale partijen. Zij beïnvloeden het bewustzijn, de aanvaardbaarheid en uitvoerbaarheid van kwaliteitsadviezen. Echter,

ook zij ervaren uitdagingen bij implementatie. Veel van deze organisaties rekenen vooral op lokale zorgprofessionals en zorginstellingen om veranderingen door te voeren.

Hoewel het Nederlandse zorgsysteem bekend staat om zijn hoge kwaliteit en gestructureerdheid, kampt ook dit systeem met niet-passende zorg en suboptimale implementatie van kwaliteitsadviezen. Nederlandse centrale organisaties spelen een sleutelrol in het dichten van deze kloof. Echter, hun rol in implementatie is nog weinig onderzocht.

Dit proefschrift onderzoekt de rol van centrale organisaties bij de implementatie van evidence-based kwaliteitsadviezen, met als doel hun inspanningen te optimaliseren en uiteindelijk zorguitkomsten te verbeteren. De onderzoeksdoelen van dit proefschrift zijn:

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- Inzicht verkrijgen in hoe centrale organisaties de implementatie van kwaliteitsadviezen in de zorg kunnen stimuleren.
- Exploreren welke determinanten volgens centrale organisaties van invloed zijn op de implementatie van kwaliteitsadviezen.

De rol van centrale organisaties bij de implementatie van richtlijnen in ziekenhuiszorg

In de eerste studie, gepresenteerd in **Hoofdstuk 2**, hebben we een systematische review uitgevoerd om uit te zoeken hoe centrale organisaties wereldwijd de implementatie van richtlijnen met betrekking tot ziekenhuiszorg plannen en uitvoeren. We analyseerden de impact van deze inspanningen en onderzochten de factoren die implementatie beïnvloeden.

Van de 26 geïncludeerde empirische studies rapporteerden slechts 16 hoe zij hun verspreidings- en implementatiestrategieën selecteerden en op maat maakten. In 39% van de studies werden implementatietheorieën, -modellen of -raamwerken gebruikt, 23% betrok patiënten of zorgprofessionals bij de planningsfase, en 19% identificeerde vooraf barrières (en bevorderende factoren) voor implementatie. Dit zijn planningsmethodes waarvan we uit eerder onderzoek weten dat ze de toepassing en impact van richtlijnen kunnen bevorderen.

De geïncludeerde studies beschreven in totaal 62 verschillende implementatiestrategieën, toegepast in uiteenlopende combinaties, variërend van 1 tot 16 strategieën per initiatief. De meest gerapporteerde strategieën waren: 1) educatieve sessies, 2) het aanbieden van aanvullende implementatie ondersteunende materialen, en 3) publicaties op websites. Van de studies die de impact van hun initiatieven hadden gemeten, rapporteerde 85% verbeteringen in adoptie, kennis, gedrag en/of klinische uitkomsten. Achttien studies rapporteerden in totaal 72 implementatiebarrières, waarvan de meest genoemde het

gebrek aan tijd en middelen voor implementatie bij zorgprofessionals was. Zestien studies rapporteerden in totaal 42 bevorderende factoren, waarvan de meest genoemde de (ervaren) geloofwaardigheid, wetenschappelijke onderbouwing en praktijkrelevantie van de richtlijn betrof.

We vonden geen eenduidige, optimale aanpak die de implementatie en impact van richtlijnen consequent verbeterde. Wel vonden we aanwijzingen dat het gebruik van meerdere interactieve implementatiestrategieën – met name het aanbieden of aanvragen van een protocol in lijn met de richtlijnen en het informeren of betrekken van het management van het ziekenhuis – de implementatie kan bevorderen. Daarnaast lijkt ook de aanwezigheid van bevorderende factoren zoals steun van interne ziekenhuiscollega's of afdelingen (bijv. management en IT) of externe organisaties, samen te hangen met verbeteringen.

De rol van Nederlandse centrale organisaties bij landelijke implementatie van richtlijnen

In de tweede studie, beschreven in **Hoofdstuk 3**, onderzochten we hoe Nederlandse centrale organisaties de verspreiding en implementatie van richtlijnen plannen, uitvoeren, monitoren en evalueren. We interviewden 35 vertegenwoordigers van 24 Nederlandse centrale organisaties, waaronder wetenschappelijke verenigingen en beroepsorganisaties, kennisinstituten, overheidsinstanties, zorgverzekeraars, patiëntenorganisaties en andere nationale (koepel)organisaties.

De meeste centrale organisaties maakten beperkt gebruik van vooraf geïdentificeerde implementatiebarrières, input van belanghebbenden en implementatietheorieën, -modellen of -raamwerken bij het selecteren en op maat maken van hun verspreidings- en implementatiestrategieën. In plaats daarvan maakten zij voornamelijk gebruik van een standaard set van vooral verspreidings- en incidenteel implementatiestrategieën, gekozen vanwege hun praktische uitvoerbaarheid met betrekking tot tijd, kosten en eenvoud. Veelgebruikte strategieën waren onder andere het verspreiden en presenteren van richtlijnen, evenals het aanbieden van aanvullende implementatie-ondersteunende middelen. Wat betreft monitoring en evaluatie, evalueerden slechts enkele organisaties het proces, de implementatie of de impact van hun implementatie-inspanningen. Degenen die dat wel deden, deden dit voornamelijk door middel van visitatie en benchmarking.

Hoewel Nederlandse centrale organisaties het belang van implementatie erkennen en benadrukken, leidde dit niet altijd tot gerichte implementatieacties. De meeste organisaties beschikten niet structureel over een doordacht implementatieplan, of hadden er wel een maar voerden deze niet uit. Het ontbreken van gestructureerde monitoring en evaluatie riep vragen op over de effectiviteit van richtlijnen en de manier waarop

ze geïmplementeerd werden in het ondersteunen van eindgebruikers en het verbeteren van patiëntuitkomsten. Onze aanbevelingen omvatten het versterken van institutionele steun en gerichte financiering voor implementatie, het toepassen van een systematische, evidence-based implementatie planningsaanpak en het ontwikkelen van een nationale implementatieagenda om de implementatie van high-impact richtlijnen te prioriteren.

Implementatiebarrières en bevorderende factoren volgens Nederlandse centrale organisaties

In de derde studie, gepresenteerd in **Hoofdstuk 4**, onderzochten wij op basis van interviews de barrières en bevorderende factoren die vertegenwoordigers van centrale organisaties (dezelfde als in **Hoofdstuk 3**) ervaren bij de landelijke implementatie van richtlijnen.

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We identificeerden 45 verschillende implementatiebarrières en 35 bevorderende factoren. Deze konden worden ondergebracht in zeven overkoepelende thema's van onderling samenhangende determinanten, die op verschillende niveaus van het zorgsysteem en bij verschillende betrokken stakeholders een rol speelden:

1. Zorgvraag en beschikbaarheid van middelen – bijvoorbeeld beperkte tijd en middelen voor zowel de implementatie van de richtlijnen als het uitvoeren van de aanbevolen zorg, versterkt door de toenemende zorgvraag en de veelheid aan kwaliteitsadviezen, initiatieven en taken.
2. Kennis en expertise over implementatie – bijvoorbeeld het gebrek aan implementatiekennis en -expertise bij richtlijncommissies, zorgprofessionals en zorginstellingen.
3. Kenmerken van richtlijnen: representatie, wetenschappelijke basis en design – bijvoorbeeld de mate waarin richtlijnen aansluiten bij belangen en contexten van stakeholders en zijn onderbouwd met sterk wetenschappelijk bewijs.
4. Partnerschappen en samenwerking – bijvoorbeeld het niveau van samenwerking en vertrouwen tussen stakeholders en de aanwezigheid van formele samenwerkingsafspraken.
5. Kenmerken van implementatieplanning, uitvoering en evaluatie – bijvoorbeeld of implementatie al in een vroeg stadium van richtlijnontwikkeling werd geadresseerd.
6. Kenmerken van zorgprofessionals: behoefte, capaciteit, gelegenheid en motivatie – bijvoorbeeld een grote vraag vanuit de praktijk naar specifieke richtlijnen en de aanwezigheid van kennis en vaardigheden van zorgprofessionals om de aanbevolen zorg uit te voeren.
7. Wettelijke en regelgevende kaders – bijvoorbeeld tegenstrijdige richtlijnen en regelgeving en de mate waarin organisaties formeel mandaat hebben om implementatie te stimuleren.

Deze bevindingen helpen verklaren waarom zorgprofessionals en zorginstellingen richtlijnen in de praktijk wel, niet, traag of inconsistent naleven. Door implementatie als kernonderdeel in richtlijnontwikkeling te verankeren, ondersteund door gerichte implementatiemiddelen en gebruik te maken van AI en modulaire updates voor efficiëntere richtlijnontwikkeling, kunnen mogelijk tijd en middelen worden vrijgemaakt die kunnen worden gebruikt om implementatie te versterken.

De rol van een publieke HTA-instantie bij de landelijke implementatie van aanbevelingen voor passende zorg bij astma

Hoofdstuk 5 betreft een etnografische casestudie en onderzocht de rol van een publieke HTA-instantie bij het stimuleren van de implementatie van een kwaliteitsadvies voor passende zorg in de Nederlandse praktijk. Als casus gebruikten we het astma verbetersignalement van het *Zinnige Zorg programma* (later: *Passende Zorg verbetertrajecten*) van Zorginstituut Nederland.

Voor implementatie van het astma verbetersignalement positioneerde het Zorginstituut zich aanvankelijk in een faciliterende rol, waarbij de verantwoordelijkheid voor implementatie werd gedelegeerd naar zorgprofessionals, zorginstellingen, patiënten, zorgverzekeraars en hun vertegenwoordigende organisaties. Door factoren zoals beperkte implementatiecapaciteit, de vele verbeterinitiatieven en geringe betrokkenheid van onderling afhankelijke organisaties ontwikkelde het proces zich tot een meer gezamenlijke implementatie-inspanning van het Zorginstituut en de betrokken organisaties. Implementatiestrategieën werden deels geselecteerd en afgestemd op basis van vooraf geïdentificeerde barrières en in nauwe samenwerking met stakeholders ontwikkeld. Implementatietheorieën, -modellen of -raamwerken werden echter niet systematisch gebruikt om implementatieactiviteiten vorm te geven. Betrokken organisaties maakten voornamelijk gebruik van verspreidingsstrategieën. Meer interactieve implementatiestrategieën werden beperkt ingezet.

Deze studie laat de complexiteit van nationale implementatie-initiatieven met meerdere stakeholders zien. Onze bevindingen benadrukken het belang van op implementatietheorie gebaseerde, flexibele en proactieve implementatieplanning en van organisatie-overstijgende coördinatie van rollen, mogelijkheden en acties. Dit betekent dat er vanaf de start rekening wordt gehouden met implementatievraagstukken en dat voor het selecteren en op maat maken van implementatiestrategieën evidence-based planningsstrategieën worden gebruikt. Toekomstig onderzoek zou kunnen vergelijken of een intensievere samenwerkingsaanpak en gezamenlijke agendering voor landelijke kwaliteitsverbetering kunnen leiden tot efficiëntere en effectievere implementatie inspanningen en betere gezondheidsuitkomsten.

Algemene discussie

In dit proefschrift onderzochten we de rol van centrale organisaties bij de implementatie van evidence-based kwaliteitsadviezen. De resultaten van ons onderzoek laten zien dat, hoewel centrale organisaties hun verantwoordelijkheid in het stimuleren van implementatie erkennen en benadrukken, implementatie niet structureel wordt geprioriteerd, geprofessionaliseerd, ingebed of ondersteund met gerichte middelen.

De manier waarop implementatie wordt aangepakt, verschilt sterk tussen organisaties. Sommige centrale organisaties maken gebruik van bewezen planningsmethoden om hun verspreidings- en implementatiestrategieën te selecteren en op maat te maken, terwijl anderen vooral terugvallen op eerder gebruikte strategieën, strategievoorkeuren van de richtlijncommissie of praktische strategieën. Met betrekking tot verspreidings- en implementatiestrategieën blijkt dat centrale organisaties een breed scala aan strategieën inzetten en dat ze vaak een combinatie van strategieën gebruiken. Centrale organisaties maken voornamelijk gebruik van verspreidingsstrategieën en maar beperkt gebruik van interactieve implementatiestrategieën.

We onderzochten ook welke determinanten volgens centrale organisaties van invloed zijn op de implementatie van kwaliteitsadviezen. De studies toonden een enigszins consistente set van factoren, wat wijst op overeenkomsten tussen internationale initiatieven en de Nederlandse implementatiecontext. Belangrijke determinanten waren onder andere: beperkte beschikbare middelen voor implementatie en een groot aantal verbeterinitiatieven; onderlinge wederzijdse afhankelijkheid van organisaties en benodigde afstemming van beleid en inzet; de kracht van de wetenschappelijke onderbouwing, ervaren relevantie en geloofwaardigheid van kwaliteitsadviezen; en factoren gerelateerd aan de implementatieaanpak van centrale organisaties.

Wat betreft de limitaties van dit proefschrift, richtten we ons voornamelijk op de perspectieven van centrale organisaties en lieten we bijvoorbeeld die van zorgprofessionals of zorginstellingen buiten beschouwing. Ook hebben we de directe impact van kwaliteitsadviezen of implementatiestrategieën op de klinische praktijk of patiëntuitkomsten niet (uitgebreid) onderzocht. Daarnaast kunnen we niet garanderen dat onze bevindingen breed representatief zijn voor (Nederlandse) centrale organisaties.

Met betrekking tot de implicaties voor praktijk, beleid en onderzoek concluderen we dat implementatie verbeterd kan worden door systematischer vooraf barrières te identificeren, belanghebbenden te betrekken en gebruik te maken van implementatietheorieën, -modellen en -raamwerken bij het ontwerpen van strategieën. Ook is het essentieel om implementatie vanaf het begin te integreren in het ontwikkelproces, ondersteund door implementatie-expertise en gerichte middelen. Daarnaast kan regelmatige evaluatie van

welke kwaliteitsadviezen en implementatiestrategieën daadwerkelijk de eindgebruikers bereiken en aanspreken, waardevolle inzichten opleveren voor het verbeteren van implementatie-inspanningen. Een gecoördineerde nationale implementatie agenda kan helpen om high-impact kwaliteitsadviezen te prioriteren en implementatie-inspanningen tussen organisaties beter op elkaar af te stemmen. Verder kunnen centrale organisaties overwegen om transparante AI-modellen te gebruiken om evidence-based richtlijnen (in real-time) te ontwikkelen en te actualiseren en om klinische besluitvorming te ondersteunen op basis van richtlijnen. Dit zou mogelijk meer tijd en middelen vrij kunnen maken voor het contextualiseren en implementeren van kwaliteitsadviezen en zou het gebruik van up-to-date kwaliteitsadviezen aanzienlijk kunnen versnellen en vergroten. Tot slot kan het laagdrempelig beschikbaar stellen van klinische beslissingsondersteuning op basis van de kwaliteitsadviezen in de spreekkamer de implementatie mogelijk bevorderen en versnellen.

Al met al onderstrepen onze bevindingen de noodzaak van een verschuiving naar een proactieve, goed ondersteunde en strategisch geleide implementatie, waarbij centrale organisaties gezamenlijk voor lokale zorgprofessionals en -instellingen de weg vrij kunnen maken naar passende zorg.

DANKWOORD

Het moment is eindelijk daar: mijn proefschrift is klaar!

It takes a village to raise a child – en het kost een heel leger aan collega's, familie en vrienden om Andrea door een PhD heen te wurmen. Dit alles had ik nooit kunnen bereiken zonder de onmisbare steun, aanmoediging en bijdragen van velen, die ik graag hiervoor wil bedanken.

Als eerste wil ik mijn (oud-)begeleiders bedanken: **Steffie**, **Martine**, **Diana**, **Ilse** en **Hanneke**. Mijn all-women sterrenteam, en wat voor een. Dankjewel **Steffie**, mijn co-promotor van het eerste uur. Vers uit de schoolbanken nam jij me onder je hoede en leerde je me de eerste fijne kneepjes van het PhD-vak. Toen twee weken na mijn aantreden de lockdown begon, heb jij me ongeschonden – op de review-trauma's na dan ;-) – door zowel de COVID-19 pandemie, als de eerste strubbelingen van een opstartende PhD heen gesleurd. Jammer dat we het niet samen hebben kunnen afmaken, maar ik heb warme herinneringen aan je begeleiding en onze tijd als collega's.

Dank ook aan **Martine**, mijn academische 'moeder'. Wij leerden elkaar kennen in 2018, toen ik stage liep bij de Inspectie. Wat fijn dat je aan mij dacht toen er een PhD-plekje vrijkwam. Altijd enthousiast, positief, energiek en met een eindeloze stroom aan ideeën. Het is bewonderenswaardig hoe je alle ballen in de lucht weet te houden en tegelijkertijd oog hebt voor elk individu. Je bent een opleider pur sang: niet alleen gefocust op het eindresultaat, maar vooral op het proces én de mens erachter. Je bood een PhD op maat – afgestemd op wie ik ben en wat ik nodig had. Bij gebrek aan afwisseling toverde je moeiteloos nieuwe klussen uit je mouw waarin ik mijn ei kwijt kon. Ook bij het zetten van vervolgstappen in mijn carrière ben je een constante bron van advies en steun geweest. Ik had me geen betere promotor kunnen wensen.

Dan **Diana**, de Wijze uit het Zuiden. Wat een enorme schat aan kennis zit er in jouw hoofd. En wat knap hoe je dat toch altijd weer zo duidelijk, gestructureerd en begrijpelijk over kunt brengen. Voor elke uitdaging een oplossing. Voor elk lastig concept een mooie metafoor. Je bent één van de slimste mensen die ik ken. Dankjewel voor je goede begeleiding en alles wat ik van je heb mogen leren. Het was een eer om met je samen te werken.

Veel dank ook aan **Ilse**, mijn insider bij het Zorginstituut. Dank voor je ervaringsdeskundigheid als beleidsmaker en geslaagd promovenda, de uurtjes waardevol overleg en advies en de vele pagina's – ik ben helaas niet bepaald kort van stof – die je naast je reguliere werk voor mij hebt zitten doorakkeren.

Hanneke, als mede-procrastinator weet jij als geen ander hoe heerlijk – zij het enigzins toxic – de rush van stress kan zijn waarop wij o zo lekker floreren. Als mede-niet-thuiswerker kon ik altijd op je rekenen voor gezellige gezamenlijke lunches (met als hoogtepunt de Surinaamse kip, óf als het echt feest was, één van jouw baksels), tussendoor klaagsessies als de rest van de wereld weer eens niet meewerkte, culinaire gesprekken over al het lekkers in de wereld én geweldige anekdotes over je vroegere Amsterdamse rave-verleden. Je was niet alleen mijn anticonceptie (haha), maar ook mijn rem op controledrang en perfectionisme. Je bent de snelst lezende die ik ken, een messcherpe feedbacker en een fantastisch docent. Ik gun iedereen zo'n kalme, warme, grappige en slimme begeleider als jij.

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Graag wil ik ook mijn dank uitspreken aan de leden van de promotiecommissie: **Christianne de Groot**, **Leti van Bodegom-Vos**, **Hester van de Bovenkamp**, **Tijn Kool**, **Dionne Kringos**, **Kiki Lombarts** en **Sjoerd Repping**. Jullie werk is een bron van inspiratie. Bedankt voor jullie tijd en aandacht waarmee jullie dit proefschrift kritisch gelezen en beoordeeld hebben. En voor de belangrijke bijdrage die jullie hebben geleverd aan het afsluiten van een bijzondere en memorabele fase van mijn leven.

Veel dank ook aan de **Academische Werkplaats Zorgpraktijk en Beleid**: de stuurgroepleden van het **Zorginstituut** en de **Nederlandse Federatie voor Universitair Medisch Centra – consortium Kwaliteit van Zorg**. Dank voor jullie inspanningen om beleid en praktijk dichter bij elkaar te brengen en de kwaliteit van zorg te optimaliseren. Dank voor de ruimte die jullie hebben geboden om dit belangrijke onderwerp te onderzoeken. Dank voor jullie waardevolle inzichten en ondersteuning en de kansen die jullie hebben geboden om onze opgedane kennis verder te verspreiden. Ik geloof dat oplossingen voor de uitdagingen binnen ons zorgsysteem liggen in het naar elkaar luisteren en samenwerken over de grenzen van organisaties heen. Een Werkplaats als deze is daar een krachtig voorbeeld van.

Ook veel dank aan mijn werkmaatjes van Public & Occupational Health, de Academische Werkplaats, AmsCIS en het NIVEL: **Susanne**, **Jacky**, **Britt**, **Tony**, **Gioia**, **Inge**, **Taryn**, **Fenna**, **Judith**, **Daan**, **Tessa**, **Sophie**, **Lisanne**, **Janneke**, **Bart**, **Jesse**, **Merel**, **Irene**, **Anouk**, **Paul**, **Toby**, **Anika**, **Thom**, **Guido**, **Miyase**, **Judith, Cordula, Jicke, Carla, Charlotte**, **Gary**, **Linda**, **Ilja**, **Bo**, **Mees**, **Karlijn**, **Caroline**, **Floris, Mireille**, **Femke**, **Annicka**, **Christiaan**, **Esther**, **Miriam**, **Iris** en **Anouk**. Men zegt weleens dat een PhD doen eenzaam is, elleboogwerk vereist en dat je concurrenten van elkaar bent. Bij ons was niets minder waar. Jullie maakten het werk leuker, lichter en zoveel gezelliger. Dank voor de fijne samenwerking, smakelijke lunches en leuke borrels. De vele hulp, koffietjes (of in mijn geval thees en chai lattes) en lekkers, wandelingen en boeiende gesprekken. Voor de schrijfweken in kastelen en escalatie op het Wees Jezelf festival en de CaRe days.

Leuke congressen, tostivrijdagen en het gezellige commissiewerk. Ik hoop – maar schat de kans klein in – dat ik ooit nog zulke fijne collega's ga hebben.

Ik wil graag twee collega's speciaal bedanken. Lieve **Marlinde**: van onze eerste Zoom-kennismaking tijdens corona, naar nu een afgeronde PhD. We hebben lief, leed, memes en shotjes gedeeld en elkaar zien groeien tot volwaardige onderzoekers. Je bent slim, grappig, zorgzaam, kritisch op een aardige manier (een kunst die maar weinig mensen beheersen), een bubbly blij ei, levensgenietende Bourgondiër en bovenal een fijn mensenmens. Wat een geluk dat we samen onze PhD journeys hebben kunnen mappen ;-).

Lieve **Vera**. Jij sterke, slimme, hardwerkende vrouw. Van het leiden van echoënde stuurgroepmeetings aan jouw keukentafel in Amsterdam-Oost, tot het maken van awkward projectfilmpjes. Van roomies zijn tijdens de writing retreat, tot samen congres bijwonen in Istanbul. En nu dan eindelijk (bijna) onze PhD's afgerond. Aardig wat pieken en dalen samen meegemaakt: gevallen, opgestaan en weer doorgegaan. Knap hoe jij weerbarstig hoofd hebt geboden aan alle uitdagingen op je pad. Dankjewel voor je gezelligheid en wijze adviezen. En ik weet zeker: of je nou ziekenhuisdirecteur, arts, consultant (nee please ;-)), topambtenaar of professioneel taartenbakster wilt worden, ik heb er alle vertrouwen in dat jij het gaat maken!

Dank ook aan de collega's van het Zorginstituut: **Geert-Jan**, **Peter**, **Linda**, **Pieter**, **Colien** en **Maaike**. Dank voor het vertrouwen dat ik jullie teamlid mocht zijn, een kijkje in de keuken mocht nemen, mocht proeven van het beleidswerk, mee mocht implementeren en veel van jullie mocht leren.

Lieve **pap** en **mam**. Jullie keken vreemd op toen ik vertelde dat ik een PhD ging doen. 'Weet je zeker dat het iets voor je is…?'. En ja, jullie hadden (deels) gelijk – jullie kennen me soms beter dan ik mezelf. Maargoed, zo'n kans is useless unless used – dus die heb ik niet kunnen laten liggen. Ook de koppigheid en het tanden vastbijten en niet meer loslaten heb ik van jullie. En nu staan we hier. Dank voor het 7-vinkjes nest waardoor ik me zorgeloos kon ontwikkelen tot wie ik nu ben. Dank voor het uitknippen, doorsturen en bewaren van interessante krantenstukjes over passende zorg. Voor het (poging doen tot) lezen en corrigeren van onbegrijpelijke stukken tekst. Voor de milkshakes en maaltijden als ik een weekendje overkwam maar moest werken. Voor het luisteren naar mijn rants over hoe we de zorg kunnen verbeteren. Voor de bubbels die koud stonden telkens als er ook maar iets te vieren viel. Dank voor jullie onvoorwaardelijke steun en liefde.

Lieve **Cas**, 'kleine' broer en paranimf van me. Fijn dat we (van binnen) zo hetzelfde zijn en maar aan één blik genoeg hebben om elkaar te begrijpen. Ik bewonder hoe jij je kunt verliezen in je passies: van landkaarten, tot auto's, tot muziek en nu langzamerhand

ook 'licht'. Jij de specialist, ik de generalist (al verwacht je van een PhD'er misschien iets anders). Fijn dat je op De Grote Dag naast me wilt staan in je pinguinpak. Luv u – al je hele leven lang.

Lieve **Noura**. Al sinds vele jaren ben jij een hele speciale voor mij. En bij zo'n buitengewone meid hoort natuurlijk een bijzondere rol. Wat fijn dat je – ook al wist je niet zo goed wat het precies inhield – zo enthousiast 'JA!' zei op mijn aanzoek of je mijn paranimf wilde worden. Nu mag ik tijdens de Verdediging in jouw handje knijpen als het even wat teveel wordt (of een moeilijke vraag naar je doorspelen – nee oké ik beloof je dat niet te zullen doen ;-)). En dat is nog niet alles: jij hebt ook de machtig mooie creaties gemaakt die dit boekje sieren. Wat ben ik blij met jou – mijn vrolijke, lieve, zorgzame, mooie, talentvolle, creatieve moppie. Love you longtime!

&

Lieve andere kanjers van Terroahr: **Hanna**, **Liesbeth**, **Thijs**, **Marthe**, **Sophie**, **Charlotte**, **Jan**, **Sarah**, **Lisa** en **Naomi**. Van de NSG, naar Voedsel & Planeten, tot nu een PhD – wat een 'journey'! Al 15+ jaar delen we lief en leed, en hebben we elkaar zien opgroeien van onzekere pubers tot volwassen(?) carrièretijgers, avonturiers en wereldverbeteraars. Dank voor jullie steun, knuffels, luisterend oor, afleiding en de nodige *fuck-deze-shit*-escalatiemomenten wanneer ik het bijltje erbij neer wilde gooien. Ik zou jullie voor geen goud willen missen.

Lieve **Sam**, **Roos**, **Hannah**, **Daniël**, **Milou**: dank voor jullie steun, afleiding, gekkigheid, boeiende discussies en liefde. Thanks for being my personal cheerleaders!

Lieve familie **Thoonsen**, **Veerman/Heezen**, **Trago**, **Groenink** en **Grottendieck**. Jullie creativiteit, slimheid, zorgzaamheid, kracht en doorzettingsvermogen zijn een bron van inspiratie voor mij. Dank voor jullie gejuich langs de zijlijn en geloof in mij!

Mijn lieve Gyrinusvriendjes: **Ylona**, **Michiel**, **Marjolein**, **Sam**, **Meike**, **Milou**, **Dimitri**, **Niels**, **Auke**, **Dominique**, **Jesse**, **Wouter**, **Jordy**, **Karlien**, **Lars**, **Amar**, **Renate**, **Ivar**, **Luuk**, **Malu**, **Thijs**, **Merel**, **Nadia**, **Rianne**, **Robin**, **Ruben** en **Tom**. Met jullie begon mijn VU-carrière, en met jullie sluit ik 'm ook af. Mooi om te zien hoe iedereen vanuit een gedeelde interesse in bio/medische/gezondheidswetenschappen uitwaaiert en uiteindelijk z'n eigen pad kiest. Wat we aan de academie te danken hebben, betalen we ruimschoots terug: binnen drie maanden maar liefst drie nieuwe Dr.'s erbij – en er zullen er nog vele volgen. Dankjulliewel voor jullie (goudgele) support, wijze adviezen en broodnodige afleiding. Jullie zijn mijn leukste gezelligheidsmensen. Zin in nog meer bourgondische avonturen samen!

Cleo, ik weet dat je dit niet kunt lezen – laat staan begrijpen, maar ook jou wil ik graag bedanken. Voor je ochtendwekservice (vaak te vroeg), je reminders dat er voor jou en mezelf gezorgd moest worden als ik weer urenlang achter elkaar had zitten tikken, je warme welkom als ik thuis kwam van werk en je gezelschap tijdens nachtelijke doorhaalsessies.

Lieve **Bas**, mijn olijke vrolijkert. Jij maakt het (PhD-)leven lichter. Je discipline, dedication, creativiteit en werkplezier zijn bewonderenswaardig – en stiekem ook een tikkeltje jaloersmakend. Dank je wel voor je knuffels, opvrolijkmethodes en geduld op de momenten dat ik door het werk even niet te genieten was. Je bent mijn constante factor en rots in de branding geweest tijdens deze bijna 6 jaar highs en lows. En hoe leuk is het dat je creatieve creaties via mijn artikelen nu vereeuwigd staan op het internet?! Bij jou is het glas nooit halfleeg, maar stroomt het over. Met jou is het leven een voortdurend exploderend confettikanon. Kan niet wachten op alle avonturen die we nog samen gaan beleven! Ik hou van je.

Ten slotte ben ik me bewust van – en dankbaar voor – de kans die ik heb gekregen om dit promotietraject te mogen doen. Het is een voorrecht dat allerminst vanzelfsprekend is, en dat mogelijk is gemaakt door de inspanningen van velen die mij voorgingen. Dank aan alle generaties feministen, wetenschappers en andere voorvechters die zich onvermoeibaar hebben ingezet – en nog steeds inzetten – voor gelijke rechten, voor een betere wereld, voor de vrijheid om te dromen, te ambiëren, te leren en te onderzoeken wat we willen. Dankzij hun strijd mag ik vandaag mijn stem laten horen in de wetenschap, mijn ideeën delen, mijn werk publiceren en mijn plek opeisen in een wereld die ooit voor velen gesloten bleef. Mogen we – in een tijd waarin oog voor een ander, feiten en gelijke rechten onder druk staan – die ruimte weerbarstig blijven uitbreiden.

ABOUT THE AUTHOR

Andrea Carmel Thoonsen was born on 3 December 1994 in Nijmegen, the Netherlands. After completing her secondary education (gymnasium) at the Nijmeegse Scholengemeenschap Groenewoud, she began her studies at the Vrije Universiteit Amsterdam, which would become her 'academic home' for the next 12 years. She obtained her Bachelor's degree in Health and Life Sciences (2013–2016), conducting her thesis on *The Healthier School Canteen* at the Department of Health Sciences.

In 2017, Andrea enrolled in the two-year Master's program Management, Policy Analysis and Entrepreneurship in Health and Life Sciences, taught by the Athena Institute. During her first internship at the Inspectie Gezondheidszorg en Jeugd, she evaluated the effectiveness of its audit and feedback program in improving the quality of care in Dutch hospitals. This experience led her to the Care Quality Commission, England's health inspectorate based in London, where she completed her graduate internship. There, she studied the impact of the Commission's *Experts by Experience* on the quality of its inspection work.

After completing her Master's degree in 2020, Andrea began her PhD at Amsterdam UMC, location VUmc, in the Department of Public and Occupational Health. The book you are holding now is the result of that doctoral research.

In addition to her PhD work, Andrea held several side roles. Together with colleagues from the Amsterdam Public Health research institute she co-founded the Amsterdam Center for Implementation Science (AmsCIS) in 2021. AmsCIS aims to empower researchers to effectively translate research into policy and practice, raise awareness of the importance of sustainable implementation and advance the field of Implementation Science as a leading center of expertise in Europe. Andrea served on the executive board of AmsCIS where she contributed to various initiatives, including organizing educational programs on implementation science and building an Implementation Science Knowledge Hub.

In collaboration with Innovation Exchange Amsterdam (IXA), she organized courses on societal impact and entrepreneurship for public health researchers. She also obtained her University Teaching Qualification and worked as a scientific lecturer and educational support staff member for various Bachelor's and Master's courses in both Health Sciences and Medicine. Improving care quality and creating meaningful societal impact are topics she aims to carry forward in her work for many years to come.

Andrea currently resides in Amsterdam.

PHD PORTFOLIO

ACTIVITY	YEARS	ECTS
Courses		
Basiskwalificatie Onderwijs Course, *Vrije Universiteit*	2022-2023	5.40
Epidemiologisch Onderzoek: Basisprincipes Course, *Amsterdam UMC*	2021	4.00
Scientific Writing Course, *Vrije Universiteit*	2018	3.00
Research Integrity Course, *Amsterdam UMC*	2020-2021	2.00
Presenting and Pitching your Research Course, *Vrije Universiteit*	2022	2.00
Practical Biostatistics Course, *Amsterdam UMC*	2022	1.43
Implementation Science Course, *Erasmus MC*	2021	1.40
Getting Published: Effectively Communicating your Research Workshop, *Nature*	2022	0.43
(Inter)national conferences and presentations		
CaRe days, *the Netherlands*	2022-2025	2.29
International Society for Quality in Health Care (ISQua) conference + lightning talk, *Istanbul*	2024	2.00
Guidelines International Network conference + poster, *Toronto*	2022	2.00
Zorgevaluatie Congress, *the Netherlands*	2020-2024	1.43
NFU Conference + presentation, *the Netherlands*	2023	1.00
APH Annual Meeting + poster, *Amsterdam*	2024	1.00
Zorginstituut Wetenschapsdag + panel member, *the Netherlands*	2024	1.00
European Implementation Event, *online*	2021	0.57
Teaching, student supervision and organization of courses		
Coordination and teaching master course Regulatie & Organisatie van de Gezondheidszorg (MSc Health Sciences), *Amsterdam UMC*	2023-2025	4.00
Supervision of 3 students' internships and theses (MSc Health Sciences and MSc MPA), *Amsterdam UMC*	2020-2023	3.00
Designing and teaching Practica Suboptimale Gebeurtenissen (BSc Medicine), *Amsterdam UMC*	2021-2025	2.00

PhD Portfolio. (continued)

ACTIVITY	YEARS	ECTS
Organizing APH Explore: Societal Impact & Entrepreneurship in Public Health program (postgraduate), *Amsterdam UMC*	2021-2022	2.00
Teaching Practica Medische Missers (BSc Medicine), *Amsterdam UMC*	2020-2024	1.50
Organizing and teaching Symposium Team Resource Management (MSc Medicine), *Amsterdam UMC*	2023-2025	1.00
Organizing Symposium Value-Based Healthcare (MSc Medicine), *Amsterdam UMC*	2025	0.50
Other academic activities		
Executive Board Member Amsterdam Center for Implementation Science (AmsCIS), *Amsterdam Public Health research institute*	2020-2025	5.00
Member Public and Occupational Health Social Activities Committee, *Amsterdam UMC*	2022-2024	2.00
Monthly meetings research group + presentations, *Amsterdam UMC*	2020-2025	2.00
Network meetings Appropriate Care researchers + presentation, *online*	2022-2025	1.50
Monthly meetings section, *Amsterdam UMC*	2020-2025	0.50
Monthly meetings department, *Amsterdam UMC*	2020-2025	0.50
Review scientific paper	2025	0.25
Total number of ECTS		------+ **56.70**

LIST OF PUBLICATIONS

Thoonsen, A. C., van Schoten, S. M., Merten, H., van Beusekom, I., Schoonmade, L. J., Delnoij, D. M., & de Bruijne, M. C. (2024). Stimulating implementation of clinical practice guidelines in hospital care from a central guideline organization perspective: a systematic review. *Health policy*, *148*/105135.

Thoonsen, A. C., Merten, H., Broeders, T. T., Gans, A., van Beusekom, I., Delnoij, D. M., & de Bruijne, M. C. (2024). The role of guideline organizations in nationwide guideline implementation: a qualitative study. *Health Research Policy and Systems*, *22*(1), 174.

Thoonsen, A. C., Gans, A., Broeders, T. T., van Beusekom, I., Delnoij, D. M., de Bruijne, M. C., & Merten, H. (2025). Nationwide guideline implementation: a qualitative study of barriers and facilitators from the perspective of guideline organizations. *BMC Health Services Research*, *25*(1), 150.

Thoonsen, A. C., Merten, H., van Beusekom, I., de Bruijne, M. C., & Delnoij, D. M. From policy to practice: an ethnographic process evaluation of a public HTA agency's role in nationwide implementation of asthma appropriate care recommendations. Submitted.