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PO Box 117
221 00 Lund
+46 46-222 00 00



IMPLEMENT

Implementation of evidence-based nursing care for hospital patients with community-acquired pneumonia

SIGNE EEKHOLM

DEPT OF HEALTH SCIENCES | FACULTY OF MEDICINE | LUND UNIVERSITY



Implementation of evidence-based nursing care for hospital patients with community-acquired pneumonia

Design, development, and evaluation of an implementation strategy

Signe Eekholm



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DOCTORAL DISSERTATION

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Faculty opponent

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Abstract <p>Insufficient nursing care is a major threat to a patient's safety. Despite the development of evidence-based guidelines (EBGs) guiding the delivery of high-quality and effective nursing care, research presents an inadequate implementation of EBGs in clinical practice. Patients who appear to receive insufficient nursing care are older patients (≥65 years) with community-acquired pneumonia (CAP), a disease that is a significant cause of morbidity and in-hospital mortality. Optimised nursing care will benefit CAP patients' safety and clinical practice.</p> <p>The overall aim of the thesis was to determine a tailored theory- and research-based strategy to implement EBGs for nursing care of older patients admitted with CAP in a hospital setting.</p> <p>A descriptive cross-sectional study (<i>Study I</i>) identified gaps between current practice and EBG recommendations for the diagnostics, treatment, and care of CAP. An ethnographic study (<i>Study II</i>) explored determinants influencing registered nurses' (RNs) adherence to EBGs. In <i>Studies III and IV</i>, a tailored theory- and research-based strategy for implementing evidence-based nursing care (EBNC) was designed, developed, and evaluated.</p> <p><i>Study I</i> shows a few potentially serious gaps in diagnostic procedures and medical treatment, but several gaps in nursing care. In <i>Study II</i>, RNs' adherence to EBGs was heavily influenced by the RNs' professional identity and contextual barriers, such as the dominance of the biomedical model, the team-related hierarchy, and the organisational structures. The nurse manager was a key facilitator for mediating a changed hierarchical culture and the performance of EBNC. The developed strategy (<i>Study III</i>) consisted of multiple interventions targeting individual, team, and environmental determinants, and a structured programme for implementation. The strategy was found to be acceptable, appropriate, and feasible for implementing EBNC (<i>Study IV</i>). However, the lack of timely resources, and competing organisational tasks challenged fidelity and sustainability.</p> <p>In conclusion, the tailored theory- and research-based strategy appeared feasible for changing determinants influencing nursing practice and improving patient care.</p>		
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Implementation of evidence-based nursing care for hospital patients with Community Acquired Pneumonia

Design, development, and evaluation of an implementation strategy

Signe Eekholm



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Hard Work Pays Off.

Mathew Fraser

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Abstract

Insufficient nursing care is a major threat to a patient's safety. Despite the development of evidence-based guidelines (EBGs) guiding the delivery of high-quality and effective nursing care, research presents an inadequate implementation of EBGs in clinical practice. Patients who appear to receive insufficient nursing care are older patients (≥ 65 years) with community-acquired pneumonia (CAP), a disease that is a significant cause of morbidity and in-hospital mortality. Optimised nursing care will benefit CAP patients' safety and clinical practice.

The overall aim of the thesis was to determine a tailored theory- and research-based strategy to implement EBGs for nursing care of older patients admitted with CAP in a hospital setting.

A descriptive cross-sectional study (*Study I*) identified gaps between current practice and EBG recommendations for the diagnostics, treatment, and care of CAP. An ethnographic study (*Study II*) explored determinants influencing registered nurses' (RNs) adherence to EBGs. In *Studies III and IV*, a tailored theory- and research-based strategy for implementing evidence-based nursing care (EBNC) was designed, developed, and evaluated.

Study I shows a few potentially serious gaps in diagnostic procedures and medical treatment, but several gaps in nursing care. In *Study II*, RNs' adherence to EBGs was heavily influenced by the RNs' professional identity and contextual barriers, such as the dominance of the biomedical model, the team-related hierarchy, and the organisational structures. The nurse manager was a key facilitator for mediating a changed hierarchical culture and the performance of EBNC. The developed strategy (*Study III*) consisted of multiple interventions targeting individual, team, and environmental determinants, and a structured programme for implementation. The strategy was found to be acceptable, appropriate, and feasible for implementing EBNC (*Study IV*). However, the lack of timely resources, and competing organisational tasks challenged fidelity and sustainability.

In conclusion, the tailored theory- and research-based strategy appeared feasible for changing determinants influencing nursing practice and improving patient care.

Abbreviations

CAP:	Community-acquired pneumonia
CURB-65:	CAP severity assessment score
EBGs:	Evidence-based guidelines
EBNC:	Evidence-based nursing care
EPA:	The European Pathways Association
ICU:	Intensive care unit
IM:	Intervention Mapping Framework
IMC:	Implementation Model of Change
IOF:	Implementation Outcomes Framework
PEP:	Positive expiratory pressure
RNs:	Registered nurses
TDF:	Theoretical Domains Framework

Original papers

This thesis consists of four studies that are referred to in the text by Roman numerals.

- I. Eekholm, S., Ahlström, G., Kristensson, J., Lindhardt, T. (2020). Gaps between current clinical practice and evidence-based guidelines for treatment and care of older patients with Community Acquired Pneumonia: a descriptive cross-sectional study. *BMC Infectious Diseases*, 20 (1), 73. doi:10.1186/s12879-019-4742-4
- II. Eekholm, S., Samuelson, K., Ahlström, G., Lindhardt, T. (2021). ‘Stolen Time’—Delivering Nursing at the Bottom of a Hierarchy: An Ethnographic Study of Barriers and Facilitators for Evidence-Based Nursing for Patients with Community-Acquired Pneumonia. *Healthcare*, 9, 1524. doi:10.3390/healthcare9111524
- III. Eekholm, S., Samuelson, K., Ahlström, G., Lindhardt, T. (202x). Design and development of a strategy for implementation of evidence-based nursing care for patients with community-acquired pneumonia: An intervention mapping approach. Submitted
- IV. Eekholm, S., Samuelson, K., Ahlström, G., Lindhardt, T. (202x). Evaluation of a tailored strategy for implementation of evidence-based nursing care for hospital patients with community-acquired pneumonia. In manuscript

Studies I and II are available in open access.

Introduction

The quality of healthcare service is a prime concern for healthcare professionals and patients. In a hospital setting, registered nurses (RNs) taking care of patients 24 hours a day play an important role in ensuring that patients receive safe and high quality of care. However, often patients do not receive the nursing care as expected (1) and RNs are claimed to be responsible for suboptimal care (2).

Evidence-based guidelines (EBGs), also called evidence-based clinical practice guidelines are available to guide RNs to deliver the best research-based and effective nursing care interventions to prevent treatment and care failures. In nursing care, the use of EBGs is referred to as evidence-based practice. However, research shows that EBGs are not implemented sufficiently in daily clinical practice (3). Consequently, low adherence to EBGs is a serious threat to the admitted patient's safety.

A group of patients who appear to be deprived of evidence-based practice in a hospital setting are older patients with community-acquired pneumonia (CAP) (4-8). CAP is one of the leading causes of acute hospitalisation among older persons and both admission and readmission rates are rising, possibly due to an overall increase in the older population (9). Problematically, research reports that a lack of sufficient nursing care places patient safety at risk, possibly entailing fatal patient outcomes (3,10,11).

To reduce patient risk, it is important to ensure that patients with CAP receive systematic and effective nursing care interventions as recommended in national and international EBGs (12-15). To this end, there is a need to improve current clinical practice and, in particular, nursing care practice.

Implementation research is a rising scientific area due to its potential to support practice change and enhance the quality and equity of healthcare by implementing evidence-based practice in a daily clinical routine (16,17). However, despite the rapid growth of research in a field, evidence of how- to best support healthcare professionals, particularly RNs, in transforming the evidence-based recommendations in EBGs into 'hands-on' practice is still sparse (17,18).

This PhD project contributes to knowledge on how to support the implementation of safe and efficient evidence-based nursing care (EBNC) (in this thesis, considered as the use of best available research evidence from EBGs), as recommended in EBGs for older patients with CAP in a hospital setting.

Background

Nursing care in a hospital setting

When patients are hospitalised, the responsibility for their well-being and health safety is in the hands of healthcare professionals. Among them, RNs play a vital role, and their primary task is to carefully observe the patient, measure vital parameters, assess patient physical and psychosocial needs for care and treatment, set goals for, and prescribe nursing interventions such as keeping them warm and clean, give fluids and, nutrition, mobilise patients, and evaluate the outcome (19,20). This is performed with respect and empathy for the individual patient, where the RNs engage meaningfully with the patient and acknowledge them as unique human beings. This relationship requires commitment and trust (21-24). In short, RNs in a hospital setting have the responsibility and authority to coordinate care during a patient's admission. This is expected to be achieved by support of research-based knowledge and evidence-based practice (25). According to McCormack (26) the evidence-based practice comprises the use of the best available research evidence, clinical expertise, and patient references with considerations of available resources in decision making. This process will ensure ethical and accountable practice, protect patients from incompetence and achieve the best patient outcomes through organizations meeting their responsibilities for the delivery of high-quality care (26, 27).

In Denmark, as in many other countries, RNs interact with a variety of other healthcare professionals, e.g. licensed practical nurses who are integrated into the delivery of fundamental aspects of care, such as oral care and nutrition (23,25). This is expected to be performed in close cooperation with RNs (28,29). Moreover, in the delivery of patient care, RNs interact with the interdisciplinary team of managers, physicians, physiotherapists, and dieticians to plan, evaluate, and adjust the nursing care plans for the individual patient. Also, the external health services are part of this plan e.g. kitchen catering, administrative, and municipality. Thus, in the process of delivery of care, RNs do not act autonomously, and therefore their actions and decisions may be influenced by others.

In recent decades, there has been a change in an acute care setting due to political and financial demands (30-32). The in-hospital stay has become shorter to increase

productivity in healthcare settings, and the ‘fast-track’ treatment and care service have shown that patients admitted to a hospital unit are more complex multi-morbid patients (6,33). Consequently, these patients require advanced and highly specialised health services, delivered by knowledgeable and competent RNs in cooperation with other health professionals. Moreover, this also means that in the delivery of nursing care, RNs need to take into account the political and financial demands. This might be a difficult task if the care is expected to be delivered according to RNs’ professional goals, values, and high standards (34). Problematically, conditions for RNs to engage with patients, plan nursing initiatives, and perform care considers individual patients’ needs and preferences are limited. Conclusively, current acute care settings may not support the delivery of high-standard nursing care, meaning that the patient’s health and safety are at risk when admitted to a hospital (35). A group of patients who seem to get in a pinch in the current health system and appear to be deprived of nursing care initiatives are older patients with CAP who fill a large proportion of the beds in acute care settings in Denmark (36,37). Therefore, more understanding is needed about how RNs in cooperation with a variety of other healthcare professionals, can deliver safe, effective, and high-standard EBNC in a hospital setting.

Community-acquired pneumonia

CAP is defined by the Infectious Disease Society of America as an acute disease caused by an infection of the lung parenchyma, accompanied by the presence of an acute infiltrate on a chest radiograph (38). The infection occurs outside the hospital and can be caused by many different pathogens. The most frequently identified pathogen, regardless of setting, comorbidity, or age, is *Streptococcus pneumoniae*, which is associated with severe disease, high invasiveness, fatality, and antimicrobial resistance (9,39).

CAP is associated with high rates of hospitalisation, length of hospital stays, and long-term effects on quality of life, and it is a significant cause of morbidity (40-43). Furthermore, it is the leading cause of mortality, with an incidence of 6-20% for hospitalised patients and 50% for patients admitted to the intensive care unit (ICU) (44). According to the World Health Organisation, CAP is one of the deadliest infectious diseases globally, exceeded only by ischaemic heart disease, stroke, and chronic obstructive pulmonary disease (45).

The European Respiratory Society (ERS) reports the incidence of pneumonia to be 68–7000 per 100,000 people, and which is therefore estimated to be a major acute disease (9). In Europe, there are about one million hospitalisations for CAP per year, and up to 10% require admission to the ICU (9,46). However, the rates of hospitalisation vary considerably from country to country by 20- 50% (9). In

Denmark, CAP is estimated to be the fifth most common cause of acute hospitalisations and the most common reason for readmissions having considerable implications and high costs for the healthcare system (36,37,47). The incidence of in-hospital mortality for patients with CAP in danish hospitals has been reported to be 8-11,5% (Klausen 2012, Egelund 2017).

In general, the rates are highest in older patients (≥ 65 years) due to immunosenescence (changes in the immune system associated with age), multimorbidity, and frailty, and the risk of developing CAP increases steadily in patients with underlying comorbidities such as chronic obstructive pulmonary disease, asthma, diabetes mellitus, congestive heart failure, and cancer (9,48,49). Due to the overall increase in the older population worldwide, the rates of CAP are anticipated to rise even more (50-53). Therefore, the relevance of CAP among elderly the is a major public health challenge.

Evidence-based guidelines for CAP

The management of CAP among older patients has been studied for years to find a solution to the major public health challenge. Advances in CAP prevention through vaccines, diagnostic tests, and antibiotics have been made. Much effort has also gone into the development and publishing of national and international EBGs. The EBGs aid in translating complex scientific research into simplified recommendations in clinical practice and are established means to inform evidence-based practice (54,55). International research has confirmed that the use of EBGs for CAP significantly reduces morbidity, decreases hospitalisation rates and length of stay, significantly improves care processes, and reduces mortality rates (15,56). Thus, the EBGs are meant to support RNs as well as other healthcare professionals in decision-making regarding appropriate and effective treatment and care interventions that will increase the quality of healthcare and patients' outcomes. However, despite the existence of an amount of EBGs on national and international levels, the description of nursing care interventions for patients with CAP varies and they are sporadically described¹ (14,57-59). The recommended nursing care interventions in EBGs for patients with CAP are nutrition support, fluid therapy, oral care, mobilisation, sputum mobilisation, and oxygen therapy (14,57-59). Therefore, RNs need to combine and translate several other EBGs, e.g. EBGs for oral care, nutrition support, and fluid therapy, to get a sense of how to perform optimal EBNC interventions. However, this may not always be possible, considering the daily busyness in a hospital unit. Consequently, the insufficient

¹ This was the case when this PhD study started. In recent years, the nursing care interventions have been more thoroughly described in national EBGs for CAP (12)

description of nursing care interventions in EBGs for CAP may contribute to a lack of evidence uptake in clinical practice.

Adherence to EBGs in clinical practice

Overall, there is much evidence reporting that there is a variety in healthcare professionals' adherence to EBGs, and the delivery of health service is often inconsistent with EBGs (3). A scoping review by Fisher et al. (60) that identified barriers to guideline implementation, based on 69 articles (n = 42 studies and 27 reviews), reported that 30–40% of patients worldwide receive non-evidence-based health services. Furthermore, it is reported that of recommended EBNC interventions, only 60% of care is consistent with EBGs, 30% of performed care is of low value, and 10% is harmful (61). The same pattern is seen for adherence to EBGs for patients with CAP. A Danish national registry study (4) on 11,322 older patients (≥ 65 years) with CAP found large variations within regions and between hospitals in the length of stay, mortality, and readmissions within 30 days, which could indicate insufficient implementation of evidence-based practice in Danish hospitals. Furthermore, a national retrospective study (5) examined healthcare professionals' adherence to EBG recommendations for treatment and care of older hospital patients (≥ 65 years) with CAP through audits of patient records from 20 Danish hospitals. They identified that the diagnostic procedures and medical treatment were in accordance with EBGs, except for the systematic severity assessment that was absent. However, the study also found that particularly nursing care interventions, such as nutrition support, fluid therapy, and mobilisation, were neglected or sporadically addressed and the authors acknowledged that the study results might not do justice to clinical practice as a lack of documentation is a well-known problem (5,62,63). Those results are in line with results from international research, indicating patients receiving unsystematic and haphazard nursing care (1,10,11).

Non-adherence to recommendations in EBGs can have fatal consequences for patients with CAP. For example, in the medical perspective, inappropriate antibiotic therapy (e.g. non-combined antibiotic therapy, discordant therapy to microorganisms) is associated with morbidity, and increased treatment costs, and has been shown to be an independent predictor of in-hospital and 30-day mortality (41,42,64,65). From a nursing perspective, the recommended nursing care interventions such as nutritional support, fluid therapy, oral care, mobilisation, sputum mobilisation, and oxygen therapy have been reported to reduce morbidity, mortality, length of stay, and readmission rates (66-75). On the other hand, the unsystematic or missing performance of these interventions is reported to be associated with adverse outcomes, most notably with mortality (11,76,77). Thus,

the consequences for patient safety and a lack of adherence to EBGs are overwhelming and indicate the crucial need and importance of EBGs implementation in clinical practice, particularly EBGs recommendations for nursing care.

Clinical pathway (CPW)

There have been extensive descriptions of the challenges associated with the implementation of EBGs. This has stimulated researchers and healthcare professionals to be innovative in developing ideas to address issues relating to patient safety and develop strategies to improve the adoption of evidence-based practice by increased use of EBGs (78). One of the developed tools is a clinical pathway (CPW), also called a care pathway or integrated care pathway. CPW is used to translate high-quality evidence and EBG recommendations into local structures and daily clinical processes of treatment and care. The main focus in developing CPW is patient safety, patient-centredness, and effectiveness. The difference between EBGs and CPWs is that EBGs provide generic recommendations, while CPWs bring evidence described in EBGs to the bedside for all healthcare professionals involved in patient treatment and care.

According to the European Pathways Association (EPA), which aims to support the development, implementation, and evaluation of CPWs in Europe, CPWs are used in more than 50 countries (79). The systematic review by Askari et al. (80) analysed the evidence on the effectiveness of CPWs and reported increased adherence to EBG. They also found conclusive evidence of improvement in appropriate timeliness of care and length of stay. This result is supported by others, reporting CPWs to improve patient outcomes and to reduce complications, readmissions, and length of stay without negatively influencing mortality or quality of life, organisational efficiency, and hospital costs (81-83).

Seemingly, CPWs have the potential to promote evidence uptake, maximise clinical efficiency, and reduce variations in clinical practice and are effective in improving the quality of care. However, the majority of studies evaluating CPWs focus on effectiveness rather than on CPW uptake (80). Evidence for successful CPW implementation is poorly reported and does not provide identification of characteristics that contribute to the CPWs' uptake in clinical practice, and variations and limitations of methodology development persist. There is a need for more evidence regarding the implementation of evidence-based practice by the use of CPWs to guide researchers and clinicians to transform scientific evidence from EBGs into local structures.

Implementation

In recent decades, the implementation of evidence-based practice has received growing interest due to increasing research findings of missing and sub-optimal performance of healthcare services, threatening patient safety (11,84-88). Therefore, the implementation in a healthcare setting has been stressed by policy organisations as an important investment (89,90). Implementation is defined as the use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings (16,91). With the ambition to promote better uptake of evidence and improve the quality and safety of healthcare, efforts have been made in implementation science to contribute to an understanding of factors important to successful implementation. Thus, a growing number of empirical studies, theories, frameworks, and models have been developed to gain insight into the mechanism of implementation and to guide researchers and healthcare professionals to carry out a systematic and successful implementation process (92-94). Although they all differ in terms of their assumptions, aims, and characteristics, they also overlap and address important aspects, that need to be considered when embarking on an implementation endeavour (92). Next, the important aspects for implementation success are described.

There is a consensus in implementation science that implementation requires a systematic approach with a strong rationale for design and clear reporting of the development process (95,96). Therefore, the first and most important step is to identify gaps between research evidence and routine practice. The next step is to analyse the context in which the intervention will take place and identify factors that hamper or stimulate the change (e.g. adherence to EBGs) (95,97-99). This is necessary for designing a relevant implementation strategy tailored to the local context. A thorough understanding of the context, such as the setting and culture, and a systematic examination of determinants at multiple levels, e.g. individual, team, organisation, and social contexts of care provision, are central (60,95,100,101). Nevertheless, a systematic review by Colquhoun (102) has reported that the majority of studies designing interventions aimed at changing healthcare professionals' behaviours target change at the individual level only, and there is a lack of studies that have considered the organisation- and system-level contexts (102). Considering a healthcare setting where healthcare professionals collaborate across disciplines and organisational borders, the assessment of determinants at multiple levels is required to achieve success and avoid research waste.

Another acknowledged approach for successful implementation is the design and development of a tailored implementation strategy (97,98). Implementation strategies are defined as methods or techniques to improve the adoption, implementation, and sustainment of evidence-based practice (98). In this process user involvement is recommended as a key component for tailoring the content of

the implementation strategy interventions and enhancing the fit to contextual needs and preferences (95,98,103,104). However, it is claimed that implementation strategies are too often designed unsystematically and fail as tailored strategies to address relevant contextual determinants as the strategies do not match the context in which they are developed (17,97,98,105). This indicates that there is a need for studies using a more systematic approach and a clear rationale for interventions when designing tailored strategies for implementing EBP.

Finally, to close the gap between research evidence and daily clinical practice, a theory-based approach with a strong rationale for the strategy's design is stressed (92,101,106). The UK Medical Research Council (107) emphasises that applying a theoretical approach in the development of interventions is crucial for increasing the interventions' effectiveness. Furthermore, the theoretical approach is required for guiding implementation, facilitating the identification of determinants, and, most importantly guiding the selection of implementation strategies (106). According to Nielsen et al. (92) the acknowledgment of the importance of the theory-based approach in implementation design has led to the development of so many approaches that it makes it challenging to choose the appropriate one. Although there are strong advocates for the use of a theory, the amount of evidence on the use of theory-based approach to implementation is low (108,105,106,109,110). According to Nielsen et al. (92), poor theoretical underpinning makes it difficult to understand or explain how and why implementation succeeded or failed. Furthermore, it limits the possibility of adjusting and developing strategies for more successful implementation.

To summarise, despite the efforts in implementation science, implementation studies continue to report limited use of evidence-based interventions in clinical practice, indicating that implementation remains a complex and difficult task to manage (84,93,96). Problematically, patients fail to receive effective EBNC, and healthcare organisations fail to benefit from cost-saving opportunities (41). Therefore, it is important to take into consideration the above-described criteria for successful implementation when developing and implementing strategies to support RNs in evidence uptake in clinical practice.

Rationale

Acknowledging the implications of CAP for older patients, capacity challenges for hospitals, and the economic burden for healthcare systems and society, there is a need to optimise the delivery of health services in an acute care setting for this patient group.

International and national studies indicate that treatment and care for patients with CAP are often not delivered according to EBG recommendations, and national research indicates that particularly EBNC is insufficient. This represents a serious threat to patient safety and health, indicating the need to improve the quality and effectiveness of current nursing practices in a hospital setting. However, findings from previous research are based on audits of patient records, and therefore the possibility of evaluating the actual level of adherence to EBGs is limited. Audits of electronic patient records may not reflect the actual gaps in clinical practice and the level of care delivered. Therefore, observational studies are called for to identify gaps between current clinical practice and the recommendations in EBGs for patients with CAP.

Regarding the findings confirming the unsuccessful transfer of evidence in nursing practice, research is needed to explore what hinders or facilitates RNs in delivering EBNC. This requires a systematic and thorough exploration of the context where RNs work in close cooperation with other professionals. Therefore, an explorative study identifying barriers and facilitators at the individual, team, and environmental levels may add considerably to our understanding of determinants of clinical nursing practice.

Research within implementation science is growing rapidly, and evidence has been established about success criteria for the development of implementation strategies improving clinical practice by evidence uptake. However, research results of CAP patient outcomes and healthcare professionals' adherence rates to EBGs indicate ongoing challenges associated with the implementation of EBGs. Although the CPWs have been reported to be effective in transforming high-quality evidence from EBGs into local structures, there is still a knowledge gap on how to support the implementation of evidence-based practice by the use of the CPWs. Therefore, more evidence is needed regarding the implementation of evidence-based practice by the use of a CPW.

Furthermore, as described previously, despite an overwhelming amount of literature, there is limited evidence to guide healthcare professionals in how to develop and design an efficient implementation strategy that is research- and theory-based and tailored to contextual needs and user's preferences. Therefore, there is a need for studies using a systematic approach and a clear rationale for the design and development of the implementation strategy. Moreover, there are limited studies developing strategies for clinical practice by targeting change at multiple levels. Considering the clinical setting where RNs collaborate across disciplines and organisational borders, studies targeting determinants at the individual, team, and organisational levels may therefore add to the general body of knowledge in the field of implementation science.

Finally, there is a need to execute the strategy in a hospital context and systematically evaluate the implementation process to assess whether the developed strategy is successful in improving current nursing practices for patients with CAP.

Aims

The overall aim of the thesis was to determine a tailored theory- and research-based strategy to implement EBGs for nursing care of older patients admitted with CAP in a hospital setting. The specific aims of the all four studies were the following:

- I. Identify gaps between current clinical practice and evidence-based recommendations regarding diagnostic procedures, medical treatment, and general management (nursing care interventions) for older patients admitted with CAP.
- II. Describe work-based barriers and facilitators at the individual, team, and organisational levels influencing RNs' adherence to EBG recommendations for nursing care for older CAP patients.
- III. Design and develop a tailored theory- and research-based strategy for implementation of EBNC interventions described in a CPW for older patients with CAP, using the Intervention Mapping Framework (IM).
- IV. Evaluate a tailored theory- and research-based strategy for implementation of EBNC for patients with CAP in a hospital setting by use of the Implementation Outcomes Framework (IOF).

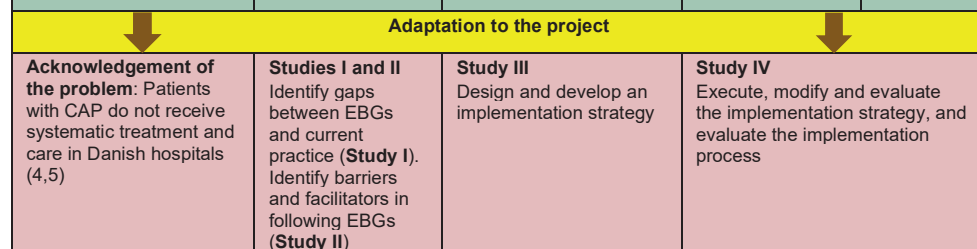
Methods

Applied theoretical model and frameworks

Implementation Model of Change

To address important approaches and concepts in the implementation process, the Implementation Model of Change (IMC), developed by Grol and Wensing (95), was selected as an overall theoretical framework for this PhD study. Each phase in a model constitutes a study (Table 1).

Table 1. Adaptation of the IMC before this thesis and in the four studies

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Development or determination of concrete proposal/targets for improvement or change	Analysis of performance, target group and setting	Development/selection of strategies and measures to change practice	Development, testing and execution of the implementation plan	Evaluation and adapting plan
 Adaptation to the project				
Acknowledgement of the problem: Patients with CAP do not receive systematic treatment and care in Danish hospitals (4,5)	Studies I and II Identify gaps between EBGs and current practice (Study I). Identify barriers and facilitators in following EBGs (Study II)	Study III Design and develop an implementation strategy	Study IV Execute, modify and evaluate the implementation strategy, and evaluate the implementation process	

The model was selected due to its comprehensive theory base for behavioural change theories and theories within implementation science facilitating effective implementation of change in healthcare practice. The model emphasises the importance of systematic planning and thorough analysis before going into action to deliver a clear rationale for implementation that is essential and called for to accomplish practice improvement. Furthermore, the model facilitates the use of other mid-range theories and frameworks in all five phases. The assumption is that successful implementation is a function of all five phases and their interrelatedness.

The five IMC phases and other frameworks applied in all four studies are illustrated in Figure 1 and are described as follows.

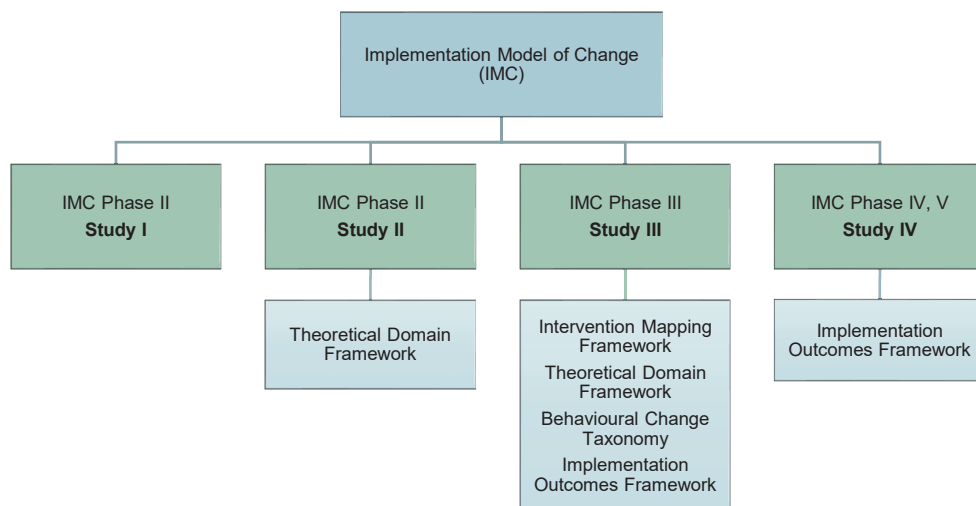


Figure 1. Overview of the Implementation Model of Change (IMC) and applied theoretical frameworks in all four studies

Phase 1: The first phase in IMC for effective implementation comprises the development of concrete proposal/targets for improvement or change, where the relevant practice issues are identified and the need for implementation is justified (95). In this phase, findings from national research by Lindhardt (5) and colleagues (4), indicating that patients with CAP did not receive systematic treatment and care in Danish hospitals, functioned as a starting point for this thesis and targeted the decision for change.

Phase 2: The second phase in IMC is an analysis of performance, target group and setting, within which changes occur. According to Grol and Wensing (95), this phase involves careful identification of the actual care provision, the target group, and setting for the implementation. Insights into these factors are important as they inform what changes in current practice are needed, how implementation strategy needs to be designed, and which interventions should be developed to achieve the desired change. This phase comprised identification of gaps between EBGs and clinical practice for patients with CAP (Study I) and identification of barriers and facilitators (Study II) by use of the Theoretical Domains Framework (TDF) (Figure 1) (see the section ‘Theoretical Domains Framework’).

Phase 3: In the third phase, the development/selection of strategies and measures to change practice is performed. According to Grol and Wensing (95), well-designed interventions based on theory and research are most successful in bringing change. Furthermore, tailored strategies comprising multifaceted interventions addressing specific barriers to change are more effective than single interventions. It is also preferable to involve the target group and their perspectives in the design and development process to foster a positive attitude and willingness for behavioural change. Therefore, the Intervention Mapping Framework (IM) (see the section ‘Intervention Mapping Framework’) was selected to develop a tailored theory- and research-based strategy (Study III) (Figure 1).

Phases 4 and 5: In the fourth and fifth phases, *development, testing and execution of the implementation plan* and *evaluation and adaptation of the plan* are performed. Those two phases were carried out as Study IV, where the implementation strategy was executed, continually adjusted, and evaluated by the use of the *Implementation Outcomes Framework* (IOF) (111) (see the section ‘Implementation Outcomes Framework’) (Figure 1).

In the following, the theoretical frameworks applied in different phases are described.

Theoretical Domains Framework

The *Theoretical Domains Framework* (TDF) (112,113), initially developed to identify factors influencing the implementation of evidence-based recommendations, was applied in Study II to explore and describe barriers and facilitators influencing RNs’ adherence to EBG recommendations for nursing care for older patients with CAP. The TDF is derived from a synthesis of 33 theories of behaviour and behaviour change and 128 theoretical constructs, clustered into 14 (originally 12) overarching domains consisting of: ‘Knowledge’, ‘Skills’, ‘Social/professional role and identity’, ‘Beliefs about capabilities’, ‘Memory, attention and decision processes’, ‘Beliefs about consequences’, ‘Environmental context and resources’, ‘Social influences’, ‘Emotions’, ‘Intentions’, ‘Optimism’, ‘Goals’, ‘Behavioural regulation’, and ‘Reinforcement’. These domains provide a theoretical lens to view the potential individual, social, and environmental factors that might influence clinical behaviour. The TDF was also applied in Study III (step 3) to inform the choice of the potential behaviour change techniques to develop appropriate implementation interventions.

Intervention Mapping Framework

The *Intervention Mapping Framework* (IM), is a systematic six-step approach that guides planning, development, implementation, and evaluation of implementation

strategies targeting behavioural change (114). It is an iterative process from the recognition of a problem to the identification of a solution, characterised by three perspectives. First, the IM is underpinned on a social ecological model that focuses on interrelationships between individuals and their environments that include interpersonal, social, organisational, and cultural aspects. Thereby, the IM guides the framework users to understand interventions as part of a system in which individuals and environmental factors are interrelated. Second, the IM directs to systematically identify and use relevant theories and empirical evidence to develop appropriate and effective theory- and research-based interventions regarding the targets for change. Third, the IM emphasises the use of relevant stakeholders (e.g. project managers and implementers) in all steps of a project and aspects of decision-making, as they can influence diffusion and sustainable implementation (114,115).

In this PhD study, the IM guided the development of a tailored, theory- and research-based implementation strategy through the six-step process: 1) developing a logic model of the problem, 2) developing a matrix of change objectives, 3) designing the intervention, 4) producing the programme, 5) planning implementation, and 6) developing an evaluation plan. A detailed description of each steps is presented in the section ‘Study III’ under ‘Data Collection’.

Behaviour Change Technique Taxonomy

The *Behaviour Change Technique Taxonomy* (BCT) is a formal, standardised system developed to identify theory-based behaviour change interventions. The BCT is defined as an ‘observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behavior’ (116). The BCT consists of 93 behaviour change techniques, grouped into 16 categories that provides a standardised approach to classify active ingredients (e.g. feedback, self-monitoring, reinforcement) of a behaviour change intervention. These 16 behaviour change techniques have their own individual labels and definitions that can be used when designing interventions or coding interventions for their content.

In this PhD project, the BCT was used in Study III (step 3) as a mapping tool, where the identified determinants (barriers and facilitators) (Study II), grouped by the TDF domains (113), were mapped to theoretical behaviour change techniques, which are most likely to be effective in changing determinants. Table 2 provides a partial example of the mapping process.

Table 2. An example of mapping TDF domains to behaviour change techniques

TDF DOMAINS		BCT, behaviour change techniques
<i>Knowledge</i>	➡	Information regarding behaviour
<i>Skills</i>	➡	Increasing skills: problem solving, decision-making, goal setting Rehearsal of relevant skills Modelling/demonstration of behaviour by others
<i>Environmental context and resources</i>	➡	Environmental changes (e.g. objects to facilitate behaviour)
<i>Social/professional role and identity</i>	➡	Social processes of encouragement, pressure, support

Implementation Outcomes Framework

The *Implementation Outcomes Framework* (IOF) developed by Proctor et al. (111) consists of eight conceptually distinct but interrelated implementation outcomes that can be applied to evaluate successful implementation processes in different healthcare settings.

There are various models and frameworks guiding researchers to structure and describe the evaluation process. However, as many of them lack a clear description of how to perform the evaluation process in practice and which methods to use, the IOF was preferred to be used in this PhD study to develop an evaluation plan (Study III) as part of the IM framework (step 5) and to evaluate the implementation process (Study IV) (Figure 1). Moreover, the IOF was chosen because it is a comprehensive framework consisting of outcomes often perceived to be the ‘gold standard’ in implementation research: *acceptability*, *adoption*, *appropriateness*, *feasibility*, *fidelity*, *penetration*, *sustainability*, and *costs*. Using of the IOF outcomes, it was possible to identify critical contextual issues in the implementation process, potential gaps in the developed implementation strategy (Study III), and which conditions favour successful implementation.

Design

For the purpose of designing, developing, and evaluating a tailored strategy to implement EBGs for the treatment and care of older patients admitted with CAP in a hospital setting, we used various methodological approaches and study designs. An overview of all four study designs is presented in Table 3.

Table 3. Design, samples, data collection, frameworks, models, and analysis used in Studies I-IV

Study	I	II	III	IV
Design	Descriptive cross-sectional design	Ethnographic approach	Design and development of an implementation strategy	Evaluation study
Sample	30 patients, 86 healthcare professionals	14 registered nurses, 88 interdisciplinary healthcare professionals, 57 patients*	40 healthcare professionals, 8 patients*	40 healthcare professionals, 195 patients*
Data collection	<i>Baseline assessment:</i> Structured participant observations, individual ad hoc interviews and audits of electronic patient record reviews	<i>Baseline assessment:</i> Semi-structured focus group interviews, field observations and individual follow-up interviews	Data from Studies I and II	<i>During 8-months implementation and at follow-up data collection (3 and, 6 months):</i> Participatory field observations, ad-hoc interviews (individual and in group), focus-group interviews, registrations, audit of electronic patient record reviews
Theoretical model and frameworks**	IMC phase II	IMC phase II, TDF	IMC phase III, IM, TDF, BCT	IMC phase IV and V, IOF
Analysis	Deductive manifest content analysis and descriptive statistics	Qualitative manifest and latent content analysis		Deductive content analysis and descriptive statistics

*Patients participated in a study by testing materials and contributed to data collection through audits of electronic patient journals but were not a sample of the study.

**Abbreviations: BCT, Behaviour Change Technique Taxonomy; IM, Intervention Mapping Framework; IMC, Implementation model of Change; IOF, Implementation Outcomes Framework; TDF, Theoretical Domain Framework.

Research setting and sample

This study was carried out in the Department of Internal Medicine at Herlev and Gentofte University Hospital, in the capital region of Denmark. At the start of the study, the hospital served an area of 700,000 inhabitants providing specialist healthcare to approximately 700,000 patients per year and had 957 beds for admitted patients.

Study I included four hospital units: the emergency department (ED) and three medical units specialising in infectious diseases, respiratory diseases, and a short-term unit covering various medical specialties. Participants were older patients (≥ 65 years) admitted with CAP ($n = 30$) and healthcare professionals responsible for patients' treatment and care ($n = 86$; 40 physicians, 40 RNs, and 6 physiotherapists).

Participants were included prospectively and consecutively during six months in two phases. In the first phase, patients were recruited from the ED and included when they were diagnosed with CAP. In the second phase, patients were recruited from three medical units. Patients were excluded if they were diagnosed with other respiratory diseases (e.g. COPD, asthma, etc.) or were not able to give informed consent (e.g. due to severe confusion). In total, 50 patients were invited to participate. Of those, one refused, four had severe confusion, and 15 were excluded due to diagnosis with other respiratory diseases; thus, 30 were included. Once each patient was recruited, the healthcare professionals responsible for the patients' treatment and care were asked to participate. All 86 healthcare professionals gave their consent.

Study II was carried out at three of the medical units (58 beds): infectious diseases (21 beds), respiratory diseases (22 beds), and a short-term unit (15 beds), where older patients (≥ 65 years) diagnosed with CAP were admitted for further treatment and care after receiving acute treatment in the emergency department. Participants were RNs ($n = 14$) selected by purposeful sampling. Eligibility included RNs taking care of at least one patient diagnosed with CAP (≥ 65 years). As RNs worked in close cooperation with RN colleagues, licensed practical nurses, physicians, physiotherapists, clinical nurse specialists, managers, and interacted with municipality, kitchen, and cleaning staff, the whole team was recruited to the study. In total, 88 professionals in interaction with 14 nurses participated in the study. During the data collection, the selected RNs delivered treatment and care for 57 patients, of whom 28 were diagnosed with CAP.

Study III was carried out at the unit for respiratory diseases (25 beds), comprising healthcare professionals ($n = 48$) of RNs, licensed practical nurses, physicians, physiotherapists, the head nurse manager, nurse manager, assistant nurse managers, and a clinical nurse specialist. With these employees, a project organisation was established, which, in cooperation with researchers ($n = 2$) participated in a study by a co-design approach to design and develop a tailored implementation strategy. The staff and admitted patients ($n = 8$, selected by purposive sample) were used to pretest implementation strategy materials.

Study IV was carried out at unit for respiratory diseases and comprised the same participants ($n = 40$) as in Study III. Furthermore, admitted patients' electronic patient records (including patients admitted with CAP) ($n = 195$) were used in a study to evaluate the penetration of the implementation interventions. The reason for selecting all admitted patients' electronic patient records, and not only CAP patients' electronic patient records was the Covid-19 pandemic. After eight weeks within the study, very few patients with CAP were admitted to the unit, limiting the possibility of collecting data and executing the interventions. Therefore, besides the focus in this study on patients with CAP, there was a need to change the selection strategy and include all admitted patients. However, as the planned nursing care

interventions were fundamental for all patients and the care was assessed and performed according to patients' individual needs, this change did not affect the execution of the implementation strategy.

Data collection

Study I

Data for Study I were collected by *structured participant observations*, *individual ad hoc interviews*, and *patient record reviews* during the six-month period from September 2016 to February 2017. Data were collected using of the data collection guide based on EBG criteria for diagnostic procedures, medical treatment, and general management (i.e. nursing care interventions) for patients with CAP (Table 4). To identify if the patient's treatment and care were initiated in accordance with the patient's individual needs (i.e. adherence to EBG), patient needs were assessed independently of healthcare professionals' assessments by the researcher (SE), regarding the patient's clinical and haemodynamical status, according to the criteria in the EBG. An experienced clinician and senior researcher (TL) were involved in the data analysis, challenging SE's preunderstanding and interpretations of the data.

Structured participant observations were conducted in two phases. The first phase at the ED focuses on healthcare professionals' adherence to the EBGs for diagnostic procedures and acute treatment and care. Observations for each patient ranged between 6 and 8.5 hours. In the second phase, observations were conducted at the three medical units, focusing on RNs' adherence to recommendations for nursing care interventions. Observations for each patient lasted for three days, from 07:30 to 19:00–21:00, or until the patient was discharged, admitted to the ICU, or admitted to another non-medical unit. For this pragmatic reason, 15 patients were observed for one day, 13 for two days, and 9 for three days. In total, 528 hours of observations were conducted.

Individual ad hoc interviews were conducted with patients and healthcare professionals, to clarify any uncertainties during the observations. In total, 116 study participants (30 patients and 86 healthcare professionals) were interviewed ad hoc. During and after the observations, field notes and notes during the interviews were continually written by hand and transcribed verbatim.

Table 4. Recommended interventions for older patients admitted with CAP according to EBG*

INDICATOR	RECOMMENDED INTERVENTION*
Diagnostic procedures	<p>Chest radiography, sputum culture and sensitivity, physical examination of chest (auscultation/ percussion), oxygenation saturation (SpO₂), mini-mental test, travel exposure (within 2 weeks).</p> <p>Blood tests: Blood cultures, Full blood count, C-reactive protein (CRP), Electrolytes, Liver function, Arterial blood gases (indicated when SpO₂ <92%, Respiratory rate >20 or dyspnoea). Severity assessment by CURB-65 score.</p> <p>Response: moderate or high severity score or not responding to treatment ≤48 - 72 hours: Chest radiography, CRP and white cell count, blood cultures, Legionella pneumophila urine antigen test (LUT), Pneumococcal urine antigen test (PUT), Polymerase chain reaction test (PCR), sputum test for culture and sensitivity.</p>
Antibiotic (AB) treatment	<p>Administer AB treatment ≤4hours after admission and prescribe treatment according to CURB-65 score:</p> <ul style="list-style-type: none"> CURB-65 (0 - 2, low severity): Benzylpenicillin 1 mill.IE (~667 mg) x4. Penicillin allergy: Clarithromycin 500 mg x 2. CURB-65 (3 - 5, moderate severity): Benzylpenicillin 2 mill.IE (~1333 mg) x4+ and Clarithromycin 500 mg x 2. Penicillin allergy: Cefuroxim 500 mg x 3+ Clarithromycin 500 mg x 2. CURB-65 (≥3, high severity): Piperacillin/tazobactam 4,0/0,5 x 4 + Clarithromycin 500 mg x 2. Penicillin allergy: Cefuroxim 1500 mg x 3+ Clarithromycin 500 mg x 2. <p>Adjust AB treatment according to pathogen resistance test ≤48 - 72 hours. Switch intravenous to oral treatment when: haemodynamical and clinical stability are reached, normal gastrointestinal tract for 24 hours and able to ingest medication.</p>
Discharge management	Clinical control around 6 weeks and chest radiography at around 6 weeks for patients >50 years, smokers and when symptoms persist.
General management: Sputum mobilisation	Airway clearance techniques by positive expiratory pressure when patients have difficulty with expectoration or in the event of a pre-existing lung condition.
Oral care	Tooth brushing minimum twice a day (minimum 2 minutes) with toothpaste containing 1000 – 1500 ppm fluoride.
Fluid therapy	Assess volume depletion and fluid status daily, develop target fluid therapy plan when a discrepancy between fluid intake and output, electrolyte disturbances, abnormal pulse and blood pressure and in the presence of; confusion, diarrhoea, and vomiting; advise to drink plenty of fluids.
Nutritional support	Screen nutrition status within ≤24 hours of admission and develop targeted nutrition support plan for patients at risk of malnutrition (assessed by: BMI (<20,5), weight loss ≤3 months, reduced dietary intake ≤1week, age (>70 years) and health condition (chronic illness, bedridden, in intensive care).
Mobilisation	Assess functional ability and develop targeted mobilisation plan for patients with loss of functional ability (in conjunction with hospitalisation), who need mobilisation support (for activities of daily living) or rehabilitation. Mobilise patients (walk or sit out of bed) within ≤24 hours of hospitalisation, for 20 minutes, and increase mobilisation each subsequent day.
Oxygen therapy	Oxygen therapy must be guided by the level of arterial oxygen tension (PaO ₂) and oxygen saturation (SpO ₂). For acutely ill patients (not at risk of hypercapnic respiratory failure) PaO ₂ is >8 kPa and SpO ₂ 94 – 98%. For patients with COPD or who are at risk of hypercapnic respiratory failure, SpO ₂ is 88 - 92%.

* The EBG recommendations are based on criteria from: (ref: 14,57,58,59,66,117-120)

Patient record reviews were reviewed retrospectively to extract variables of diagnostics procedures, medical treatment, discharge management, and general management. Furthermore, data were extracted to assess patient characteristics and

data of readmission, hospital mortality, and mortality within 1 month of hospitalisation. Data were recorded in a tally sheet created in a Word file. At the end, all data - the transcribed field notes, interview texts, and patient record reviews - were merged and analysed as one text body.

Study II

In Study II, data were collected by two *focus group interviews* (6 RNs in each group), followed by *field observations* of 14 RNs (n = 49 observation hours) and *individual follow-up interviews* with 10 of the RNs, in a period of November 2017 to March 2018.

Focus group interviews were conducted with the aim of exploring barriers and facilitators influencing the RNs' adherence to the EBG recommendations for nursing care interventions for older patients with CAP. The interviews were conducted by the moderator (SE) and the observer (TL). The moderator briefed about the aim of the interview, presented results from Study I to explore their reflections about the outcome, and led the interview by following a semi-structured interview guide based on the TDF framework (113). The interview contained questions such as the following: *Do you know, or have you read the content of EBGs for patients with CAP? To what degree do your colleagues, context, or resources influence your performance of EBG recommendations for nursing care for patients with CAP?* The interview questions were planned but were flexible, providing the opportunity to change the sequence of questions and probe for more information. The interview sessions lasted approximately 1.5 hours, were digitally recorded, and were transcribed verbatim by SE.

Field observations were conducted because the focus group interviews indicated time pressure as an explanation for missing care, although the participants were not able to account for how they used the available time. Therefore, there was a need for further exploration of RNs' prioritisation of time and tasks by conducting field observations. The observations were conducted in line with the ethnographic approach, where the researcher (SE) explored common behaviours, experiences, shared features, and patterns of individuals in a bounded group and distinct situations or issues in the participants' natural environment. In Study II, the RNs were observed during their full day shifts, placing the researcher on the side-lines of the RN's activities. Observations were carried out by guidance of (1) EBGs' criteria for nursing care interventions related to CAP (Table 3), (2) the TDF indicating possible barriers and facilitators in clinical practice (113), (3) data from Study I (121) disclosing gaps between EBGs recommendations for nursing care and the current clinical practice in the same units, and (4) the researcher's preunderstanding based on expert knowledge and experience in treatment and care of patients with CAP as an RN and a clinical nurse specialist. Observations lasted until it was deemed that a comprehensive picture of the influencing barriers and

facilitators of adherence to EBGs was attained. In total, the observations lasted 49 hours.

Individual follow-up interviews were performed with the RN immediately after observations. Interviews were conducted to deepen the understanding of the barriers and facilitators influencing RNs' adherence to EBGs for nursing care. The interview questions comprised issues or reflections that arose during the observations. The location of the interviews was in an office in the hospital unit. The interviews ranged from 30 to 45 min, were digitally recorded, and were transcribed verbatim by the researcher.

Study III

In Study III, the tailored strategy was developed in a six-month period from October 2019 to April 2020. The Intervention Mapping Framework guided the design and development process of the tailored theory- and research-based strategy for the implementation of EBNC by following the six steps of IM: (1) conducting a needs assessment to create a *logic model* and gain insight into the problem (quality of care) and its underlying factors and determinants (by use of the TDF) - for this purpose, data from Studies I and Study II were used; (2) stating expected outcomes and performance objectives for environment and for the behaviour of healthcare professionals, which in matrices were linked to change objectives, stating what needed to be achieved to accomplish *performance objectives*; (3) designing the implementation strategy interventions by using relevant theory- and evidence-based methods and converting them into a practical plan (by use of the BCT and TDF); (4) refining the implementation strategy structure, preparing interventions, and producing programme materials; (5) identifying project organisation and designing a detailed plan for the adoption, implementation, and maintenance of the implementation strategy; and (6) developing an evaluation plan (by use of the IOF).

Study IV

In Study IV, data were collected by the guidance of the IOF. For this purpose, data were collected in an eight-month period from June 2020 to January 2021 by *participatory field observations*, *ad hoc interviews*, *focus group interviews*, *registration* of frequency and execution of the interventions and *patient record reviews*. Furthermore, three, and at six-month follow-up was carried out to assess the penetration and the sustainability.

Data analysis

Content analysis

The qualitative data in Studies I, II, and IV were chosen to be analysed by content analysis, which can be used in numerous ways with qualitative and quantitative data and inductive or deductive approaches (122).

In Study I, the text obtained from the transcribed field notes, interviews, and patient record reviews were analysed as one text body by deductive quantitative manifest content analysis inspired by Berg (123). In this study, the EBGs for patients with CAP were applied as a deductive approach and were used to code and analyse the data according to analytic categories consisting of criteria from the EBGs for nursing care interventions. The manifest content was applied to give the analytic categories the value 0 or 1, where 0 was non-compliant and 1 was compliant with the respective criterion in the EBG. The deductive manifest analysis was discussed until all authors reached a common understanding and agreement of the process, whereafter the first author (SE) continued the analysis process and performed descriptive statistics that was assessed and approved by TL.

In Study II, the transcribed field notes and interview texts were analysed by qualitative manifest and latent content analyses, inspired by Graneheim and Lundman (124). The manifest content was the descriptive part of the analysis, in which the analysis concerned what was visible and what was said in the text. The latent content analysis was the interpretive part of the analysis, in which the meaning structure and a deeper understanding of the text were sought.

As a first step, the first and last authors read the transcribed texts several times to obtain a sense of the whole. Second, the transcribed text was subsequently analysed using open coding. This was performed by writing memos, reflections, and interpretative attempts for transcribed texts with empirical knowledge of the TDF domains, the EBG criteria for nursing interventions, and preunderstanding of the context and clinical experience. The findings were compared and discussed to reach a mutual understanding of the text. Next, SE divided the text into meaning units related to the study aim, labelled them with a code, sorted them into subcategories, and categorised them according to the manifest content. These were critically reviewed and discussed in depth with the last author to adjust the system of subcategories and categories and to find a hierarchy of the manifest content. In the fourth step, the latent content analysis was performed by searching for the underlying meaning on an interpretative level across the categories and subcategories, as well as in the meaning units and codes and the abovementioned memos and notes. From this process, a hierarchy of subthemes, themes, and main themes emerged, expressing the latent content of the text. All four authors critically questioned and discussed the findings until a consensus was reached.

In Study IV, transcribed field notes and interview texts were analysed as one text body by deductive content analysis, applying the IOF (111). The analysis was carried out by the first author by reading through the whole text body to obtain a sense of the whole. Then, the data were sorted into categories according to Proctor's implementation outcomes, which were critically reviewed by the last author and discussed in depth with the first author. The final categories were critically questioned and discussed with all authors until consensus was reached.

Descriptive statistics

The quantitative data in Studies I and IV were analysed using descriptive statistics. In Study I, frequencies were applied to present categorical data (e.g. gender, symptoms of CAP, the severity of CAP assessed by the CURB-65 score (14)), reported as numbers with percentages. Frequency distribution was applied to present distribution of continuous data (e.g. age, length of hospital stay, time to antibiotic administration) and was presented as median values with interquartile range (IQR). In Study IV, frequencies were applied to present the performance of EBNC (nutrition support, fluid therapy, oral care, mobilisation, sputum mobilisation, and oxygen therapy) registered in electronic patient records during the study period. Furthermore, it was applied to present RNs' use of patient care plans, patient involvement in care plans, information and guidance of patients about nursing care, and the use of professional terminology in the documentation. Categorical data were reported as numbers with percentages. Statistical analyses in both studies were performed using IBM Statistics for Windows, version 25 (Armonk, NY: IBM Corp) software.

Ethical considerations

The ethical principles of the Helsinki Declaration (125) and the ethical principles of respect for autonomy, non-maleficence, beneficence, and justice (126) guided the design and performance of this thesis. Permission to perform the studies was obtained from the Danish Ethical Committee (Pr. No. H-16018863) and the Danish Data Protection Agency (J. No. HGH-2016-062).

Principles of respect for autonomy

The principle for autonomy refers to participants' rights to hold views, make choices, and take actions based on personal values and beliefs (126). Participants in Studies I - IV received verbal and written information about the purpose of the study to facilitate an autonomous decision about participation. They were informed about

the voluntary aspect of participation and that they could withdraw their participation at any time without giving any reason and without incurring any consequences. Participants had an opportunity to elaborate on questions according to the study before signing informed consent (Studies I and IV). Before the execution of interviews and observations in Studies I, II, and IV, the researcher repeated and clarified the purpose of the study, the method of interviews, and observations and allowed asking questions to clarify any uncertainties.

Principles of non-maleficence and beneficence

The principle of non-maleficence refers to the risk of harming study participants (126), while beneficence refers to doing good for the benefit of others. In all studies, the risk of harming, physically or mentally, was considered low. To minimise this risk and ensure the participants' confidentiality, the researcher assigned code numbers for all study participants. This was done to anonymise the participants, thereby not having the possibility to track back information to any individuals. Moreover, all data were stored anonymously in locked offices and locked cabinets.

The researcher (author of the thesis) was also aware of the possible discomfort during the data collection (observations and interviews in Studies I, II, and IV). Therefore, to maintain the principle of non-maleficence, all participants were treated with the utmost respect, and efforts were made to accommodate their needs and preferences to avoid harming. In Study I, the researcher also became aware of the possibility of observing a lack of treatment and care, which might put the patients' health and well-being at risk. Furthermore, in three cases, I terminated the observations and intervened by informing healthcare professionals about the inadequate procedure. Also, 30 patients were not informed about nursing care interventions (e.g. oral care, mobilisation, nutrition support, daily fluids intake) essential for their recovery. To avoid the risk of harm, the researcher instead needed to inform the involved healthcare professionals and CAP patients after the final observations.

Principles of justice

The principle of justice refers to fairness and includes equal access to benefits, risks, and costs (126). In this thesis, the principle of justice was considered in the selection and treatment of participants. Therefore, participants were treated equally in the selection based on the study aim and without discrimination regarding gender, age, length of employment, nationality, religion, values, etc. All participants received the same information in respective studies and received the same intervention programme in Study IV.

Main results

Principal findings

In the first study, gaps between clinical practice and EBG recommendations for diagnostic procedures, medical treatment, and nursing care interventions for older patients admitted with CAP were identified. Findings revealed a few gaps in diagnostic procedures and medical treatment, but several gaps regarding nursing interventions. Gaps regarding nursing care interventions are presented under the section '*Gaps in nursing care*'.

In the second study, barriers and facilitators at the individual, team, and organisational levels influencing RNs' adherence to EBG recommendations for nursing care were explored. The barriers and facilitators were revealed in a main theme, 'stolen time'—delivering nursing at the bottom of a hierarchy', that captured three interrelated themes: 'under the dominance of stronger paradigms', 'the loss of professional identity', and 'the power of leadership' that consisted of two to three subthemes. The main theme and themes are presented in the section '*Barriers and facilitators influencing nursing care*'.

In the third study, by systematically applying the IM framework, a tailored theory- and research-based strategy for implementation of EBNC for older patients with CAP was designed and developed. The strategy consisted of multifaceted interventions targeting individual, team, and environmental determinants and included a structured plan for adoption, implementation, and maintenance. Furthermore, there was an evaluation plan to assess the implementation process. A detailed description of a systematic stepwise approach is described in the section '*Design and development of an implementation strategy*'.

In the fourth study, evaluation of the strategy by IOF revealed that the strategy was feasible, acceptable, and appropriate in targeting individual and team-based determinants and in supporting the implementation of EBNC. However, fidelity and sustainability were threatened by timely resources and competing organisational tasks, challenging target organisational determinants and executing the strategy as planned. Evaluation of the outcomes is presented in the section '*Evaluation of the strategy*'.

Gaps in nursing care

Study I findings according to adherence to diagnostic procedures and medical treatment revealed that among all recommended diagnostic procedures, such as chest radiography, sputum test for culture and sensitivity, chest examination, blood tests, test for non-responding patients, etc., we identified the severity assessment score CURB-65 being applied most rarely (16.7%) (Table 2 in Paper I). The medication was administrated within four hours as recommended; however, the initial choice of antibiotics was the least frequently prescribed. Of all 30 patients, only 13.3% received antibiotics in accordance with recommendations (Table 3 in Paper I).

Among all interventions delivered by nurses, oxygen therapy was the only intervention that fulfilled EBG recommendations and was delivered for 88.9-100.0% of the patients (Table 4 in Paper I). Although the plans for mobilisation and fluid therapy were frequently developed (by physicians and physiotherapists), fluid therapy was received in 25.0 - 66.7% of the cases and mobilisation in 33.3 - 50.0%. During the three observation days, oral care was delivered twice a day for 26.7% of the patients on the first day, 23.1% on the second day, and 55.5% on the last observation day. Of the patients who needed sputum mobilisation by positive expiratory pressure (PEP), 18.2% received the treatment on the first day, 20.0% on the second day, and 42.9% on the third day. Most of the patients fulfilled EBG criteria for the need for nutritional support, but the nutrition support plan was developed for six patients in total. Due to the lack of calculation of energy and protein needs, and insufficient registration of nutritional intake in electronic patient journals, it was impossible to assess whether patients received nutrition in accordance with their individual needs.

Barriers and facilitators influencing nursing care

In Study II, an overarching theme 'Stolen time' - delivering nursing at the bottom of a hierarchy, revealed that RNs lacked time to perform EBNC as their time was stolen. It was stolen by different contextual and organisational factors, such as the lack of overall coordination of many professional groups' work procedures and the lack of management support in facilitating nursing. The time could also be stolen by the RNs themselves due to the lack of competencies, e.g. to work systematically with a focus on nursing care. RNs lacked professional identity and terminology to communicate professionally resulting in difficulties in catching the attention of other professionals and their own colleagues. Consequently, RNs helplessly ended up at the bottom of the hierarchy, and they had no power or skills to prevent the stealing of their time.

The first theme, ‘under the dominance of stronger paradigms’, illuminated that the context, the working culture, and the interdisciplinary team consisting of different professionals strongly influenced the RNs’ focus, their use of time, and prioritisation of nursing care, placing nursing care lowest in the hierarchy. One of the greatest barriers to performing EBNC was that RNs organised and structured their time and tasks to accommodate the demands of the biomedical model. RNs expressed that they had to focus on biomedical and administrative tasks, as they felt responsible for the patient’s condition and stability, and they were to be blamed if anything went wrong or was overseen. Nonadherence to physicians’ discharge plans caused delays and increased expenses for the unit. Therefore, carrying out biomedical and administrative tasks related to patient flow was without reflection prioritised over EBNC.

The lack of time was highlighted as a main barrier for delivering systematic and EBNC. However, the study findings revealed that there was a discrepancy between the experienced and the actual use of time. The time was there, although it was stolen by other professionals in the form of continual interruptions, unannounced visits, and lack of overall coordination of many professional groups’ work procedures. RNs were available 24 hours a day and could be interrupted anytime, anywhere and by anybody. Consequently, as other professionals’ demands and needs were prioritised higher than EBNC, RNs were hindered from focusing on and performing systematic care according to patients’ fundamental needs.

The second theme, ‘the loss of professional identity’, reflected that working under time pressure and not being in charge of own time and tasks resulted in nursing care being provided at the spur of the moment. Therefore, care was delivered in left-over time gaps from the demands of other professionals and resulted in unsystematic and haphazard delivery of nursing care. Moreover, due to the lack of time, the interventions that were considered time-consuming, e.g. oral care, were under-prioritised or left undone.

In general, RNs were knowledgeable about EBG recommendations for patients with CAP, but the knowledge was often not applied in practice. The recommended care was either forgotten or under-prioritised when RNs organised their tasks, or it was delegated to licensed practical nurses who had not a knowledgebase or competences to carry out the delegated interventions. Licensed practical nurses received neither supervision nor a care plan to guide them. Consequently, in several observations, patient safety was put at risk due to treatment failure. Moreover, the lack of professional and concise terminology in RNs’ documentation or in communication constituted a potential hazard to patient safety as RNs had difficulty catching other professionals’ attention when arguing for patient cases. In several cases, this led to a delay in acute treatment. The lack of professional and concise terminology also resulted in nursing documentation not being read or used to plan and organise nursing care. Instead, physicians’ notes were applied to create an overview of the patient, their status, and treatment plan. This blocked the view of the nursing as

RNs' focus was turned to biomedical aspects of treatment. However, the RNs who had a strong professional identity and used professional terminology and evidence-based knowledge were equivalent partners to other professionals and were listened to and treated respectfully. Furthermore, patients receiving care from these RNs had timely EBNC according to EBG recommendations.

The third theme, 'the power of leadership', reflected that the managers had the power to mediate the hierarchy and the working culture and to facilitate nursing care and professionalism. In the units where the nurse manager was absent or lacked professional leadership skills, or where the manager's focus was on biomedical and administrative tasks, the hierarchy was most apparent; here, the biomedical model ruled, and nursing practice was invisible. It became invisible because other professionals' organisation of work and demands overruled RNs' working processes and obligation to deliver nursing care. Seemingly, in these units the nursing care was devalued, and neither the RNs nor the managers or other professionals delineated the boundaries for nursing care. Conversely, the nurse manager, who had solid professional leadership skills and a consistent focus on nursing care, had the power to put nursing care on the agenda in the interdisciplinary cooperation. In cooperation with a clinical nurse specialist skilled in facilitating EBNC, they were able to facilitate EBNC and mediate the hierarchy. Through daily discussions and reflections of EBNC interventions relevant to patient care in their unit, RNs were facilitated to think, and work based on evidence-based practice. By demanding RNs to actively participate in the patients' care planning, by facilitating RNs to focus on EBNC instead of biomedical tasks, the nurse manager indicated the importance of nursing care and positioned it as an equal part of the patient treatment and care. Thereby, the nurse manager had the power to steal back time to nursing care and mediate RNs back to their professionalism.

Design and development of an implementation strategy

The results of the design and development process are presented by the following six steps of the IM framework.

Step 1: The *logic model of the problem* was created by identifying the problem (based on findings from Study I), problem behaviour, and the determinants influencing the problem behaviour in clinical practice (findings from Study II). The overall problem was defined as the haphazard and unsystematic delivery of EBNC for patients with CAP. The problem behaviour and determinants influencing the problem were related to the individual (RNs) and team (interdisciplinary team)-based behaviours such as lack of professional identity and devaluation of EBNC by the team. Moreover, environmental factors and determinants in the medical unit, such as the biomedical model, lack of managerial support, and lack of integration

of nursing care in the interdisciplinary cooperation, were identified by needs assessment to influence the problem (partial logic model of the problem is presented in Figure 2; the full version of the logic model is presented in Additional File 2 in Paper III).

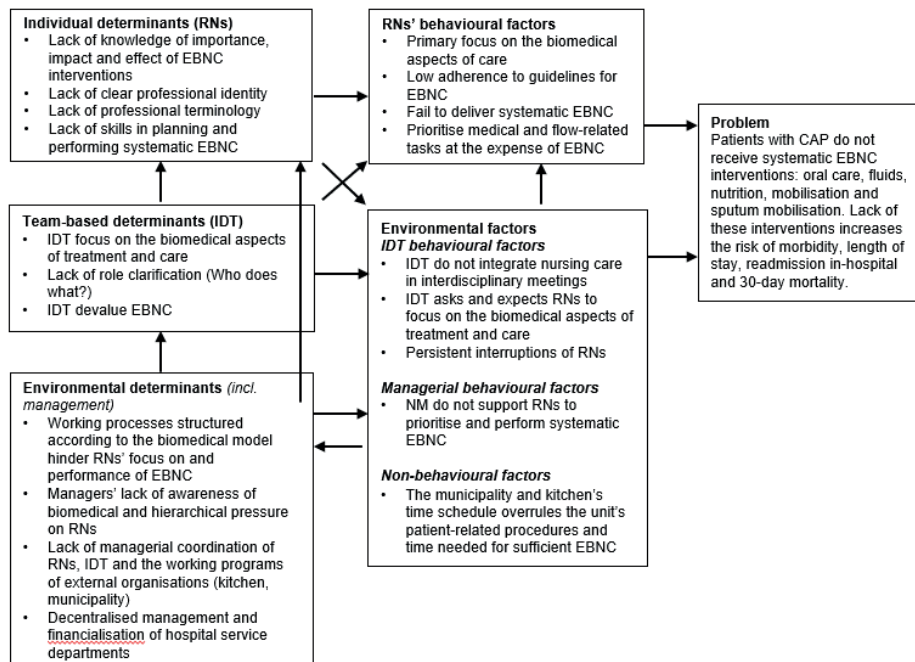


Figure 2. Partial logic model of the problem.

Step 2: *The logic model of change* was conducted by stating the desired outcome for the strategy: ‘older patients with CAP receive oral care, fluid therapy, nutritional support, mobilisation, sputum mobilisation, and oxygen therapy, systematically and according to the best evidence’. Next, the desired *behavioural and environmental outcomes* were defined and linked to *performance objectives* describing behaviours that needed to be changed at the individual and team levels and what needed to be changed at the environmental level to achieve the desired outcome for the strategy. To complete *the logic model of change*, the *matrix* was conducted by linking performance objectives to determinants (data from Study II, informed by the TDF: attention, beliefs about consequences, knowledge, skills, beliefs about capabilities (self-efficacy), social influence, and environmental context and the resources) to define change objectives at the individual, team, and environmental levels that needed to be addressed to achieve the desired outcome.

Step 3: The process in this step led to the design of a tailored theory- and research-based implementation strategy. The interventions in this strategy were designed by matching *determinants* and *change objectives* at the individual, team, and environmental levels with theoretically informed methods by use of organisational and behaviour change theories such as Social Cognitive Theory (127), the Theory of Planned Behaviour (128), etc. Thereafter, the theoretically informed methods were converted into a practical plan describing the delivery of the interventions. For example, at the individual level, based on behaviour change theories, the implementation strategy guided how to increase RNs' skills to perform systematic EBNC according to individual patient needs and patient care plans by using *guided practice* and *goal setting*. The practical plan informed the strategy users to execute training sessions using of the learning-contract with goals for training. The complete overview of applied theories and theoretically informed methods is presented in Additional File 4, Paper III.

Step 4: In this step, the implementation strategy was refined and organised, and multiple interventions targeting individual, team, and environmental determinants (presented in Appendix I) were prepared in cooperation with the implementation strategy users: the planners, managers, and implementers to ensure they fit the context and local needs. Also, the supporting implementation materials were developed and pre-tested in cooperation with the staff and patients, and their preferences and relevant additions were incorporated into the interventions and materials. An overview of the materials is presented in Appendix II.

Step 5: A project organisation was established consisting of *a steering group*, *project managers*, *project implementers*, and *keypersons*. To promote the adoption, implementation, and maintenance of the strategy, they were all presented to the strategy, the outcomes, and resources for the execution of the strategy. Activities to facilitate the strategy were then planned by the project organisation. The project managers, implementers and keypersons received training in executing interventions they were responsible for, and weekly meetings were planned to be held to support them in executing the strategy.

Step 6: An evaluation plan was developed to continually assess the implementation process. During the implementation process, data were planned to be collected two to three days a week by observations, ad hoc interviews, focus-group interviews, registration of frequency of implementation interventions execution, and audits of electronic patient records. The data were planned to be used at weekly meetings with the project implementers to evaluate the process and to adjust the implementation interventions if needed.

Evaluation of the strategy

The study consisted of the evaluation of the implementation strategy using IOF outcomes: *acceptance, adoption, appropriateness, fidelity, feasibility, penetration, sustainability, and costs*.

Findings from Study IV revealed that all study participants (the project management, implementers, RNs, physicians etc.) perceived the scope of the strategy, its interventions, and materials as acceptable, and they gave examples of how it had a beneficial and supportive effect on their practice. The findings revealed that the acceptance of the strategy entailed participants' willingness to adopt the implementation interventions targeting determinants at the individual-, team-, and organisational levels, and thereby facilitating the implementation of EBNC. Likewise, the participants (project organisation and the staff) perceived the implementation interventions (*presentations, lectures, bedside training, feedback* etc.; Table 1 in Paper IV) as appropriate and meaningful. This was an important prerequisite for the acceptance of the overall strategy. The RNs found the interventions appropriate for obtaining awareness and knowledge of their professional role, goals, and tasks and for increasing skills in systematic planning, performance, evaluation, and adjustment of EBNC according to the patients' individual needs. Initially, it was difficult for RNs to understand their professional role and change their behavioural habits. However, the combination of multiple interventions was perceived as supportive in achieving the goal and also resulted in the releasement of more time for nursing care. Importantly, through monitoring and weekly presentation of the results to the implementers, the interventions' relevance and appropriateness became visible, and they supported the maintenance of the interventions.

In general, the results indicated that the strategy was feasible. However, the fidelity and feasibility of the implementation process were challenged due to the difficulties of implementers in delivering several of the implementation interventions. Although the implementers felt confident in delivering the implementation interventions and interventions were planned according to the unit resources, unexpected events and competing organisational demands challenged the delivery. The most inhibiting barrier was the Covid-19 pandemic which brought the project on hold for 6 weeks, resulting in a delay in interventions such as bedside training, lectures, and supervision. Moreover, the implementation interventions needed to be adjusted according to emerging unforeseen needs. For example, the planned lectures needed to be expanded more than planned to enable RNs to discuss, transfer and absorb the knowledge. The RNs with language barriers needed an extra day for bedside training. Not surprisingly, a feeling of ownership was vital for the project implementers and the management. To motivate and maintain them to the implementation, the responsibility for systematically planning and executing the

strategy was handed over step-by-step from the project leader (SE), who successfully increased the independence and feeling of ownership.

Assessment of penetration showed a behaviour change within 2.5 months of the project. Both the manager and the staff expressed that the RNs had found their professional identity, which was an important prerequisite for delivering EBNC and stealing back time. The RNs and nursing care became tangible in the interdisciplinary cooperation, and the assessment of electronic patient records revealed an increase in several nursing care interventions. However, the assessment of the sustainability at the 3- and 6-month follow-up showed that the lack of integration of the strategy in implementers' everyday practice challenged the maintenance of the success. To support the staff in maintaining behaviour change, maintain the penetration of the strategy, and sustain the success, it was essential that the implementers consistently and systematically facilitated the strategy and executed the implementation interventions as designed according to contextual needs.

Discussion

The overall aim of the thesis was to determine a tailored theory- and research-based strategy to implement EBGs for the treatment and care of older patients admitted with CAP in a hospital setting. This was achieved through four studies, the results of which are discussed in the following sections.

Gaps in nursing care

The first step in this PhD study was to identify and analyse gaps between current clinical practice and EBGs recommendations regarding diagnostic procedures, medical treatment, and nursing care interventions. This was an important step as it provided an understanding and gave guidance on where the investment in practice change should be made.

The findings in Study I indicated that healthcare professionals' adherence to EBGs was in several aspects, inconsistent with recommendations. A few but serious gaps were identified in diagnostic procedures and medical treatment, but there were several gaps in nursing practice. This result confirmed findings from a national retrospective study (5), which was a decisive starting point for this PhD study, that EBGs for CAP are not implemented sufficiently in the current hospital setting, and particularly nursing interventions are performed haphazardly and unsystematically and were, in the worst cases, missing.

The study findings provided us with insight that of all recommended nursing care interventions, oxygen therapy was the only intervention performed systematically according to recommendations in EBGs. When considering all interventions, oxygen therapy can be assessed as a more technical intervention, whereas other interventions require that RNs connect with the patient to understand their unique fundamental needs. These interventions should preferably be tailored to patients' physical, psychological, cultural, and emotional needs (129). Meeting patients' fundamental needs of care requires that RNs engage meaningfully with the patient and acknowledge the patient as a unique person. It may be considered a simple and fundamental task for RN; however, this task is not executed through a simple transactional process (19). It requires time and investment for each patient. Moreover, the unique patient needs are required to be met by care intervention in

accordance with recommendations in EBGs to ensure patients receive safe and effective health service. However, meeting patients' fundamental needs for care and delivering care according to the best existing evidence has shown in our study to be a difficult task. This finding seems to be a global problem, and the prevalence of *missing care* is estimated to be 55 - 98% in acute care hospitals (1,10,11,76,77).

There seems to be a pattern that fundamental nursing interventions that are time-consuming, e.g. mobilisation, oral care and talking to a patient, are less likely performed due to under-prioritisation (34,130,131). Conversely, highly specialised and technical interventions, such as oxygen therapy in our study, are perceived as more prestigious and receive more attention (132,133). Problematically, under-prioritisation of interventions that are essential for patients with CAP, such as nutrition, fluid therapy, oral care, and mobilisation, can have fatal consequences. Previous research has reported that low adherence to oral care is significantly associated with reduced quality of life (134), malnutrition (135), and mortality (136,137). The mismanagement of fluid therapy has been reported to be associated with electrolyte complications (71,138), and patient immobility during hospitalisation is linked to pressure ulcers, immobilisation, increased risk of hospital-associated pneumonia, length of stay, and reductions in muscle mass and strength, leading to functional decline (Falvey 2015, Brown 2018, Van Ancum 2017). Conclusively, the lack of fundamental EBNC interventions in this study constitutes a threat to patient safety.

Although numerous policy initiatives and strategies have been developed emphasising the importance of care and integration of patients in care initiatives, e.g. person-centred care (141), there is still little consistency about the reason for the provision of suboptimal care. For many years, researchers and healthcare professionals have tried to find a solution to the burden of CAP. Interestingly, the majority of national and international research focuses on better and more effective diagnostic procedures and medical treatment, whereas nursing care is a neglected area. Also, the existing EBGs for CAP mainly review diagnostic tools and choice of antibiotic treatment, whereas the descriptions of EBNC interventions vary and are either sporadically described or not described at all (13,14,58,59). Consequently, to get a sense of how to perform EBNC interventions, RNs in clinical practice need to collect several EBGs describing how nursing care interventions should be performed. Therefore, to assess RNs' performance of EBNC in Study I, the data collection guide was also based on several EBGs used in current practice. One may question how strong the evidence is in these guidelines. The evidence base for many of the recommended nursing interventions for patients with CAP, e.g. sputum mobilisation, oxygen therapy, and fluid therapy, varies and is limited due to the risk of bias, small effect and small sample sizes in the original studies. This could explain why nursing interventions are not conclusively and systematically described in EBGs. Nevertheless, due to the intervention's lifesaving effect and no significant

side effects, interventions such as sputum mobilisation, oxygen therapy, and fluid therapy are included in EBGs for CAP (12,14).

In conclusion, the findings in Study I illustrated unsystematic and missed nursing care on a large scale and failure to adhere to EBGs recommendations in nursing practice. Hence, an implementation strategy was needed to ensure that patients with CAP receive safe and EBNC when admitted to the hospital.

Barriers and facilitators influencing nursing care

Considering the gaps in Study I, it was important to identify and understand obstacles in the provision of care. Therefore, Study II aimed to systematically explore barriers and facilitators influencing RNs' adherence to EBG recommendations in the context in which they work.

The findings from Study II indicated that RNs' adherence to EBGs was influenced by multiple barriers at the individual, team, and organisational levels, and only a few but essential factors facilitated RNs performance of EBNC. At the individual level, the main barrier for RNs' delivery of EBNC was perceived to be a lack of time, and which is supported by findings from previous studies (10,142,143). Nonetheless, an ethnographic approach revealed that the barriers were the RNs' use of time, unclear role perception, low prioritisation of EBNC, and lack of professionalism. On the other hand, RNs who had a clear perception of their professional roles and boundaries, who used evidence-based knowledge and communicated using professional terminology, were able to deliver recommended and timely treatment and care. Furthermore, they were more successful when collaborating with the interdisciplinary team. This finding is consistent with previous research, reporting that the quality of the performed clinical practice is associated with the level of RNs' professionalism (144,145).

However, barriers at the individual level were seemingly strongly influenced by contextual barriers at the team and organisational levels. The central contextual barrier influencing RNs' practice was the biomedical model (146), which has been reported to devalue nursing care and contribute to fragmented delivery of care (133). This organisational barrier allowed the interdisciplinary team and the managers to ask RNs to focus on and fulfil biomedical tasks, leaving limited time for nursing care. Consequently, this barrier in combination with a lack of RNs' awareness of professional roles and boundaries, turned RNs' focus on biomedical and treatment-related aspects, contributing to the devaluation of nursing care. Our finding is supported by others, reporting that the dominance of the biomedical model contributes to devaluation and poor delivery of nursing care (133,147). Study II findings also provided us with insight that RNs' daily routines were organised and structured according to the demands of the biomedical model, but also according to

other professionals' and external organisations' working structures that are based on medical traditions. This resulted in the invisibility and placement of RNs and nursing care at the bottom of the organisational hierarchy, where other professionals' priorities and tasks were attributed higher values. Also, Voldbjerg et al. (148) and Giménez-Espert et al. (149) have reported that the organisation of care has an impact on professional nursing practice and is organised to meet the needs of the medical system rather than the patient. Interestingly, already back in 1994 -1995 (150,151), it was reported that the biomedical model had a higher value and influenced RNs' perceptions of professional role and organisation of work. This evidence, in combination with evidence about the estimated high prevalence of missing care, indicates maintained challenges for the nursing profession.

Considering the consequences of lack of fundamental EBNC and acknowledging the barriers hindering the delivery of optimal care, there is a need to reconceptualise the way in which nursing care is valued and performed. There is a need to challenge underlying assumptions and understanding of the value of nursing care, not only among RNs but also among the managers, the interdisciplinary professionals, and importantly also among politicians. Our results, as well as previous research, indicates that there is a need for a paradigm shift, or at least, there is a need to develop an evidence-based understanding of how fundamental EBNC could and should link with highly specialised interventions in a system organised by a biomedical model, particularly if we want to see improvements in patient safety, care, and cost-effectiveness. For this to occur, it is seemingly insufficient to focus on nursing care separately and in isolation in the healthcare system. The task is to integrate all parties, the RNs, the interdisciplinary professionals, management, the organisation, and politicians to create a change in the current healthcare system.

Numerous reports of missed care have caused concern worldwide and intensive efforts are made to solve the complex challenge, e.g. policy initiatives (21), creating nursing strategies (141,152), optimisation of nursing curriculum (153), etc. (133). However, considering the results identified in Study II, seemingly, initiatives have not succeeded in changing current practice. A framework, 'Fundamentals of care', developed in 2013 by members of the International Learning Collaborative seems to be a promising tool to support RNs in undertaking necessary steps in changing the current practice (154). The conceptual framework focusses on enabling the patient and the nurse to assess the patient's needs competently and confidently, as well as to plan, implement, and evaluate the efforts aimed at covering the patient's needs. This is claimed to be the basis of effective nursing and is achieved through the conscious adaptation of three core elements: the establishment of the relationship with the patient, the ability to integrate the patient's care needs, and the ability to ensure that the health system or context is committed and responsive to these core tasks (154).

Strategy for implementation of EBNC

Findings from Study II emphasised that when identifying barriers and facilitators for delivery of care, it is crucial not only to explore barriers at the individual RN level but also to expand the exploration to the team and organisational levels. Conceptually, understanding these factors together allows the design of an implementation strategy that is more likely to target appropriate barriers and facilitators that will aim to increase the evidence uptake in complex healthcare systems (98).

The strategy developed in this thesis (Study III) aimed to change barriers and facilitate enablers at the individual, team, and organisational level to support the implementation of EBNC interventions for patients with CAP. The prerequisite for designing the strategy was to engage management and staff in the design and development process. Furthermore, patients were engaged in test materials involving patient care. It was an important prerequisite as it is reported to increase the ability to receive context-related insight and increase the potential to develop a tailored strategy (95,104,114,155). Moreover, it is claimed to foster the acceptability, feasibility, and sustainability of a new practice or practice change (95,104,115,155). Therefore, to motivate and engage all parties, it was important to create awareness of the problem (identified in Studies I and II), the solution (Study III), and its benefits that the participants could be a part of.

Multiple studies have previously developed implementation strategies to change behaviours in clinical practice to increase the uptake of EBGs (155-158). Unfortunately, a systematic review by Colquhoun (102) reported that few studies have developed strategies targeting change at multiple levels. The focus relies mostly on individual or organisational determinants. Also, a recent systematic review by Lewis et al. (159) stated that it is important that strategies in clinical practice are designed to directly target the determinants to avoid deployment of insufficient or less potent strategies, resulting in a waste of time and resources. Our study (Study III) differs as it embraces barriers at multiple levels. Therefore, the strategy also consisted of multiple interventions that in combination were designed to target attention, beliefs about consequences, knowledge, skills, beliefs about capabilities (self-efficacy), social influence and environmental context and resources. Moreover, the strategy used facilitators as strong professionalism and management facilitation, which was reported in Study II to facilitate delivery of EBNC and to undermine the team-based and organisational hierarchy. That we have developed a multicomponent and tailored strategy is considered a strength in implementation science (98). There is growing evidence indicating that multicomponent strategies tailored to target context-specific barriers and facilitators are more effective in implementing change and improving professional practice than passive single intervention strategies (97,98,160). However, there is little understanding of why and how these multicomponent and tailored strategies work

(159), limiting the possibility of transferability and expanding the knowledge of the development or selection of strategies in implementation science. According to Grol and Wensing, designing an effective strategy for change requires a systematic approach with a strong rationale for the design and explicit reporting of the intervention development process, which will support the transferability of the development process in other contexts (95). Therefore, to support clinicians and researchers in developing a strategy and enlighten the field of implementation science, it was crucial in Study III to thoroughly describe the design and development process.

To increase the uptake of fundamental EBNC, our study differed from previous studies as we did not try to implement EBG recommendations in their raw form. The EBGs were first transformed into a CPW by translating evidence-based knowledge in EBGs to practical guidance. Moreover, the strategy developed in this thesis is designed and developed both using previous research and multiple theories, as recommended in the implementation science, which is a major strength (92,103). It is considered a strength, as interventions based on theory are reported to be more effective than non-evidence-based interventions (161,162). Moreover, the use of theory facilitates the possibility of drawing conclusions on the effectiveness and understanding of generalisability and replicability (92,163,164). Therefore, it was also important in Study III to systematically report the design and development process and describe in detail how the relevant research and theories were used. However, the use of theory does not ensure the effectiveness of the strategy (165). The chosen theories must also target the identified determinants that influences behaviours in clinical practice (166). This was achieved in Study III in this thesis.

Changing nursing practice

A final step in the implementation of innovations is evaluation. According to Grol and Wensing, it is crucial to determine whether the efforts have led to the desired change, and if not, assess where improvements can be made to achieve the success (95). Therefore, in Study IV the implementation strategy was evaluated using of the implementation outcomes framework (IOF), and primary findings are discussed in the following.

Findings from Study IV revealed that the strategy was found acceptable and appropriate by study participants. Acceptability and appropriateness are important prerequisites as they may have an impact on several other outcomes, such as fidelity, feasibility, and penetration. Evaluation of the acceptability and appropriateness illuminated that the study participants were interested in and motivated to participate in a study. Importantly, they had a positive attitude towards changes the strategy targeted for. The prerequisite for the success was that the participants had an

understanding and knowledge of the problem, needs for change, and an understanding of how the strategy would target determinants to achieve the change. This was achieved through the implementation strategy interventions such as lectures, presentations, and information.

The goal setting for the strategy seemed to correspond to participants' preferences and this was another important prerequisite for participants' motivation and acceptance too cooperate. This result is in conjunction with a systematic review by Kwasnicka (167), reporting that the motivation and goal setting that corresponds to participants' preferences are effective and supportive in changing professional behaviours. Moreover, the theory of behavioural change describes goal setting as an effective technique in changing behaviours (116). Therefore, the theoretically informed methods that were chosen to (Study III) target individual and team-based determinants can be considered as appropriate and relevant to achieve desired outcomes.

As in Study III and also in Study IV, we used participants from the clinical setting (manager, implementers and the staff) as active partners in the implementation process through the co-design process. They were involved in testing the materials and their voices were heard and integrated when adjustments needed to be made. The acknowledgement of staff professionals' opinions may also have contributed to the acceptance of the strategy, which is reported to increase the probability of developing a successful and tailored strategy targeting contextual determinants (95,115,168).

Findings in Study IV also revealed that the strategy was feasible and supportive to improve RNs' professionalism and professional identity. RNs became aware of their professional roles, goals, and tasks, which turned their focus on delivering fundamental EBNC regarding the patient's individual needs and preferences. Also, at the team level, the interdisciplinary team were observed to change their behaviours by supporting RNs to focus on nursing care and integrating RNs and nursing care in patient treatment and care plans, instead of demanding RNs to focus on biomedical tasks (identified barrier in Study II). This result was a major achievement, indicating that by use of tailored, multicomponent interventions based on relevant research-based evidence and multiple relevant theories, it is possible to change complex barriers in clinical practice such as hierarchy, lack of professionalism, and professional identity. Moreover, this result confirms recommendations in the implementation research, that the strategies developed to change practice patterns should be tailored theory- and research-based and include multicomponent interventions to promote better uptake of evidence and improve the quality and safety in healthcare (92,95,98,166).

When evaluating the implementation process, it is also important to assess fidelity to determine whether the strategy was delivered as intended (111). The findings in our study revealed several threats affecting fidelity, mostly for the intervention *bed-*

side training. Interestingly, this was also the only intervention that implementers were not used to execute. Findings revealed that implementers were challenged in executing interventions due to the lack of time and competing organisational demands and tasks. They had difficulties prioritising time and tasks. Ironically, this was the same barrier that hindered RNs from delivering fundamental EBNC (identified in Study II). This barrier occurred despite the allocation of time, resources, and weekly meetings where the execution of the implementation interventions was planned, evaluated, and adjusted. The lack of time is also reported by previous studies to be a major barrier in the implementation process (169,170), indicating that when designing an implementation strategy, there is a need to thoroughly assess whether the strategy fits with the context timely and economic resources.

The most challenging task in Study IV was organisational changes, which is line with findings in previous research (168,171,172). Despite the managers efforts in cooperating with the external partners in making organisational changes that were needed to give RNs the possibility to deliver nutrition support, we did not succeed. This result confirmed the challenges nursing care is facing in a hierarchical and complex healthcare setting. Furthermore, this result indicated that in future studies, it is crucial for managers to have more support and possibly stronger skills in executing organisational change, particularly as managers are recognised as prime facilitators in the implementation process and as they have the power to mediate clinical practice (173-178).

When considering the penetration in Study IV, the result must be interpreted with caution, as SE (first author) was much involved in an implementation process by helping implementers to execute the interventions. Possibly, the involvement of SE constituted an unnatural setting for implementation that possibly was also a threat to sustainability. Therefore, in future studies, more attention should be paid to the training of the implementers regarding their skills to execute the implementation process.

Methodological considerations

Methodological strengths and limitations should be taken into consideration when interpreting the results of the research study. In this thesis multiple methodological approaches were used, and considerations regarding methodological strengths and weaknesses are discussed in the following. The quantitative research conducted in this thesis is discussed in terms of validity, whereas the scientific rigour of qualitative research is discussed in terms of credibility, dependability, confirmability, and transferability, according to Lincoln et al. (179).

Validity

Validity is referred to as the approximate truth of inference (180), indicating whether the study findings are correct and true, and is discussed in terms of internal validity, reliability, and external validity in the following.

Internal validity is defined as the extent to which the observed results represent the truth in the study population and are not influenced by methodological errors (180). The strength of internal validity in Study I was that the data were collected in a real-life setting. When interpreting Study I results, it is important to acknowledge that data according to diagnostic procedures and medical treatment in electronic patient records were assessed by one author who had expert knowledge as an RN in the treatment and care of patients with CAP. Data were assessed by the guidance of the EBG criteria for diagnostic procedures and medical treatment. Therefore, it is possible that author conclusions may differ from healthcare professionals, which weakens the internal validity in Study I. Desirably, the internal validity could have been enhanced by involving a physician to interpret the data of diagnostic procedures and medical treatment. However, TL (the last author) reviewed the assessment of the data according to EBG criteria and the patient's clinical data, which strengthens the internal validity. Another possible threat to internal validity both in Studies I and Study IV is that I, as the first author, collected and analysed the data, which can be considered possible bias due to the lack of blinding. To reduce this methodological threat, TL rechecked the data and the analysis process. Furthermore, to increase the internal validity, data were checked several times after entering them in SPSS.

Reliability concerns accuracy and refers to the extent to which a measure assesses the characteristics of interest in a consistent way (180). In Study I, quantitative data were collected by using the data collection guide based on EBG criteria, which was a strength to ensure consistency. However, data collection was carried out by one author, which possibly was a weakness and threat to reliability. Therefore, it would have been preferred to enhance the reliability by *inter-rater reliability* that refers to different raters' (researchers) judgement. That could have been achieved by, for example, two researchers executing data collection with the same data collection guide whereafter the data collection was compared to assess the consistency. To enhance the reliability, SE tested the data collection guide three times, discussed the concerns with TL, and adjusted the guide to ensure accuracy before the final data collection started.

External validity concerns the extent to which the findings can be generalised beyond the sample, setting, and conditions (180). A major strength in this thesis was that studies were conducted in a real-life setting over a wide time span that possibly reflects realistic everyday outcomes and is therefore considered a strength to external validity. Moreover, a strength to external validity was that we included a heterogenous group of healthcare professionals without having exclusion regarding

age, gender, length of employment, or length of professional experience. Therefore, the healthcare professionals in our studies represented the real-life sample.

When considering external validity, another strength in our studies was (Studies I and IV) that patients were selected by purposive sample and were included from a large capital region in Denmark where the population might be representative for the rest of the population in Scandinavia. However, when considering the socioeconomic status that is well described to influence health (181), it might be that patients in our study have a lower socioeconomic status than the population from other regions with a higher socioeconomic status. However, when assessing patient characteristics (health status) (Study I), the participants seemed to be representative of the general population of older patients with CAP (7,53).

It is also important to acknowledge when considering the external validity that the EBGs used in our study (Study I) were ones that are valid in Denmark. Therefore, it is important to note when generalising our results whether the EBGs for patients with CAP are the same in other countries. Moreover, it is important to acknowledge that studies in this thesis were carried out in a local medical unit in a large university hospital; therefore, the context, culture, and organisation of interdisciplinary cooperation between the RNs and other professionals might be much different in other clinical settings. This might also limit the generalisability to other countries.

Credibility and confirmability

Credibility relates to the truth, trustworthiness, and interpretation of the data (124,179). According to Lincoln et al. (179) credibility includes carrying out the study on a trustworthy way and demonstrating the credibility when reporting the results.

Prolonged engagement is one of the activities that strengthened the credibility of this thesis. Prolonged engagement refers to the researcher being familiar with the context and building trust with the participants. I am an RN employed in the department for several years with a special function as a clinical nurse specialist, which gave me a deep contextual understanding, including the care of CAP patients. This made it possible to collect and analyse the data in a complex setting by multiple methods and to have a deeper understanding of the narratives and to interpret the occurring situations during the data collection. However, this inside perspective and preunderstanding can also be considered a limitation. The insight knowledge of the context may have limited my openness to new and unexpected aspects during the observations and interviews and biased interpretation of the result. To enhance the credibility and confirmability (referred to as objectivity and neutrality of the data (182)) of the findings, the researcher triangulation was used where all authors were involved in reflections and critical discussions throughout the data collection and

analysis to challenge my preunderstanding, choices and interpretations, which enhanced the trustworthiness of the findings.

Another strength of all four studies in the thesis is the data triangulation that enhances the credibility and confirmability of the findings. In all four studies multiple data collection methods were used to gain a deeper understanding of the research question. Moreover, the heterogeneity of the several medical units involved in Studies I and II, which had different cultures, teams, and leadership styles, enhanced the strength of the results. However, when designing the strategy for a respiratory unit in Study IV, only determinates for this specific context were applied.

Moreover, to allow the reader to assess the credibility of the study method and findings, the ambition was in all four studies to thoroughly describe the sampling process, the data collection methods, and the analytical procedure.

A potential threat to credibility in this thesis was in Studies I, II, and IV due to the trust and openness of the participants as they possibly could not feel free to discuss sensitive experiences and perceptions during the interviews - possibly as they knew the interviewer and the moderator as their colleagues. This limitation could disturb the nature of the data and affect the results. However, the participants discussed and spoke openly about the topics they were asked about, indicating confidence with the researcher and the interview situations. Moreover, all healthcare professionals in all four studies consented to participate, and no one withdrew.

Dependability and transferability

Dependability refers to the stability of the data and the conditions. To achieve the dependability of the data, it is important to question the same areas for all participants (124). Regarding dependability, a data collection guide was used in Studies I, II, and IV to reduce the risk of inconsistencies, although the participants were encouraged to narrate freely about the areas related to the study aim. To strengthen dependability throughout all studies, data were collected by the same moderator and observer. One of the threats to dependability was in Study IV. The Covid-19 pandemic made it impossible to carry out the project as intended. Initially, the study included electronic patient records (EPR) from patients admitted with CAP. The intention was to evaluate the penetration of the implementation strategy and to assess whether the electronic patient records reflected the systematic planning and performance of EBNC. However, after eight weeks into the project, only a limited number of patients with CAP were admitted. Instead, an overload of patients with CAP were admitted. Terminating the project was not an alternative, and therefore we needed to change the strategy and include electronic patient records from all admitted patients. Therefore, this major change is a threat to dependability and might have affected the results. However, because the EBNC interventions were considered fundamental interventions for all admitted patients and not only for

patients with CAP, the change was considered to have a limited impact on results. Moreover, as all data (EBNC interventions) from electronic patient records were assessed according to each patient's individual needs and EBG recommendations.

The concept of transferability refers to the extent to which the findings can be transferred to another context (124). According to Lincoln et al. (179), it is the researcher's responsibility to present sufficient data about the context and the participants, so it is possible to evaluate the applicability of the findings. On the other hand, it is the responsibility of the reader to determine whether the findings are transferable to their context. To enhance transferability, efforts have been made to describe all four studies in detail, particularly the design and development of a tailored theory- and research-based strategy, all of which will enable others to apply the method to their context.

Reflections regarding the theoretical frameworks

As a frame of this thesis, the IMC guided the use of several theoretical frameworks that in combination supported the design, data collection, data analyses, and development of an implementation strategy. Considerations regarding the IM, TDF, BCT, and IOF that were used in Studies II, III, and IV are discussed below.

The use of the IM framework was a major strength of this thesis. The IM supported our understanding of how barriers and facilitators, identified in Study II, systematically could be applied to develop a tailored strategy, and target its interventions to the desired change in clinical practice. The process of conducting the *logic model of the problem* and the *logic model of the change* provided an overview of the barriers and facilitators that were required to be addressed to facilitate the change at the individual, team, and organisational levels to achieve the evidence-based practice uptake. Most importantly, the *logic model of the problem* informed the importance of identifying not only the barriers and facilitators but also the underlying cause for barriers and facilitators, called behavioural and environmental factors in the model. Study II findings revealed that the main barrier influencing RNs to deliver EBGs was perceived to be 'lack of time'. If our study had settled for 'lack of time' and not explored the underlying cause of 'lack of time', we had not identified the main source of the problem and the implementation strategy had been designed and developed erroneously on inappropriate barriers. However, the framework does not guide the researchers in differentiating between the barriers, facilitators and underlying causes and how choosing appropriate strategies. Notably, during the development process, we became aware that this is an important gap in the existing literature. Even though a large number of frameworks exist in implementation science, none of them explicitly describe how to identify causal mechanisms for barriers and facilitators (183) and how to link them to strategies to overcome or exchange them. This limitation is also pointed out in a recent letter to the editor for Implementation Science (184), who calls for urgent

action in implementation science to fulfil this gap. In Study II, we used the TDF to identify the barriers and facilitators. Findings from this study were transformed to Study III to develop the strategy to target identified barriers and facilitators. Although the TDF did not support the identification of a causal mechanism, the extensive analysis by the support of the TDF was performed to differentiate between barriers, facilitators, and its causal mechanism. Therefore, we agree with Sales et al. (184) about the gap in implementation science.

Another acknowledgement by the use of the IM was the importance of the involvement of participants in the context in which the strategy would be used. The use of participants enabled the development of a tailored strategy where contextual needs and preferences were taken into account. This was confirmed in Study IV to be an important investment.

As described previously, the use of theory- and research-based strategies is strongly recommended to facilitate change and the evidence-based practice uptake. To achieve this request, the IM guided us to provide a structure and method for applying theory and research. However, the IM is limited in providing detailed guidance on how to link identified determinants to change methods. Therefore, one more theoretical approach was needed; the BCT provided us with support and guidance to match determinants with change methods, resulting in the development of a comprehensive strategy including multifaceted interventions.

Considering the process, the complexity, and the time used to develop the strategy (Study III), the framework can be considered too challenging for frontline healthcare professionals to apply. Therefore, despite the fact that the overall aim in this thesis was to support RNs in implementing evidence-based practice by the use of the implementation strategy, it is suggested that the design and the development of the process are carried out by an experienced researcher or an expert in implementation to enhance the success. However, despite the complexity, this systematic and stepwise process (IM) in combination with the use of the TDF and the BCT enabled us to develop a strategy that, by its multifaceted interventions, showed to be successful in changing complex contextual determinants influencing the uptake of evidence-based practice.

Finally, to evaluate the implementation strategy (Study IV), we applied the IOF to structure the evaluation process. The advantage of using the IOF was that we managed to evaluate outcomes that are perceived as ‘gold standard’ outcomes in implementation research and are perceived to advance our understanding of the implementation process, participants’ experience, and the contextual influences. However, it was rather difficult to differentiate between some of the outcomes that are in line with others’ perceptions of the framework (185). Despite this, we evaluated all outcomes, which were essential for the effective translation of research knowledge into practice.

Conclusion and clinical implications

In conclusion, this thesis has identified important issues in clinical practice. The findings indicate that there is a variety in practice management, and the treatment and care in a hospital setting for patients with CAP are inconsistent with EBGs. In particular, delivery of essential nursing care interventions is deficient. Importantly, this study reveals that RNs and the delivery of nursing care are strongly influenced by individual (RNs), team-based (team of interdisciplinary professionals), and organisational (management and organisational structure) determinants. The unsuccessful transfer of evidence into practice and delivery of haphazard, unsystematic, and missed care may be explained by the dominance of the biomedical model and a hierarchy where RNs and nursing care end up at the bottom, and RNs lose their professional identity. This phenomenon is strengthened by a lack of strong professionalism among RNs and a lack of management, poor leadership skills, and a lack of professional nursing focus.

The thesis also shows, that by following recommendations in implementation research, by guidance of relevant theoretical frameworks, and by the use of relevant theories and research-based evidence in design and development of an implementation strategy, it is possible to change complex determinants in a healthcare setting influencing nursing care. The systematic and stepwise theoretical approach ensured the development of a tailored theory- and research-based strategy, that was found acceptable, appropriate, and feasible to address relevant determinants targeting change in clinical practice and support improvement of nursing care by uptake of evidence-based recommendations in EBGs. The detailed report of the systematic approach provided in this thesis can serve as a guide for researchers or experts in future efforts to develop implementation strategies that will overcome barriers in clinical practice that are seemingly faced by RNs globally. However, the success of this strategy needs to be evaluated in a larger intervention study, and adjustments need to be made in efforts to increase implementers' skills and competencies in executing organisational change and implementation.

Further research

This PhD study raised several considerations that are warranted to investigate in future research.

First, due to the Covid-19 pandemic, we were not able to carry out several interventions as intended, and the length of the study was condensed. Therefore, the strategy should be executed and explored under more natural conditions.

Second, sustainability was evaluated after 3- and 6-months and during the ongoing Covid-19 pandemic that possibly limited implementers to carry out the strategy as intended. Therefore, it would be relevant to evaluate the strategy after a longer period, in which the implementers could have more time to implement.

Third, during the design of the strategy, we became aware of limitations in implementation science about guidance for how to identify and differentiate underlying causes to barriers and facilitators and how to select appropriate theories and strategies to overcome barriers or facilitate existing facilitators. Therefore, more research is needed, and existing frameworks and models should possibly be expanded to fill the knowledge gap.

Fourth, considering the importance of developing implementation strategies tailored to contextual needs and preferences, the strategy cannot be transformed directly to another context. However, the approach and the process used in the thesis may possibly be transformed. Thus, to fully understand whether the method used in this study could successfully be used in other hospital units and for another group of patients, further research is warranted to test the strategy in various locations, for instance, by multicentre study.

Finally, further research needs to investigate whether the developed strategy has an effect on patient outcomes such as length of stay, readmission rates, morbidity and mortality.

Summary in Danish

Introduktion: Utilstrækkelig sygepleje kan være en trussel mod patientsikkerheden. På trods udvikling af evidensbaserede kliniske retningslinjer (EBKR), der guider leveringen af højkvalitets og effektiv sygepleje, viser national som international forskning insufficient implementering af EBKR'er i klinisk praksis. Ældre patienter (≥ 65 år), indlagt med samfundserhvervet lungebetændelse er en patientgruppe som ser ud til at være i risiko for ikke at modtage optimal sygepleje pga. mangelfuld implementering af EBKR'er. Som konsekvens, kan disse patienters tilstand forværres alvorligt og i værste fald med død til følge. Op til 8-11% af indlagte patienter med samfundserhvervet lungebetændelse dør under indlæggelse på danske hospitaler. Optimeret sygepleje vil gavne disse patienters sikkerhed og overlevelse.

Hovedformål med dette PhD projekt var at designe og udvikle en skræddersyet teori- og forskningsbaseret strategi for implementering af EBKR'er for sygepleje af ældre patienter indlagt med samfundserhvervet lungebetændelse. Projektet var baseret på 4 delstudier med formål: (*studie I*) at identificere uoverensstemmelser mellem klinisk praksis og evidens-baserede anbefalinger for diagnostik, behandling og pleje af ældre patienter med samfundserhvervet lungebetændelse, (*studie II*) at identificere barrierer og facilitator på individuel, team og organisatorisk niveau for plejen af patienter iflg. kliniske retningslinjer, (*studie III*) at designe og udvikle implementeringsstrategien ved brug af Intervention Mapping Framework (IM), og (*studie IV*) at evaluere strategien ved brug af Implementation Outcomes Framework (IOF).

Metode: *Studie I* var et deskriptivt tværsnitsstudie baseret på strukturerede feltobservationer af 30 patienters (≥ 65 år) indlæggelsesforløb og observationer af 86 sundhedsprofessioner, ansvarlig for patienternes diagnostik, behandling og pleje. Yderlig blev der gennemført individuelle ad hoc interviews med patienter og personale, samt audit af elektroniske patienter journaler. *Studie II* var et etnografisk studie baseret på semistrukturerede fokusgruppe interviews og feltobservationer af 14 sygeplejersker som i samarbejde med 88 andre sundhedsprofessioner varetog 57 patienters behandling og pleje. Observationer blev efterfulgt af individuelle followup interviews med 10 sygeplejersker. *Studie III* fokuserede på at designe og udvikle en skræddersyet teori- og forskningsbaseret implementeringsstrategi ved involvering af patienter og sundhedsprofessionelle, guidet af Intervention Mapping Framework.

Studie IV var et prospektivt studie som evaluerede implementering af strategien hen over 8 måneder på en medicinsk afdeling, efterfulgt af 3 og 6 måneders followup evaluering for at vurdere strategiens vedvarende anvendelse i klinisk praksis. Data blev indsamlet via feltobservationer, ad hoc interviews og fokusgruppe interviews med sundhedsprofessioner og via audit af elektroniske patienter journaler.

Resultater: I *studie I* fandt vi få men alvorlige uoverensstemmelser i diagnostiske procedurer og i medicinsk behandling ift. anbefalinger i EBKR'er, men også flere uoverensstemmelser i sygeplejen. Sygeplejeinterventioner som var mangelfulde eller blev leveret usystematisk, var mundhygiejne, mobilisering, ernæring, væskebehandling og mobilisering af sekret fra luftveje. I *studie II* fandt vi at sygeplejerskers adhærence til EBKR'er var stærkt influeret af konteksten, såsom organisationen og arbejdskulturen domineret af den biomedicinske model, team-baseret hierarki og manglende koordinering af forskellige faggruppers arbejdsgange. Desuden, mangelfuld professionalisme og fagidentitet blandt sygeplejersker bidrog til usystematisk og utilstrækkelig pleje af patienter. Leder med fokus på sygeplejen og dens kerneværdier viste at have en central rolle i at mediere hierarkiet og facilitere evidensbaseret sygepleje. *Studie III* resulterede i at designe og udvikle en implementeringsstrategi, indeholdende multiple interventioner, målrettet til at ændre individuelle, team-baserede og organisatoriske barrierer, og til at styrke faktorer der fremmer udførelse af sygepleje ift. EBKR'er. I *studie IV* fandt vi, at implementeringsstrategien var acceptabel, anvendelig, meningsgivende og feasible (gennemførlig) til implementering af evidensbaseret sygepleje og til at nedbryde barriere på individuel og på team-niveau. Til gengæld, udførsel af organisatoriske ændringer var ikke gennemførbare. Desuden, mangelfulde ressourcer og konkurrerende organisatoriske opgaver blandt implementerings udøvere, udfordrede fastholdelse af strategiens interventioner ved 3 og 6 måneders followup.

Konklusion: Dette PhD studie belyser, at levering af sygepleje for ældre patienter med samfundserhvervet lungebetændelse er mangelfuld. Studiet viser også, at sygepleje er stærkt påvirket af individuelle, team-baserede og organisatoriske determinanter. Systematisk brug af relevante teorier, referencerammer og forskningsbaseret evidens, sikrede udviklingen af en skræddersyet teori- og forskningsbaseret strategi som viste at adressere de komplekse determinanter i klinisk praksis og understøtte implementering af evidensbaseret sygepleje. For at vurdere om strategien er succesfuld i at forbedre patientpleje og sikkerhed, er der behov for at strategien testes i et større interventionsstudie. Desuden er der behov for at strategien justeres i bestræbelsen på at øge implementerings udøvers kompetencer i implementering og udførelse af organisatoriske forandringer.

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Appendix I-II

Appendix I: Overview of implementation interventions targeting individual (I) -, team-based (T) behaviours, organisational changes (O) including management level (M), and project organisation (PO).

Targeted behaviour	Intervention s	Description of the implementation intervention	The target
Knowledge, Beliefs about consequences	<i>Presentation</i>	<ul style="list-style-type: none"> Previous research results of missing and unsystematic performance of nursing care and its consequences, and barriers and facilitators for delivering EBNC Implementation strategy and its interventions 	I, T, PO
	<i>Information</i>	<ul style="list-style-type: none"> Implementation strategy adjustments and progress 	I, T, PO
	<i>Lectures</i>	<ul style="list-style-type: none"> Professional role, tasks, goals, and terminology EBNC in the CPW: <ul style="list-style-type: none"> Assessment of patient individual needs Person-centred care: integration of patients in their care plan Development and use of the care plan's Systematic planning and execution of a nursing care Use of products (e.g. fluids, oral care products) Cooperation with the interdisciplinary team Documentation of nursing care 	I
		<p>The management, project implementers and keypersons received lectures of the implementation interventions they needed to execute:</p> <ul style="list-style-type: none"> Reminders, feedback Facilitation and elimination of behaviours Professional role, tasks, goals, and terminology EBNC Interdisciplinary cooperation Sustainability of the implementation process Organisational changes 	PO: management, implementers, keypersons
Attention, Beliefs about capabilities	<i>Reminders, facilitation /elimination</i>	<ul style="list-style-type: none"> Performance of nursing care Nursing role, tasks, and goals Professional terminology Elimination of non-supportive implementation behaviours 	I
		<ul style="list-style-type: none"> Support implementation of evidence-based nursing Elimination of non-supportive implementation behaviours 	T
		<ul style="list-style-type: none"> Execution and maintenance of implementation interventions Planning, discussion, decision making 	PO: management, implementers, keypersons
	<i>Feedback</i>	<ul style="list-style-type: none"> Ad hoc according to individual, team and management performance Implementation progress and results of collective performance 	I, T, PO: management, implementers
	<i>Nudging</i>	<ul style="list-style-type: none"> Whiteboard magnets, pocket sheets, pocket cards, newsletter, CPW, patient list with reminding EBNC interventions, learning contract for bedside training, folders about the project, guide with facilitating/eliminating strategies 	I, T, PO: management, implementers
Skills	<i>Bedside training</i>	<p>Practical execution of EBNC:</p> <ul style="list-style-type: none"> Systematic assessment, performance, evaluation, adjustment, and documentation of EBNC according to patient individual needs 	I, PO: implementers

		<ul style="list-style-type: none"> Cooperation with the interdisciplinary team according to own professional role, goals and tasks 	
	<i>Training</i>	<ul style="list-style-type: none"> Execution of implementation interventions: reminding's, facilitation, elimination, feedback and bedside training 	PO: management, implementers
	<i>Supervision</i>	<ul style="list-style-type: none"> Ad hoc according to individual needs 	I, PO: implementers
	<i>Group training</i>	Practical execution of EBNC: <ul style="list-style-type: none"> Documentation, development and use of patient care plans Use of products Calculation of patient individual needs for protein and energy intake 	I, PO: implementers
	<i>Organisational changes</i>	<ul style="list-style-type: none"> Cooperation with the central kitchen and municipality 	O, PO: management

Appendix II: Implementation strategy materials

Materials	The target
CPW (paper and electronic forms)	RNs, team
Educational materials regarding the six nursing interventions (quizzes, videos, etc.)	RNs
Newsletters and folders informing about the project	RNs, team, implementers
Learning-contract and the evaluation sheet for the individual bed-side training	RNs
Bedside whiteboard magnets (for the six-nursing intervention to involve the patient)	RNs
Daily patient list reminding nurses of the six nursing intervention areas in the CPW	RNs
Pocket cards guiding the interdisciplinary whiteboard meeting and patient rounds	RNs, team, implementers
Guide for facilitating and eliminating strategies	Implementers

Paper I-IV

Registered nurses, as the largest group of healthcare professionals, has a central role in ensuring safe and effective care for hospital patients. However, research emphasizes the ongoing challenges assuring that patients receive high-quality nursing care according to best available evidence. Older patients with community-acquired pneumonia seems to be a patient group at risk of being omitted of safe and effective care. This thesis aims to design, develop, and evaluate an implementation strategy supporting implementation of evidence-based nursing care for hospital patients with community-acquired pneumonia.

