Dissertation

Implementation of research-based knowledge

Lessons learned from the nursing perspective

Helga Elisabeth Breimaier

Institute of Nursing Science, Medical University of Graz

A thesis submitted for the academic degree of
Doctor of Nursing Science (Dr. rer. cur.)

2015

Supervisors:
Univ.-Prof. Dr. Christa Lohrmann
Associate Prof. Dr. Ruud JG Halfens

Declaration

I hereby declare that this doctoral thesis is my own original work and that I have fully acknowledged by name all of those individuals and organisations that have contributed to the research of this doctoral thesis. Due acknowledgement has been made in the text to all other material used. Throughout this doctoral thesis and in all related publications I followed the guidelines of „Good Scientific Practice“.

Graz, 02.07.2015 Helga Elisabeth Breimaier, eh

Copyright © Helga E. Breimaier, 2015

All rights reserved. No part of this thesis may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage or retrieval system, without permission in writing from the author.

Painting by Nicole Achermann (Copyright 2015), used with permission

Implementation of research-based knowledge

Lessons learned from the nursing perspective

Helga Elisabeth Breimaier

“If the process of knowing what to do and actually doing it were perfect, there would be no need for knowledge translation or implementation research”

Redle*

*Redle EE. Improving practice through implementation science and knowledge translation. American Speech-Language-Hearing Association. 1997-2015. [http://www.asha.org/Academic/questions/Improving-Practice-Through-Implementation-Science-and-Knowledge-Translation/].

CONTENTS

LIST OF ABBREVIATIONS

A	Austria
A & F	Audit and feedback
AGS	Attitudes Towards Guidelines Scale
ASD	Accident surgery department
CFIR	Consolidated Framework for Implementation Research
CPG	Clinical practice guideline
D	Germany
d.f. / df	Degree of freedom
e.g.	For example
EPOC	Effective Practice and Organization of Care
i.e.	That is to say
n / N	Number
n.d. / s.a.	No date
NL	The Netherlands
OD	Ophthalmic Department
p / P	Probability
PAR	Participatory action research
RD	Research diary
resp.	Respectively
SD	Standard deviation
SGMM	Steering-group-meeting minutes
t1	Baseline data collection
t2	Mid-term data collection
t3	Final data collection

Chapter 1

General introduction

INTRODUCTION

Applying evidence to clinical practice is seen as a requirement for the best patient care [1]. Nurses are expected to use current evidence in their daily practice [2] and are increasingly held accountable for the care they provide [3]. Research-based knowledge is continually produced and provided to nurses. Yet only a small proportion of the new knowledge produced is applied in the daily care of patients [4, 5]. Mazurek Melnyk indicated that it often takes decades to translate evidence aimed at improving (nursing) care quality, outcomes and costs into real-world practice settings [6]. Thus, the implementation of evidence into practice is often not accomplished [7]. This exposes nursing care recipients to the possibility of, for example, preventable falls with accompanying consequences to care recipients' physical and mental health or other inconveniences.

This doctoral thesis investigates the implementation of guidelines into hospital-based nursing care. It comprises four components: guideline implementation, influencing factors, implementation strategies and a theoretical framework (the *Consolidated Framework for Implementation Research CFIR*) in combination with participatory action research (PAR). The implementation of a guideline is influenced by a diversity of factors that must be considered. To facilitate the implementation of a guideline, particular implementation strategies are used. The selection of respective strategies offered will have an influence on the implementation of the guideline. The application of a theoretical framework helps to identify respective influential factors in an implementation project, and this, in turn, supports the choice of adequate implementation strategies. The PAR approach supports the implementation process. The four components will be subsequently described in more detail.

The terms evidence, current evidence and research-based knowledge are used interchangeably when describing the meanings of findings from rigorous research ([8], p. 27) because there is no consensus in the international literature on the definition of evidence ([8], p. 27).

Guideline implementation

The best available scientific knowledge is frequently translated into national or international clinical practice guidelines (CPGs). These CPGs are seen as important aids and facilitators that can be used to instil research findings into

daily nursing practice and, thus, facilitate the delivery of evidence-based care [9, 10]. Evidence-based care combines the best available external evidence from disciplined research with clinical expertise and patient preferences in a clinical problem-solving approach ([8], p. 727; [11]).

Evidence-based CPGs summarise the current state of knowledge [9, 10] and include systematically developed statements that can support practitioners and patients when making decisions about appropriate health care in specific clinical circumstances [12]. They should also include a description of whether recommendations are clearly beneficial, harmful, or whether the benefits and risks are uncertain, as well as information about the level of evidence that supports the recommendations [1]. Additionally, the benefits and disadvantages of alternative care options should ideally be included [9].

The publication and dissemination of evidence-based CPGs does not ensure their routine application in the daily nursing practice; they must be actively implemented. Implementation signifies the application of strategies whereby evidence-based interventions are adopted and integrated, for example, in the case of CPGs, which are aimed at advancing the effectiveness or efficiency of provided care or improving patient outcomes [13 - 16]. Key elements of implementation are, according to Grol and Wensing [16]:

1. *A planned process and systematic introduction of the improvement in clinical practice.* Applied strategies should be based on an analysis of the problems, the target group and the setting to effect change.
2. *Value proven innovations.* These may be new or improved innovations, procedures or organisational processes, or be different from the previously established or accepted ones.
3. *Giving the change a structural place.* This signifies that the introduced change should be sustained after the respective implementation project has been completed, i.e., it is incorporated into the routine of daily (nursing) practice.
4. *The level at which a change can take place.* This can be the professional practice, the functioning of organisation(s) or the structure of healthcare. The usual aim is to improve the effectiveness or efficiency of healthcare or result in direct improvements to patient outcomes.

An implementation is considered to be effective when “complex interventions are made workable and are integrated in everyday health care practice” ([17], p. 2), i.e., in the words of Grol and Wensing [16], having a structural place. Yet, the ‘how’ to best translate research evidence into clinical practice is, according to Squires et al., one of the greatest challenges for health-care systems globally [18]. This also can be interpreted as reality in the practice of nursing. It is still not clear what works when and why when implementing current evidence into nursing practice, although numerous research studies exist on guideline implementation in medicine. However, one has to consider that these research results cannot simply be translated to nurses, because their practice differs from medicine in terms of role, autonomy and cultural norms [19].

Influential factors

It is already known that a variety of factors influence an implementation process and the subsequent use of research findings [20]. A review of the published literature indicates that these factors can hinder or facilitate implementation processes and should be taken into consideration at both the beginning and during an implementation process in order to adjust for these factors [19, 21 - 24]. It is remarkable that hardly any information is available about the nurses’ wishes, needs and requirements with respect to implementing evidence into their daily practice. In Austria, where nursing science is still a young discipline, no information about perceived barriers or about facilitators with regard to implementing research results into nursing practice was available. Knowing these influential factors, however, can help those implementing such processes select suitable strategies and tailor them to a given situation [25].

Additionally, an assessment of the available resources when designing a change intervention is recommended, and one should recognise the time required for the successful implementation of a CPG from the beginning [26]. Yet, the time required to implement a CPG has been rarely reported.

Implementation strategies

Implementation strategies are seen as core elements in the field of implementation science [27, 28], because they constitute the ‘how to’ component of changing healthcare and, respectively, nursing practice [28]. Therefore, the

important goals of implementation science are to identify, develop and test implementation strategies, which are also called interventions [27].

A broad array of implementation strategies is available to facilitate the uptake of research findings, such as evidence-based CPGs, and to help overcome barriers to their adoption in clinical settings [25, 29]. These strategies can be categorized in various ways. A widely used taxonomy is the *Effective Practice and Organization of Care Group (EPOC)* taxonomy, originally used for Cochrane reviews [25]. This taxonomy clusters strategies according to whether these are directed toward care providers (i.e., the professionals) or toward the organisation, and whether these are financial or regulatory interventions [30]. However, the existing knowledge about the effectiveness of many implementation strategies and which ones are used in nursing practice is insufficient. Studies on the implementation of evidence-based practice in nursing care make a very small contribution to the overall evidence on effective implementation, as noted by van Achterberg and Sales [3].

Implementation strategies differ in type, range and nature. Some implementation strategies reflect a 'top down' and 'bottom up', others display a push and pull approach and still others describe a combination of rewards and punishment to induce behaviours. Furthermore, they vary in their complexity - from a single component strategy to a combined number of strategies, so-called multifaceted strategies [28]. Meanwhile, multifaceted strategies that target existing barriers [31, 32] and that are tailored to meet contextual needs [33 - 35] have been recommended. However, evidence about their effectiveness is inconsistent and needs further clarification.

The Consolidated Framework for Implementation Research (CFIR) as a theoretical framework in combination with participatory action research (PAR)

Consolidated Framework for Implementation Research (CFIR)

Several authors recommend to use an explicit and even robust theory when implementing research-based knowledge into nursing practice [14, 36, 37] as such a theory "form the foundation for rigorous research to inform implementation journeys" ([14], p. 12). The application of a theory improves the understanding of barriers, in the design of interventions and the exploration of intervening factors and moderators to advance the science of implemen-

tation research [37]. Such applications also enhance the interpretability of study findings [38]. Applying a formal theory, which is both explicit and open to critique, as compared to applying mere common sense [24] is an additional advantage.

The *Consolidated Framework for Implementation Research (CFIR)* by Damschroder et al. is just such a theoretical framework with five main domains: *intervention characteristics, outer setting, inner setting, characteristics of individuals* and *process*. Each domain has underlying (sub-) constructs, all in all, 39 [39]. According to a recently published paper, this framework belongs to the group of *determinant frameworks*, because it specifies domains "of determinants and individual determinants, which act as barriers and enablers (independent variables) that influence implementation outcomes (dependent variables)". The author adds that these frameworks imply "a systems approach to implementation because they point to multiple levels of influence and acknowledge that there are relationships within and across the levels and different types of determinants" ([24], p. 3). Their overarching aim is to allow the prediction of outcomes or provide an understanding and/or explanation for influences on outcomes retrospectively [24].

The *CFIR* has been recommended for the assessment of the implementation context, the evaluation of the implementation process and to explain the findings of quality improvement initiatives [39]. Yet, the CFIR itself has rarely been tested for its comprehensiveness, applicability and usefulness in an implementation project.

Participatory action research (PAR)

Implementing evidence-based CPGs into a healthcare setting is considered a complex endeavour. So-called 'whole systems' approaches like participatory action research (PAR) have been recommended, because they take into account all facets of a healthcare setting [40] that are viewed as organic, interactive entities [36]. PAR strives for improvement in a practical situation [41]. This approach comprises five interconnected key features [22, 42], which are:

1. being focussed on the problem and context-specific,
2. executing a change intervention aimed at improvement,
3. promoting collaboration among those affected by the issue being studied,
4. including development of theory, and

5. describing a cyclical and reiterative process, which interlinks problem identification, planning, action and evaluation

Within each phase of the cyclical process, a critical movement between reflection and action is observed, because each phase should allow two questions to be answered: “What should be done?” and “How should this be done?” [42]. The cyclical process is presented in Figure 1.

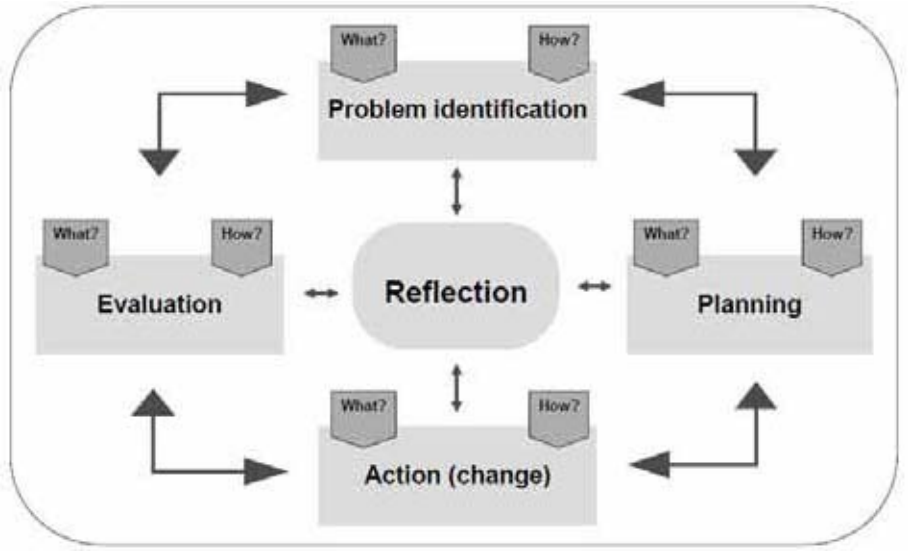


Figure 1 Cyclical process of participatory action research

The Consolidated Framework for Implementation Research (CFIR) and participatory action research

Nilsen point out that determinant frameworks, to which the *CFIR* belongs, do not explicitly take a process perspective in implementation and provide limited “how-to” support for carrying out a CPG implementation [24]. However, the *CFIR* and the PAR seem to complement each other in that the *CFIR* helps users consider influential factors and the PAR approach helps them understand how the implementation process can proceed most effectively. Thus, the facilitators as well as the barriers to the implementation of an evidence-based CPG into nursing practice can be taken into consideration when planning the concrete steps.

Research gaps identified

While delineating the components of this doctoral thesis, four research knowledge gaps were identified and are summarised as following:

- Gap as to nurses' wishes, needs, requirements
- Gap as to applied implementation strategies
- Gap as to the effectiveness of multifaceted and tailored implementation strategies
- Gap as to the comprehensiveness, applicability and usefulness of the *CFIR* in real life implementation projects

These gaps, which were identified in the introduction, provided the basis for the project plan of this doctoral thesis. First, a survey was conducted to explore implementing factors with regard to the implementation of research-based knowledge into daily nursing practice, and particularly to clarify nurses' wishes, needs and requirements. In a second step, strategies that have been applied in implementing a clinical practice guideline (CPG) into nursing practice were identified. The results supported the development of an implementation project, in which an evidence-based guideline was implemented into nursing care by applying multifaceted and tailored strategies. Based on recommendations from the literature, a theoretical model (the *Consolidated Framework for Implementation Research CFIR*) and a PAR approach were chosen to guide the implementation process. The project plan of this doctoral thesis is outlined in Figure 2.

Based on the research gaps delineated above, the subsequent aims and research questions were developed.

AIMS, RESEARCH QUESTIONS AND STRUCTURE OF THE DOCTORAL THESIS

Aims and research questions

The general aim of this doctoral thesis was to obtain more information about the process of implementing research-based knowledge into nursing care, especially with regard to influential factors, strategies used to implement evidence-based CPGs into nursing practice and the theoretical framework to be applied when implementing an evidence-based CPG into acute care nursing

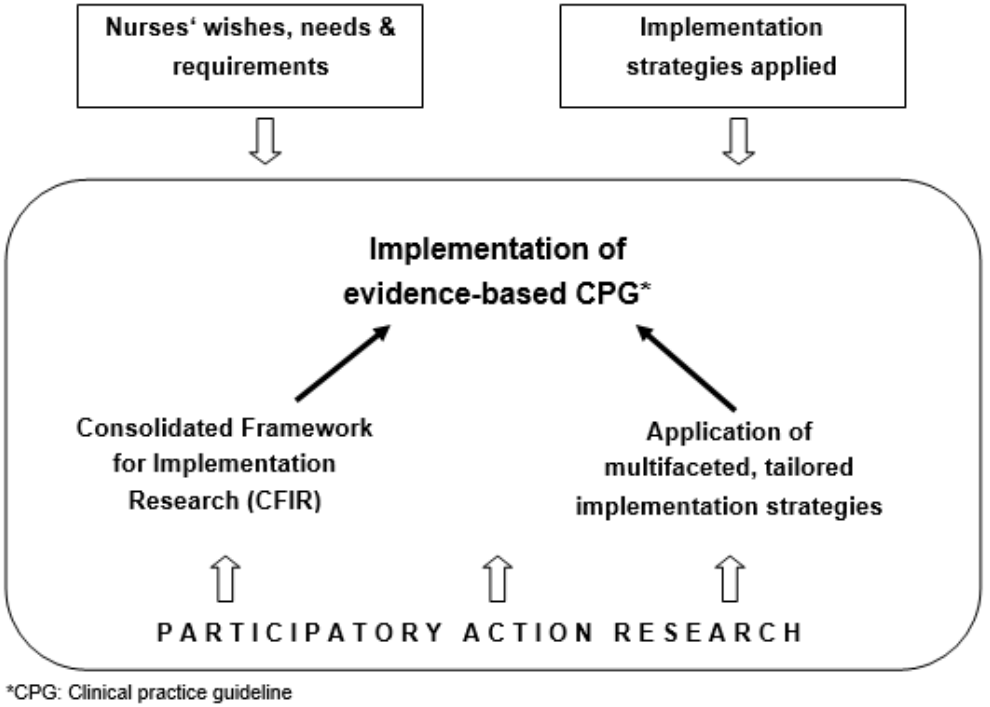


Figure 2 Project plan of doctoral thesis

practice. The following specific objectives promoted the investigations, which have been carried out within the framework of three research projects:

Study I: to explore nurses wishes with regard to research implementation and research utilisation, their knowledge of and attitudes about nursing research as well as perceived barriers and facilitators of the implementation and application of research results into practice from the perspective of Austrian nurses. The research questions were:

1. What are the nurses' wishes, needs and requirements with regard to research implementation and research utilisation?
2. What knowledge do nurses have about nursing research and evidence-based practice?
3. What are the nurses' attitudes towards nursing research and research utilisation?
4. What are the perceived barriers to and facilitators of implementing and applying research results in practice?
5. What is the extent to which nurses who graduated between <2000 and ≥2000 differ with regard to these topics?

Study II: to investigate interventions used to implement new knowledge with regard to pressure ulcer, malnutrition, incontinence and discharge management by means of (evidence-based) guidelines into nursing practice, referring to case examples from Austrian, German and Dutch hospitals and nursing homes in order to get a broader insight into this matter. The research questions were:

1. What are the current range and rates of the interventions used to implement nursing guidelines in Austria, Germany and The Netherlands?
2. What differences exist among the interventions used in the three countries?

Study III, part 1: to assess the effectiveness of and required time investment for multifaceted and tailored strategies when implementing an evidence-based fall-prevention guideline (Falls CPG) into nursing practice in an acute care hospital setting. The research questions were:

1. How effective are multifaceted and tailored strategies that are used to implement an evidence-based Falls CPG into nursing practice in an acute care hospital setting?

2. What is the time invested by nursing personnel when implementing this Falls CPG?

Study III, part 2: to evaluate the comprehensiveness, applicability and usefulness of the *CFIR* when implementing a Falls CPG into nursing practice in an acute care hospital setting. The research questions were:

1. How comprehensive is the *CFIR* as a theoretical framework within a CPG implementation project?
2. How applicable and useful is the *CFIR* when utilised as a theoretical framework within a CPG implementation project?

Structure of the doctoral thesis

This doctoral thesis consists of seven chapters. Chapter two provides a brief overview of methodological aspects with regard to design, sample, setting, data collection and analysis of the conducted studies. Chapters three to six present the results of studies I to III (part 1 & 2) according to the four research aims. The results of studies I to III, part 1 have already been published as peer-reviewed articles; the results of study III, part 2 has already been submitted and is under review. The final chapter, chapter seven, includes a general discussion that reflects on the results of all studies described.

REFERENCES

1. Lim W, Arnold DM, Bachanova V, Hapel RL, Rosovsky RP, Shustov AR, Crowther MA. Evidence-based guidelines – an introduction. *Hematology Am Soc* 2008:26-30. doi: 10.1182/asheducation-2008.1.26.
2. Twycross A. Leadership is key to ensuring evidence is used in practice. *Evid-Based Nurs.* 2011;14:31. doi: 10.1136/ebn1149.
3. van Achterberg T, Sales AE. Implementation Science for nursing: Evidence needed! Call for papers for a special issue. *Int J Nurs Stud.* 2011;48:1163–4.
4. Grol R. Introduction. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: Wiley Blackwell BMJ|Books; 2013. p. xiii–xvii.
5. Wallin L. Knowledge translation and implementation research in nursing. *Int J Nurs Stud.* 2009;46:576–87.
6. Mazurek Melnyk B. Speeding the translation of research into evidence-based practice and conducting projects that impact healthcare quality, patient outcomes and costs: the "So what" outcome factors. *Worldviews Evid Based Nurs.* 2014;11:1–4.
7. van Achterberg T, Schoonhoven L, Grol R. Nursing implementation science: how evidence-based nursing requires evidence-based implementation. *J Nurs Scholarsh*. 2008;40:302–10.
8. Polit DF, Tatano Beck C. *Nursing research: generating and assessing evidence for nursing practice.* 9th ed. Philadelphia: Wolters Kluwer Health | Lippincott Williams & Wilkins; 2012.
9. Burgers J, Smolders M, van der Weijden T, Davis D. Clinical practice guidelines as a tool for improving patient care. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: Wiley Blackwell BMJ|Books; 2013. p. 91–113.
10. Ploeg J, Davies B, Edwards N, Giggord W, Miller PE. Factors influencing best-practice guideline implementation: lessons learned from administrators, nursing staff, and project leaders. *Worldviews Evid Based Nurs.* 2007;4:210–9.
11. Mazurek Melnyk B, Fineout-Overholt E. Making the case for evidence-based practice and cultivating a spirit of inquiry. In: Mazurek Melnyk B, Fineout-Overholt E, editors. *Evidence-based practice in nursing & healthcare.* A guide to best practice. 2nd ed. Philadelphia: Wolters Kluwer Health | Lippincott Williams & Wilkins; 2011. p. 3–24.
12. Institute of Medicine, Committee on Quality Health Care in America. *Crossing the quality chasm: A new health system for the 21st century*; 2001. Washington, DC: National Academy Press. [http://images.nap.edu/openbook/0309072808/gifmid/151.gif].
13. Neta G, Glasgow RE, Carpenter CR, Grimshaw JM, Rabin BA, Fernandez ME, Brownson RC. A framework for enhancing the value of research for dissemination and implementation. *Am J Public Health.* 2015;105:49–57.
14. May C. Towards a general theory of implementation. *Implement Sci.* 2013;8:18. doi: 10.1186/1748-5908-8-18.
15. Mazza D, Bairstow P, Buchan H, Paubrey Chakraborty P, Van Hecke O, Grech C, Kunnamo I. Refining a taxonomy for guideline implementation: results of an exercise in abstract classification. *Implement Sci.* 2013;8:32. doi: 10.1186/1748-5908-8-32.
16. Grol R, Wensing M. Implementation of change in healthcare: a complex problem. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: Wiley Blackwell BMJ|Books; 2013. p. 3–17.
17. May C, Finch T, Mair F, Ballini L, Dowrick C, Eccles M, Gask L, MacFarlane A, Murray E, Raphley T, Rogers A, Treweek S, Wallace P, Anderson G, Burns J, Heaven B. Understanding the implementation of complex interventions in health care: the normalization process model. *BMC Health Serv Res.* 2007;7:148. doi: 10.1186/1472-6963-7-148.

18. Squires JE, Sullivan K, Eccles MP, Worswick J, Grimshaw J. Are multifaceted interventions more effective than single-component interventions in changing health-care professionals' behaviours? An overview of systematic reviews. *Implement Sci.* 2014;9:152. doi: 10.1186/s13012-014-0152-6.
19. Matthew-Maich N, Ploeg J, Dobbins M, Jack S. Supporting the uptake of nursing guidelines: what you really need to know to move nursing guidelines into practice. *Worldviews Evid Based Nurs.* 2013;10:104–15.
20. Gerrish K. Evidence-based practice. In: Gerrish K, Lathlean J, editors. *The research process in nursing.* 7th ed. Chichester: Wiley Blackwell; 2015. p. 541–53.
21. Dogherty EJ, Harrison MB, Graham ID, Digel Vandyk A, Keeping-Burke L. Turning knowledge into action at the point-of-care: the collective experience of nurses facilitating the implementation of evidence-based practice. *Worldviews Evid Based Nurs.* 2013;10:129–39.
22. Waterman H, Tillen D, Dickson R, de Koning K. Action research: a systematic review and guidance for assessment. *Health Technol Assess.* 2001;5:23.
23. Meyer J, Cooper J. Action research. In: Gerrish K, Lathlean J, editors. *The research process in nursing.* 7th ed. Chichester: Wiley Blackwell; 2015. p. 303–17.
24. Nilsen P. Making sense of implementation theories, models and frameworks. *Implement Sci.* 2015;10:53. doi: 10.1186/s13012-015-0242-0.
25. Grol R, Bosch M, Wensing M. Development and selection of strategies for improving patient care. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: Wiley Blackwell BMJ|Books; 2013. p. 167–84.
26. Simpson F, Doig GS. The relative effectiveness of practice change interventions in overcoming common barriers to change: a survey of 14 hospitals with experience implementing evidence-based guidelines. *J Eval Clin Pract.* 2007;13:709–15.
27. Powell BJ, Waltz TJ, Chinman MJ, Damschroder LJ, Smith JL, Matthieu MM, Proctor EK, Kirchner JAE. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci.* 2015;10:21. doi: 10.1186/s13012-015-0209-1.
28. Proctor EK, Powell BJ, McMillen JC. Debate. Implementation strategies: recommendations for specifying and reporting. *Implement Sci.* 2013;8:139. doi: 10.1186/1748-5908-8-139.
29. Thorsen T, Mäkelä M. A framework for guidelines implementation studies. In: Thorsen T, Mäkelä M, editors. *Changing Professional Practice. Theory and Practice of Clinical Guidelines Implementation.* Copenhagen: Danish Institute for Health Services Research; 1999, p. 23–53.
30. Cochrane *Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist.* 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].
31. Prior M, Guerin M, Grimmer-Somers K. The effectiveness of clinical guideline implementation strategies—a synthesis of systematic review findings. *J Eval Clin Pract.* 2008;14:888–97.
32. Boaz A, Baeza J, Fraser A and for the European Implementation Score Collaborative Group (EIS). Effective implementation of research into practice: an overview of systematic reviews of the health literature. *BMC Res Notes.* 2011;4:212. doi: 10.1186/1756-0500-4-212.
33. Francke AL, Smit MC, de Veer AJE, Mistiaen P. Factors influencing the implementation of clinical guidelines for health care professionals: a systematic meta-review. *BMC Med Inform Decis Mak.* 2008;8:38. doi: 10.1186/1472-6947-8-38.
34. Harrison MB, Légaré F, Graham ID, Fervers B. Adapting clinical practice guidelines to local context and assessing barriers to their use. *CMAJ.* 2010;182:E78–84.
35. Yagasaki K, Komatsu H. Preconditions for successful guideline implementation: perceptions of oncology nurses. *BMC Nurs.* 2011;10:23. doi: 10.1186/1472-6955-10-23.

36. Kitson AL. The need for systems change: reflections on knowledge translation and organizational change. *JAN*. 2009;65:217-28.
37. Davies P, Walker AE. Grimshaw JM. A systematic review of the use of theory in the design of guideline dissemination and implementation strategies and interpretation of the results of rigorous evaluations. *Implement Sci*. 2010;5:14. doi: 10.1186/1748-5908-5-14.
38. Tabak RG, Khoong EC, Chambers DA, Brownson RC. Bridging research and practice. Models for dissemination and implementation research. *Am J Prev Med*. 2012;43:337–50.
39. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice. A consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50. doi: 10.1186/1748-5908-4-50.
40. Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlane F, Peacock R. How to spread good ideas: a systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO). 2004. [http://www.netscc.ac.uk/hsdr/files/project/SDO_FR_08-1201-038_V01.pdf].
41. Carr W, Kemmis S. *Becoming critical. Education, knowledge and action research*. Reprint, Victoria: Deakin University Press; 1990.
42. Smith A. *An action research inquiry exploring the transfer of pain knowledge from a continuing education course into practice*. PhD thesis. University of Stirling, Department of Nursing and Midwifery; 2008. [https://dspace.stir.ac.uk/bitstream/1893/474/1/A%20Smith%20-%20An%20action%20research%20inquiry%20ecploring%20the%20transfer%20etc.pdf].

Chapter 2

Methods

METHODS

The following table provides an overview of the methodological issues of studies I to III with regard to study design, sample and setting, data collection procedure and analysis. Detailed information is available in chapters three to six.

Table 1 Methodological overview of studies I to III

	Study I	**Study II**
Topic	Nurses' wishes, knowledge, attitudes and perceived barriers toward implementing research findings into practice	Implementation interventions used in nursing homes and hospitals in Austria, Germany and The Netherlands
Design	Descriptive and exploratory cross-sectional survey	Cross-sectional design, online survey
Setting	1 large Austrian university teaching hospital (1550 beds)	Austrian, German and Dutch hospitals and nursing homes
Sample	1023 graduate nurses	215 nursing homes and 118 hospitals
Data collection	Time: May 2007 Instrument: the modified version of the Questionnaire on Utilisation of Nursing Research by Parahoo [1].	Time: June/July 2008 Instrument: online-based questionnaire; based on modified typology of implementation interventions of the Cochrane *EPOC** Review Group [3, 4]
Data analysis	Qualitative statements from open ended questions: Content analysis according to Polit and Beck [2] Categorised data and data from closed-ended questions: Descriptive statistics	Descriptive statistics and one-way ANOVA

**EPOC:* Cochrane *Effective Practice and Organisation of Care*

Study III, part 1	**Study III, part 2**
Effectiveness of multifaceted and tailored strategies to implement an evidence-based fall-prevention guideline into acute care nursing practice	Comprehensiveness, applicability and usefulness of the *CFIR**** [5] in implementing a fall-prevention guideline into nursing practice
Before and after, mixed-methods design within a PAR** approach, applying the *CFIR**** [5]	Post-hoc appraisal of the *CFIR*
2 departments (ophthalmic and accident surgery department) of an Austrian university teaching hospital	
Graduate and assistant nurses (t1: n = 106; t2: n = 111; t3: n = 110) semi-structured interviews: t1, t2, t3 - each 18 interviews	
Time: autumn 2010, autumn 2011, spring 2012 Instruments: (1) semi-structured interview and group discussion guidelines, based on the *CFIR* (2) questionnaire, capturing demographic data, knowledge, attitudes, several influencing factors and process evaluation based on the *CFIR* (3) record for total staff time invested in hours	Time: autumn 2010, autumn 2011, spring 2012 Sources: team-meeting minutes, the main investigator's research diary, semi-structured interview and questionnaire data (see data collection study III, part 1)
Qualitative data: Content analysis, based on the *CFIR* and its supplements Quantitative data: Descriptive analyses and appropriate tests for comparison purposes	Critical reflection of data sources

** PAR: participatory action research
****CFIR: Consolidated Framework for Implementation Research*

REFERENCES

1. Parahoo K, Barr O, McCaughan E. Research utilisation and attitudes towards research among learning disability nurses in Northern Ireland. *J Adv Nurs*. 2000;31:607–13.
2. Polit DF, Beck CT. *Nursing Research. Generating and Assessing Evidence for Nursing Practice*. 8th ed. Philadelphia: Lippincott Williams & Wilkins, a Wolters Kluwer business; 2008.
3. Thorsen T, Mäkelä M. A framework for guidelines implementation studies. In: Thorsen T, Mäkelä M, editors. *Changing professional practice. Theory and practice of clinical guidelines implementation.* Copenhagen: Danish Institute for Health Services Research and Development; 1999, p. 23–53.
4. Cochrane Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist. 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].
5. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice. A consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50, doi: 10.1186/1748-5908-4-50.

Chapter 3

Nurses' wishes, knowledge, attitudes and perceived barriers on implementing research findings into practice among graduate nurses in Austria

Breimaier HE, Halfens RJG, Lohrmann C. Nurses' wishes, knowledge, attitudes and perceived barriers on implementing research findings into practice among graduate nurses in Austria. *J Clin Nurs*. 2011;20:1744-56.

Accepted for publication: 7 August 2010

© 2011 Blackwell Publishing Ltd, *Journal of Clinical Nursing*

ABSTRACT

Aims. To identify and describe nurses' wishes, needs, knowledge and attitudes to nursing research, as well as perceived barriers to and facilitators of research utilisation in nursing practice in Austria.

Background. Research results are not always used in daily nursing practice, despite their potential to improve nursing care quality. A variety of factors impede their implementation and use. Nurses' wishes about research utilisation have scarcely been reported. No data are available yet from an Austrian perspective.

Design. Descriptive and exploratory cross-sectional survey.

Methods. The study was conducted in an Austrian university hospital in May 2007, including all graduate nurses (*n* = 1825). One thousand and twenty-three nurses returned the self-reported questionnaire. Descriptive analysis was performed initially, then group comparisons (diploma <2001, ≥2001) were computed inferentially using the chi-square test.

Results. Nurses' most frequently indicated wishes regarding research implementation were adequate information, structural availability and professional support. Special points of interest were topics concerning nursing phenomena and interventions. Nurses' needs related to education in nursing science/research and its implementations were indicated as being predominantly of an introductory manner. Overall, nurses' attitudes tended to the negative. The top three named barriers to research utilisation were lack of time (69.9%), lack of information/knowledge (45.4%) and lack of interest (25.9%). Ten statistically significant differences were found between nurses of the two compared diploma groups.

Conclusions. Participating nurses perceived a lack in sufficient education/information and adequate organisational support, impeding them to use research results in daily practice.

Relevance to clinical practice. The results provide important insights into the matter of nurses' needs regarding the use and/or implementation of research results in practice, as well as about the promotion of positive attitudes towards research and its utilisation. These findings are of special interest to

nurse educators, employers and countries introducing nursing science to improve the clinical outcomes for patients.

Key words: Attitudes towards nursing research, barriers to research utilisation, cross-sectional survey, nurses' wishes, research utilisation

INTRODUCTION

According to the World Health Organisation, nurses have a pivotal role to play in the health system to meet the set health targets [1]. The International Council of Nurses claims that the nurse assumes the major role in determining and implementing acceptable standards of clinical nursing practice [2]. Therefore, nurses need to be able to demonstrate evidence to underpin practice [3] and show that their practice is effective, efficient and worthwhile [4]. The pressure on nurses of all levels to use research findings in daily nursing practice as a base for decision-making is rising [5], and patients are entitled to receive high quality care based on up-to-date scientific evidence [6]. Despite the availability of increasingly research-based information with the potential to improve nursing care quality in several fields of nursing [7, 8], nurses often fail to incorporate current research findings in their practices [9]. Van Achterberg et al. point out that the implementation of evidence in practice is often not accomplished [10]. Thus, one can still spot a considerable gap between what is known in the research evidence and what happens in practice, although considerable efforts have been made to increase the delivery of scientific evidence-based care [11 - 14]. Scientific evidence indicates that about 30 - 40% of patients do not receive medical care conforming to existent scientific evidence and that about 20 - 30% of the provided medical care is not needed or is even potentially harmful [15]. According to Wallin, it can be assumed that we will have a similar situation in nursing care [16]. This exposes individuals to the possibility of, for example, needless pain or other inconveniences.

For research-based practice to become widespread in reality and research results to be implemented and adapted in daily practice, the first necessary step would be a comprehensive appraisal and assessment of the current situation. The gained information makes it possible to identify problematic issues on individual as well as institutional levels and to initiate necessary changes.

To enhance clinical effectiveness, additional aspects - for example nurses' needs, requirements and wishes regarding research utilisation - have to be considered to find solutions and to develop appropriate strategies that maintain supportive factors and/or eliminate unsupportive ones [17]. The identification of barriers alone is not a sufficient means of change.

BACKGROUND

Research utilisation

Nursing research can offer solutions to and/or insights into clinical practice and related fields with the purpose of enhancing the well-being of its patients, provided it is indeed used [18]. Research utilisation itself is, according to Estabrooks, a general concept that reflects three distinct yet correlated concepts: instrumental, conceptual and symbolic research utilisation [19]. Although research utilisation is complex, Estabrooks concluded from her study that it can be measured by means of relatively simple and global questions. With a simple question, for example about the use of research, nurses are specifically asked about the use of any kind of research. The answers may comprise research utilisation in a general sense or in the sense of its reflecting concepts [19]. Various studies [18, 20 - 23] indicate that a core group ranging from almost 10 - 42% of nurses never or seldom use research in practice. Milner et al. found in their study that clinical nurse educators use research in all four above-mentioned forms of research utilisation more often than managers and staff nurses [24]. For this study, 'research utilisation' was defined as the use of any kind of research.

Nurses' wishes/needs/requirements regarding research utilisation

To date, there are only scarce data reporting on nurses' wishes, needs and requirements about research utilisation. The evidence informs us about training needs in research to improve initial nurse education [20], about further educational needs [22] or about self-perceived needs for 'research skills' of trained nurses to organise specific workshops [25]. Furthermore, it claims the necessity of good support services for nurses to promote research [26] or the current level of need for research information and whether participants' needs were being met [27]. Required assistance for research utilisation was investigated by Tsai [28]. One study focused on organisational needs regarding a special information package [29]. Retsas investigated what nurses believed would help them to use research in their practice [30]. No study including open-ended questions for nurses to answer freely has explored their wishes/needs/requirements regarding nursing research and research utilisation to date. There exists, however, an extensive literature regarding the following issues.

Knowledge, attitudes, barriers and facilitators

There is a vast amount of evidence on nurses' knowledge of and attitudes towards research as well as barriers to and facilitators of research utilisation. The literature shows, for example, that nurses' research-related knowledge and education is rarely sufficient for using research findings in daily practice [31 - 34] and that only a minority of nurses read research articles on a regular basis [3, 30, 35]. The key is a positive attitude for using and implementing research in daily practice [36], and recent years have shown a change of nurses' attitudes in a favourable direction [3]. Numerous individual and organisational aspects including social, cultural, political and economic environments and patients' opinions as well as attributes of the respective innovation and its communication constitute serious barriers [37 - 41]. Research also shows that nurses experience similar barriers to using research regardless of their individual roles, countries or the times when the studies were conducted [8, 17, 42]. Responses to questions on barriers and facilitators are found to be highly consistent [35]. According to the review published by Cheater et al. further research to identify and address barriers to change is necessary and decisions about tailored interventions should be based, among others, on that knowledge [43]. Until now, no such data are available for Austria.

Context in Austria

In Austria, nursing science as a discipline is still in its infancy. The first attempts to bring nursing to third level status were made in the 1980s, resulting in a few university-based, yet not regularly offered courses. A diploma in nursing was required for admission. Between 2004 and 2007, the first three university programmes in nursing science according to the Bologna Declaration were started. The first official PhD programmes are targeted for 2010. These facts indicate that, in Austria, nursing research has been fairly non-existent until recently [44]. The great majority of nurses are still trained in traditional, hospital-based nursing schools. Since 2001, however, nursing education programmes have followed new legal regulations directing that nursing research and nursing science be included in nursing curricula [45]; in total, nurses receive 80 lessons in a three-year diploma course. Additionally, the Austrian government is committed to providing citizens with health care based on the 'acknowledged state of scientific knowledge and experience' ([46], §3). In view of these circumstances together with evolving challenges like demographic changes that also affect the Austrian health system, it is expected that

the current delivery of nursing care in the Austrian practice setting is undergoing a paradigm shift towards scientific evidence-based practice.

In such a situation, it might be advisable to investigate the aforementioned factors and to capture the current situation in Austria as the bulk of published research studies in this field originate in North America, the United Kingdom and the Nordic countries of Europe [6].The application of these research results to Austrian nursing practice must, however, be performed with caution. This is because of the differences between countries - for example in education-related aspects - as well as differences in Austria itself. A research-based description of the above-named factors also yields information on whether there are already apparent differences between nurses having graduated before (<) 2001 or in 2001 or later (≥), i.e. whether they graduated under the previous or new curriculum.

Research aims

This study aims to identify and describe:

- nurses' wishes, needs and requirements regarding research implementation and research utilisation,
- nurses' knowledge regarding nursing research and evidence-based practice,
- nurses' attitudes towards nursing research and research utilisation,
- perceived barriers to and facilitators of implementing and using research results in practice and
- the extent to which nurses who graduated between <2001 and ≥2001 differ regarding these topics.

METHODS

Study design

A descriptive and exploratory cross-sectional survey was carried out in a large university hospital (1550 beds) in the south-eastern part of Austria.

Ethical approval

Ethical approval was obtained from the university's Research Ethics Committee. Consent to participate in the survey was assumed on the basis of a returned and completed questionnaire.

Sampling and data collection

The entire population of clinical and head nurses (*n* = 1825) was invited to participate. The hospital setting itself was chosen by convenience. The final sample consisted of 1023 nurses (response rate 56%). The eligibility criteria were being a graduate nurse and having a good command of German. Nurse auxiliaries were not included.

Instrument

A modified version of the Questionnaire on Utilisation of Nursing Research by Parahoo [18] was used. Permission to use the questionnaire was obtained from the author. This instrument had been developed to find out how the workforce perceives research utilisation, in particular, its barriers and facilitators and to learn more about nurses' research activities, research utilisation and their attitudes towards research as a first step towards evidence-based practice. The different sections of the questionnaire had been psychometrically tested to various extents: face validity was assumed for the attitude scale; content validity for the questionnaire as a whole, including its education-related items, the attitude scale; and the Barriers Scale (developed by Funk et al. [47]) was established by means of a panel of three experts with research experience. Wording was checked by piloting the questionnaire with 20 nurses [18].

For this study, the original questionnaire was translated into German by CL, together with experts of a local evidence-based nursing group. To guarantee equivalence in terms of what the instrument is measuring [48], the questionnaire was also modified by CL to be compatible with the Austrian context:

- In the two education-related scales sections, the item 'Writing a research proposal' was removed as this had not been included in nurses' basic training. Instead, three additional items regarding basic statistics, reading scientific articles written in English and evidence-based nursing practice were included.

- One item was added to the attitude scale, asking whether superiors in the field of nursing supported the utilisation of research results in practice.
- Closs and Bryar criticised the Barriers Scale for not providing the maximum information when used in another cultural environment and/or for monitoring changes in nursing practice [49]. Therefore, only the open-ended questions of the Barriers Scale regarding perceived obstacles and facilitators remained in the questionnaire for this study.

It was decided to formulate open-ended questions to let nurses share their own thoughts and ideas regarding the topics of utmost interest and to avoid suggestive questions. Experts of the evidence-based nursing group attested face validity to the questionnaire that finally comprised seven open-ended and 14 closed-ended questions:

- Demographic details: age, gender, year of diploma (<2001 and ≥2001)
- Three questions related to nurses' reported extent of research utilisation
- Closed- and open-ended questions about nurses' needs/requirements and wishes regarding nursing science, nursing research and the implementation of research results
- An education-related section with two scales: one, on the extent of research education in basic training (10 items), scored on a Likert-type scale from 1 (to no extent) - 4 (to a great extent) and second, a dichotomous-type scale asking nurses whether they would recommend the inclusion of the same 10 items in an introductory or advanced manner during their basic education
- Nurses' attitudes regarding nursing research: 12 self-descriptive statements, scored using a five point Likert scale from 1 (strongly agree) - 5 (strongly disagree)
- Perceived barriers and facilitators to implementing research results including the opportunity to write comments.

In this study, internal consistencies by Cronbach's alpha of the four included subscales were 0.71 (attitude scale), 0.86 (research preparation in basic training scale), 0.79 (basic education training needs scale) and 0.69 (further training needs scale).

Pilot study

A pilot study was undertaken to ensure the comprehensibility and understandability of the translated and modified version of the questionnaire. Nurses (n = 54) from another hospital indicated no problems as to wording and content structure.

Procedure

Permission to address the nurses was obtained from the hospital's Director of Nursing. Data were collected during a three-week period in May 2007. Beforehand, nurses had been informed about the purpose and potential benefits of the proposed study, the researchers' intention as to dissemination of the results and the procedure of data collection and returning of the questionnaires. This information was given during two oral presentations in the hospital setting and through flyers. A sufficient number of self-administered questionnaires, envelopes and a large, addressed collection envelope were then distributed to all nursing units and departments via internal mail. In an accompanying letter, head nurses were asked to grant nurses the time to complete the questionnaires. It was stressed that participation was entirely voluntary. At the end of the stated period the return-envelopes were collected by assistants. No reminder was sent.

Data analysis

The obtained data were analysed in two steps. First, content analysis was used to analyse the qualitative statements to open-ended questions for the emergence of patterns and themes [50]. To ensure credibility of the qualitative data, they were categorised together with experts in the field. In only 0.2% of the given answers, no agreement could be reached. In these cases, HEB determined the categorisation of the answer in question.

The categorised data and all data from the closed-ended questions were then entered into SPSS (version 15.0; SPSS Inc., Chicago, IL, USA). Descriptive statistics with frequencies and percentages as well as χ^2-tests to identify group differences (graduation <2001 or ≥2001) were performed. To avoid significance by chance, a p-level of ≤ 0.0005 was established according to the Bonferroni correction by dividing $\alpha = 0.05$ by the number of tests (n = 98). Missing values were not substituted; therefore, the total number n varies for

the different items, and percentages were calculated only for the sum of the answers to the specific question.

RESULTS

Participants

Demographic characteristics are presented in Table 1. Age ranged between < 20 and 60. As only two participants were < 20 years, they were added to the 20- to 30-year-group for analysis purposes. There is no significant difference in the gender distribution of the two diploma groups (<2001 = 6.9%, ≥2001 = 8.6%, χ^2 = 0.894, *d.f.* = 1, p = 0.344).

Table 1 Nurses' characteristics

Nurses' characteristics	%
Age range (n = 1017)	
<20-30	35.7
31-40	23.4
41-50	26.3
51-60	14.7
Gender (n = 1021)	
female	92.6
male	7.4
Year of diploma (n = 1019)	
<2001	71.3
≥2001	28.7

Research utilisation

The majority (77.4%) of the 991 responding nurses stated that they had never/seldom consciously used research results in past years, whereas 4.5% used them frequently/all the time.

Nurses' wishes, needs and requirements regarding research implementation

Wishes regarding research implementation

Three hundred and fifty-six nurses (34.8%) recorded 513 wishes regarding the implementation of research results. The most frequently reported aspects were:

- 'adequate information', e.g. good introduction of the innovation or of the value/significance of nursing science (39.6%),
- 'structural availability', e.g. time for implementation, more staff, or provision of necessary means/material (25.3%),
- 'professional support', e.g. regarding the implementation of research results (16.9%) and
- 'feasibility/practicability of the results for daily practice' (14.6%).

Wishes regarding further training by employer and willingness to participate

More than half of the nurses (60.4%, *n* = 960) documented their willingness to participate in further training regarding nursing research and nursing science, and 68.6% (*n* = 945) stated that further training should be offered by the employer.

Requested topics for further training

Of the 942 participants, 1.2% stated having sufficient knowledge. The five most frequently reported topics to a closed-ended question include the contribution of nursing research to daily practice, implementation of research results into practice, basic principles of nursing research, the use of libraries and databases and the consideration of research-based information (Table 2). There is a marked difference in the diploma groups' answers regarding basic principles of nursing research (<2001: 47.0%, *n* = 670; ≥2001: 24.4%, n = 270; χ^2 = 40.673, *d.f.* = 1, *p* = 1.799E-10).

By means of an open-ended question, nurses were asked to indicate topics of particular interest. The nurses (*n* = 540) showed great interest in research-based information as to 'nursing phenomena' (42.4%) like pressure ulcer, fall or communication and regarding 'nursing interventions' (36.7%) like wound management, mobilisation or feeding. Further, frequently recorded topics were 'nursing-related phenomena' (29.3%) like dementia, aspects of hygiene or psychosocial aspects, 'not clearly specified interventions' (20.2%) like

Table 2 Basic education and further training needs

	Further training needs	Basic education needs			Diploma group differences – basic education needs for introductory training				
Items	***n* = 942 (%)**	**Introductory Training (%)**	**Detailed Training (%)**	***n***	**<2001 % *(n)***	**≥2001 % *(n)***	**χ^{2*}**	***d.f.***	***p***
Contribution of research to practice	54.1	58.5	41.5	919	61.4 (634)	51.9 (283)	7.139	1	0.008
Basic principles of nursing research	40.4	61.3	38.7	925	64.4 (644)	54.1 (279)	8.740	1	0.003
Participation in research project	23.4	73.2	26.8	881	73.5 (603)	72.5 (276)	0.097	1	0.756
Use of libraries/data bases	38.1	48.8	51.2	902	51.5 (621)	42.7 (279)	6.072	1	0.014
Evaluating/critiquing research results	19.0	61.4	35.9	878	66.1 (398)	60.2 (165)	2.848	1	0.091
Consideration of research-based information	30.0	52.8	47.2	883	54.5 (607)	48.9 (274)	2.397	1	0.122
Implementing research results in practice	42.4	41.4	58.5	903	43.2 (622)	38.0 (279)	2.189	1	0.139
Basic principles of statistics	10.2	86.8	13.2	865	88.8 (589)	82.5 (274)	6.500	1	0.011
Basic principles regarding reading English scientific articles	20.1	73.4	26.6	870	71.8 (593)	76.7 (275)	2.299	1	0.129
Evidence-based nursing practice	22.7	56.3	43.7	878	59.0 (602)	50.0 (274)	6.154	1	0.013
Other	1.5	-	-	-	-	-	-	-	-

*Chi-square value was generated with two-tailed significance at ≤ 0.0005.

coping with diagnoses, risk management or dealing with patients' relatives and 'prophylaxis/prevention' (9.6%) like prevention of fall, pressure ulcers or pneumonia.

Research-related needs in basic education

Overall, the surveyed nurses indicated their education needs being predominantly of an introductory manner (Table 2). However, approximately 50% of the participants mentioned needs for detailed training as to the following topics: implementation of research results, use of libraries and data bases and consideration of research-based information for daily practice. There is no significant difference between the two diploma groups (Table 2).

Knowledge

Participants were asked about research relevant aspects in basic education, participation in further education and about reading research articles. A total of 32.8% (n = 983) of them answered that research relevant aspects had indeed been included in their basic education. Topics and group differences are listed in Table 3. However, a substantial part of the survey participants reported that the following topics had not been included in their basic education:

- basic principles to read English scientific articles/reports (47.8%),
- participation in a small-scale research project (35.5%),
- evidence-based nursing practice (25.7%),
- basic principles of statistics (25.6%),
- implementation of research results in daily practice (20.1%) and
- use of libraries and databases (19.3%).

Approximately one-third (33.8%) of the surveyed nurses (n = 1014) documented having participated in further education in nursing science, nursing research and evidence-based practice. However, significantly more nurses of the diploma group <2001 (χ^2 = 12.819, $d.f.$ = 1, p = 0.0003) attended courses on evidence-based practice. A great majority of nurses (82.7%, n = 1002) reported having read research articles less than once a month, without major group differences. Five per cent of the mentioned journals were peer reviewed ones.

Table 3 Extent of research preparation in basic education

Items	No/little extent (%)	Moderate/ great extent (%)	*n*	Diploma group differences – no/little extent				
				<2001 % *(n)*	≥2001 % *(n)*	χ^{2*}	*d.f.*	*p*
Contribution of research to practice	53.7	46.3	315	75.7 (81)	42.3 (88)	31.684	1	1.814E-08
Basic principles of nursing research	27.7	72.2	317	52.9 (56)	15.2 (32)	49.910	1	1.609E-12
Participation in research project	73.6	26.5	310	79.5 (81)	70.7 (147)	2.686	1	0.101
Use of libraries/data bases	55.7	44.3	316	64.1 (68)	51.4 (108)	4.621	1	0.032
Evaluating/critiquing research results	55.2	44.7	315	76.9 (80)	44.5 (94)	29.528	1	5.512E-08
Consideration of research-based information	69.8	30.1	312	81.7 (85)	64.0 (133)	10.422	1	0.001
Implementing research results in practice	73.5	26.5	313	78.8 (82)	70.8 (148)	2.300	1	0.129
Basic principles of statistics	64.4	35.6	312	80.4 (82)	56.7 (119)	16.861	1	4.022E-05
Basic principles regarding reading English scientific articles	80.9	19.1	314	91.4 (95)	75.7 (159)	10.996	1	0.001
Evidence-based nursing practice	67.5	32.4	311	84.4 (86)	59.3 (124)	19.511	1	1.000E-05

*Chi-square value was generated with two-tailed significance at ≤ 0.0005.

Attitudes

The answer options of the attitude scale were merged into strongly agree/agree and disagree/strongly disagree (Table 4). More than 50% of the participants considered nursing research and research utilisation as an advantageous aspect in nursing care, valuable to nurses and neither irrelevant to the real day-to-day work nor only relevant to nursing education - with a significantly higher percentage of nurses of the ≥2001 diploma group in favour of the two latter items. However, nearly 50% of the nurses disagreed that nursing should become a research-based profession. More than 50%, especially nurses of the <2001 diploma group, stated that lack of time made it difficult to actively read about or to implement research results and that the majority of nurses was not informed about research results. More than 60% stated that research experience should not be taken into account in promotion to senior posts. To obtain a general impression on nurses' attitudes, the total scale mean was calculated after all negative statements were reversed so that lower scores express a more positive attitude. It averaged 3.10 (SD 0.57, n = 900) for all nurses and 3.14 (SD 0.58, n = 620, <2001) and 3.00 (SD 0.53, n = 276, ≥2001) for the two diploma groups, respectively.

Perceived barriers

Six hundred and thirty-four participants (62%) cited a total of 1453 perceived barriers to implementing research results. The three main barriers to using research results are lack of time, lack of information/knowledge, for example on statistics, English or how to search for/obtain/criticise research reports, as well as lack of interest. These were also the three most frequently stated perceived barriers in both diploma groups. There are no significant differences between the two groups. The one group difference regarding lack of interest is not statistically significant (<2001: 22.1%, n = 430; ≥2001: 34%, n = 203; χ^2 = 10.168, *d.f.* = 1, p = 0.001). Table 5 lists the top 10 perceived barriers.

Facilitators

Four hundred and thirteen respondents (40.3%) put forward what they perceived as key facilitators and subsequently cited a total of 752 facilitators. The three main ones (Table 5) are adequate information (e.g. gaining more knowledge through further training or easily readable research literature/instructions), sufficient time and access to information. These are also the three most frequently stated facilitators in both diploma groups, albeit in differing orders.

Table 4 Attitudes as to nursing research and research utilisation

				Diploma group differences						
				<2001% *(n)*		≥2001% *(n)*				
Items*	**strongly agree/ agree (%)**	**disagree/ strongly disagree (%)**	***n***	**strongly agree/ agree**	**disagree/ strongly disagree**	**strongly agree/ agree**	**disagree/ strongly disagree**	χ^{2**}	***d.f.***	***p***
Research is not relevant to the real day-to-day work in nursing	32.2	55.1	981	35.8 (246)	50.0 (344)	23.5 (68)	67.5 (195)	25.145	2	3.466E-06
Research activities are taken into account in pro-motion to senior posts	42.8	25.0	975	45.8 (313)	24.2 (165)	35.8 (103)	27.1 (78)	8.694	2	0.013
Nursing should become a research-based profession	35.8	49.2	976	37.6 (258)	47.6 (327)	31.6 (90)	53.0 (151)	3.243	2	0.198
Nurses are too busy delivering care to spend time reading professional journals	51.7	44.6	987	54.8 (380)	42.9 (297)	44.1 (128)	48.6 (141)	19.266	2	6.555E-05
Research often leads to real practical advances in nursing care	57.4	17.0	985	54.8 (380)	19.0 (132)	63.8 (183)	12.2 (35)	8.805	2	0.012
Research expertise is of value to the nurse in clinical practice	52.7	22.2	989	51.7 (362)	23.3 (163)	54.7 (158)	19.0 (55)	2.156	2	0.340
Nurses rarely use research findings in practice	55.8	17.7	981	56.1 (387)	18.4 (127)	55.1 (158)	16.0 (46)	1.577	2	0.455

Research experience should not be taken into account in promotion to senior posts	61.6	15.9	970	64.7 (439)	15.6 (106)	54.4 (156)	16.7 (48)	11.207	2	0.004
Research is only relevant to nursing education, not to nursing practice	30.5	53.7	979	34.0 (234)	49.9 (343)	21.3 (61)	63.4 (182)	17.891	2	0.0001
Most nurses are informed about research results	14.7	66.5	986	15.6 (108)	65.4 (453)	11.8 (34)	70.2 (203)	2.904	2	0.234
Nurses are too busy delivering care to incorporate research findings into day-to-day nursing practice	54.8	30.4	981	55.9 (385)	29.0 (200)	52.1 (150)	34.0 (98)	2.399	2	0.301
Nursing superiors support the implementation and use of research results into practice	38.6	32.3	973	40.6 (277)	30.2 (206)	33.9 (97)	37.8 (108)	5.961	2	0.051

*'I do not know'-responses are not shown.
**Chi-square value was generated with two-tailed significance at ≤ 0.0005.

Table 5 Top 10 perceived barriers and facilitators

Barriers	***n* = 634 (%)**	**Facilitators**	***n* = 413 (%)**
Lack of time	69.9	Adequate information	49.2
Lack of information/ knowledge	45.4	Sufficient time	19.9
Lack of interest	25.9	Access to information	18.6
Human resources	19.1	Structural availability	14.8
No access to results	14.5	Human resources	14.0
Structural availability*	14.4	Team	13.3
Hierarchy	6.2	Interest	11.9
Insufficient flow of information	4.9	Contact person	9.7
Team	4.6	Flow of information	7.7
Rooms/equipment	4.4	Seniors/superiors	7.3

* Structural availability: e.g. monthly/regular information via internet, opportunity of further training, in-house committees for research implementation, equitable responsibility assignment.

DISCUSSION

The majority and far more nurses than in other published studies [18, 20 - 21] stated seldom or never having used research results in their practice during the past years. These findings show that nursing science in Austria is still in its infancy in development and emphasise the necessity to overcome this grave underutilisation.

According to Brown et al., the application of a research-based needs assessment creates an evidence-based foundation for organisational strategic planning [34]. This has rarely been focused on. This study shows that ‘adequate information’ and a supportive surrounding were among the most frequently highlighted wishes regarding research implementation, something which is supported by existing evidence [20, 22, 30]. In contrast to the basic education needs described by Parahoo [20], nurses of both diploma groups in this study predominantly indicated introductory training needs. Additionally, they requested further training on basic aspects of research and ways to implement it in daily practice. It is remarkable that many nurses proclaimed their willingness for further training about nursing research/science. Apparently, even a considerable number of nurses trained under the new legal regulation (≥2001 diploma group) have insufficient research knowledge. The reason

for the group difference regarding the requested further training topic 'basic principles of nursing research' might lie in the fact that it was already part of the basic education curriculum in the ≥2001 diploma group. It is also noteworthy that nurses, independently of their diploma year, showed great interest in research-based information regarding a variety of nursing phenomena and interventions to improve their daily practice. All in all, these results reflect and confirm some of the very early developmental stages of nursing science in Austria.

Until now, education in nursing research (evidence-based practice) and implementation - may it be in basic and/or further education - is marginal as a whole and taught even to a lower extent than described by Parahoo on the subject of pre-Project 2000 nurses [20]. The one difference between the two diploma groups as to participation in evidence-based practice courses might be explained by the fact that meanwhile a higher number of experienced nurses understand the necessity for evidence-based practice in their daily work. However, to become knowledgeable, i.e. to understand, to find meaning and to be able to transform, they need experience [51]. One possibility to gain experience in nursing research is through interaction in classes in basic and/or further education. It can be assumed that, currently, in many places, nursing students are taught these topics by teachers who know little more than those they teach. Reading research articles is another way to share experiences and to gain knowledge. It is notable that in contrast to the literature [3, 30], less than one-fifth of participants read a journal on a monthly basis. It is thus questionable whether trained nurses in Austria can already fulfil the requirements stated in the legal regulations for their profession. According to Luker, "the ability to provide high-quality care to service users is to a great extent dependent on the availability of a well-educated and clinically competent nursing workforce" ([52], p. 526). She continues that this workforce, in turn, is dependent on its members being able to access to and use up-to-date knowledge [52]. The results of this study show a lack of these abilities. A comparison of the already discussed research needs and the reported shortfall in research preparation demonstrates that they reflect each other.

In general and in both the diploma groups, our findings demonstrate a slightly unfavourable tendency of attitudes towards nursing research and research utilisation, thus contradicting previous results [3]. However, there seems to be one inconsistency. On the one hand, nurses are aware of the significance

and value of research (expertise) for their daily practice, especially the ≥2001 diploma group. On the other hand, a majority of nurses from both diploma groups disagree that nursing should become a research-based profession. This might be explained by a realisation of the necessity for change together with the current lack of experience/knowledge regarding nursing science, nursing research and implementation of research results, all of which might be perceived as a threat to the existing, yet well-known system. Luker already mentioned that the nursing profession as a whole seems to be ambivalent about the contribution of research and of its researchers. She further argues that the workforce is mainly action focused and therefore, an anti-intellectual culture still seems to persist [52]. This also might be the reason for nurses' belief that research experience should not be taken into account in promotion to senior posts, as many participating nurses do not have further education as to research/nursing science and its implementation-related topics. Consequently, they might fear being excluded from promotion.

Overall, this research project confirmed that time and lack of information/knowledge are top barriers [22, 26, 53]. However, 'lack of interest' as a top barrier is inconsistent with the international literature [35, 53 - 54]. In the present study, the difference between the nurses of both diploma groups is remarkable. Until now, the nursing profession in Austria has been predominantly task oriented, and a substantial share of nurses of the ≥2001 diploma group who are still at the beginning of their nursing career might cling to this orientation. The nurses of the <2001 diploma group, however, have gained enough experience to realise the necessity for change. The identified facilitators correspond to those in the literature [3, 17, 22, 34, 55 - 56] and are a reflection of the named barriers as well. Interestingly, the majority of cited facilitators concern organisational aspects as well as communication of results. 'Interest' as an individual or personal facilitator is less important than within the reported barriers. This highlights the necessity of a supportive culture/environment to foster the use of research findings in daily practice. With the exception of topics for basic education, nurses of both diploma groups do not differ substantially in the focal aspects of this survey, and it seems that legal regulations are a necessary, albeit not sufficient means for change. Considering the results of this study, the novelty of the discipline of nursing science in Austria must be kept in mind as a partial explanation.

Limitations

For interpretation purposes, the response rate (56%) was concededly low, although still in a reasonable range for a survey [50]. It compared favourably with numerous studies using similar methods (e.g. 33.3% [32], 44.6% [49], 52.6% [35], 72.6% [57]). Also, data were collected at only one hospital and may not apply to similar settings elsewhere. Parahoo points out that the extent of biases of convenience samples is considerably reduced when large samples are recruited [20], which is the case in this survey. Compared with Statistik Austria ([58], p.416), the proportion of participating male graduate nurses was drastically lower (13% and 7.4%, respectively). The proportion of our sample, however, matches hospital data for 2007: 7.9% (information from the management of the hospital). In Austria, nursing is still a mainly female profession. Another limitation relates to missing data, which resulted in varying response rates to each question/item. Missing data were highest in open-ended questions regarding wishes/needs/requirements (65.2%) and possible facilitators (59.6%) to using/implementing research results. This might indicate that the majority of nurses had seldom been faced with this topic before the present survey and that it was difficult for them to think of and express facilitators, wishes or needs/requirements. Although the questionnaire was piloted for its understandability, we do not know how individual respondents defined research and research use. For receiving a general impression of overall research utilisation, the nurses' personal interpretation might be sufficient.

CONCLUSION

Based on the results of this study, the majority of nurses are obviously not sufficiently prepared for clinical role expectations according to legal regulations [45 - 46] and internationally expected profiles of the profession [2]. A considerably large group of nursing staff do not use consciously research results in daily practice, and we can assume that the requirements to provide best possible care at the lowest possible cost in an environment of limited resources [59] are rarely met. This has serious implications on the quality of care and may expose individuals to, for example, the danger of needless suffering and inconveniences. With this survey, we have gained a first-hand impression on what nurses need if research-based practice is to become a reality in Austria. Nurses need adequate, research-based information on topics concerning daily practice, together with a supportive organisational structure and knowl-

edge of research and its implementation-related aspects. This might help to overcome a variety of perceived barriers, of which the top three relate to organisational and personal aspects.

RELEVANCE TO CLINICAL PRACTICE

The results have clear implications for nurse educators in basic and in further education as well as for nurse managers, especially those working in health care institutions in countries where nursing science is in its infancy. It provides them with valuable insights regarding the needs nurses suggested for basic as well as for further training. Additionally, they are provided with information about requirements in the clinical setting to foster the implementation of research results into practice to improve patient care. As to basic nursing education in Austria, it can be confirmed that there is a necessity to reconsider current nursing curricula.

Furthermore, the results show the necessity to foster existing positive nurses' attitudes and to deal with the assessed unfavourable ones. Based on this assessment, concerted and tailored interventions can be planned and realised in the investigated health institution, as it helps management to understand the ability of clinical nurses to implement research-based practice in the clinical practice environment. This allows prior inhibiting conditions to be reduced or eliminated and supports those that facilitate the implementation of research results. The willingness to participate in further training, preferably offered by employers, is a valuable resource for interventions regarding the implementation of research results. Furthermore, the results provide clear implications for researchers. As nurses lack sufficient knowledge and time, it is of utmost necessity to present research reports in a simple, clear and concise manner to facilitate their comprehensibility and rapid transfer into daily practice.

ACKNOWLEDGEMENTS

We wish to thank all participants who spent their precious time to share their unique experiences with us. The authors also gratefully acknowledge Susanna Schaffer and Richard Weiss (deceased) for their help with categorising the qualitative statements and the statistical assistance provided by Petra Ofner-

Kopeinig, Institute for Medical Informatics, Statistics and Documentation, Medical University of Graz.

This study received funding from the Austrian Federal Province of Styria: Land Steiermark, Abteilung 3 – Wissenschaft und Forschung.

CONTRIBUTIONS

Study design: CL; data collection and analysis: HEB and manuscript preparation: HEB, RJGH, CL.

CONFLICT OF INTEREST

None.

REFERENCES

1. Strategic directions for strengthening nursing midwifery services 2002–2008. BRIEF produced by the Global Network of WHO Collaborating Centres for Nursing and Midwifery Development. Geneva (Switzerland). 2003. [http://www.who.int/hrh/nursing_midwifery/strategic_directions_brief.pdf].
2. The ICN code of ethics for nurses. Geneva (Switzerland). 2006. [http://www.icn.ch/icncode.pdf].
3. Glacken M, Chaney D. Perceived barriers and facilitators to implementing research findings in the Irish practice setting. *J Clin Nurs.* 2004;13:731–40.
4. Parahoo K, Barr O, McCaughan E. Research utilisation and attitudes towards research among learning disability nurses in Northern Ireland. *J Adv Nurs*. 2000;31:607–13.
5. McCloskey DJ. Nurses' perceptions of research utilisation in a corporate health care system. *J Nurs Scholarsh*. 2008;40:39–45.
6. Carlson CL, Plonczynski DJ. Has the Barriers Scale changed nursing practice? An integrative review. *J Adv Nurs*. 2008;63:322–33.
7. Grol R. Introduction. In: Grol R, Wensing M, Eccles M, editors. *Improving Patient Care. The Implementation of Change in Clinical Practice.* Edinburgh: Elsevier; 2005. p. 1–3.
8. Kajermo KN, Undén M, Gardulf A, Eriksson LW, Orton M-L, Arnetz BB, Nordström G. Predictors of nurses' perceptions of barriers to research utilisation. *J Nurs Manag*. 2008;16:305–14.
9. Thompson DS, Estabrooks CA, Scott-Findlay S, Moore K, Wallin L. Interventions aimed at increasing research use in nursing: a systematic review. *Implement Sci.* 2007;2:15. doi: 10.1186/1748-5908-2-15.
10. van Achterberg T, Schoonhoven L, Grol R. Nursing implementation science: how evidence-based nursing requires evidence-based implementation. *J Nurs Scholarsh.* 2008;40:302–10.
11. Rycroft-Malone J, Harvey G, Seers K, Kitson A, McCormack B, Titchen A. An exploration of the factors that influence the implementation of evidence into practice. *J Clin Nurs.* 2004;13:913–24.
12. Ciliska D. Evidence-based nursing. How far have we come? What is next? Joanna Briggs Oration, Joanna Briggs International Conference, Adelaide (Australia). 2005. [http://www.joannabriggs.edu.au/services/orations/CiliskaNov05.htm].
13. Kitson AL. What influences the use of research in clinical practice? *Nurs Res.* 2007;56:S1–3.
14. Koehn ML, Lehman K. Nurses' perceptions of evidence-based nursing practice. *J Adv Nurs.* 2008;62:209–15.
15. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet*. 2003;362:1225–30.
16. Wallin L. Knowledge translation and implementation research in nursing. *Int J Nurs Stud.* 2009;46:576–87.
17. Parahoo K, McCaughan EM. Research utilisation among medical and surgical nurses: a comparison of their self reports and perceptions of barriers and facilitators. *J Nurs Manag.* 2001;9:21–30.
18. Parahoo K. Research utilisation and research related activities of nurses in Nothern Ireland. *Int J Nurs Stud.* 1998;35:283–91.
19. Estabrooks CA. The conceptual structure of research utilisation. *Res Nurs Health.* 1999;22:203–16.
20. Parahoo K. A comparison of pre-Project 2000 and Project 2000 nurses' perceptions of their research training, research needs and of their use of research in clinical areas. *J Adv Nurs.* 1999;29:237–45.

21. Olade RA. Evidence-based practice and research utilisation activities among rural nurses. *J Nurs Scholarsh.* 2004;36:220–5.
22. Veeramah V. Utilisation of research findings by graduate nurses and midwives. *J Adv Nurs.* 2004;47:183–91.
23. Ofi B, Sowunmi L, Edet D, Anarado N. Professional nurses' opinion on research and research utilization for promoting quality nursing care in selected teaching hospitals in Nigeria. *Int J Nurs Pract.* 2008;14:243–55.
24. Milner FM, Estabrooks EA, Humphrey C. Clinical nurse educators as agents for change: increasing research utilisation. *Int J Nurs Stud.* 2005;42:899–914.
25. Pearcey PA. Achieving research-based nursing practice. *J Adv Nurs.* 1995;22:33–9.
26. Niederhauser VP, Kohr L. Research endeavors among pediatric nurse practitioners (REAP) study. *J Pediatr Health Care.* 2005;19:80–9.
27. Ciliska D, Hayward S, Dobbins M, Brunton G, Underwood J. Transferring public-health nursing research to health-system planning: assessing the relevance and accessibility of systematic reviews. *Can J Nurs Res.* 1999;31:23–36.
28. Tsai S-L. Nurses' participation and utilisation of research in the Republic of China. I*nt J Nurs Stud.* 2000;37:435–44.
29. Mitchell A, Janzen K, Pask E, Southwell D. Assessment of nursing research utilisation needs in Ontario health agencies. *Can J Nurs Adm.* 1995;Jan.-Feb.:77–91.
30. Retsas A. Barriers to using research evidence in nursing practice. *J Adv Nurs.* 2000;31:599–606.
31. Eller LS, Kleber E, Wang SL. Research knowledge, attitudes and practices of health professionals. *Nurs Outlook.* 2003;51:165–70.
32. McCleary L, Brown GT. Association between nurses' education about research and their research use. *Nurse Educ Today.* 2003;23:556–65.
33. McKenna HP, Ashton S, Keeney S. Barriers to evidence-based practice in primary care. *J Adv Nurs.* 2004;45:178–89.
34. Brown CE, Wickline MA, Ecoff L, Glaser D. Nursing practice, knowledge, attitudes and perceived barriers to evidence-based practice at an academic medical center. *J Adv Nurs.* 2009;65:371–81.
35. Parahoo K. Barriers to and facilitators of, research utilisation among nurses in Northern Ireland. *J Adv Nurs*. 2000;31:89–98.
36. Wallin L, Boström AM, Wikblad K, Ewald U. Sustainability in changing clinical practice promotes evidence-based nursing care. *J Adv Nurs.* 2003;41:509–18.
37. Estabrooks CA, Floyd JA, Scott-Findlay S, O'Leary KA, Gushta M. Individual determinants of research utilisation: a systematic review. *J Adv Nurs.* 2003;43:506–20.
38. French B. Contextual factors influencing research use in nursing. *Worldviews Evid Based Nurs.* 2005;2:172–83.
39. Pepler CJ, Edgar L, Frisch S, Rennick J, Swidzinski M, White C, Brown TG, Gross J. Unit culture and research-based nursing practice in acute care. *Can J Nurs Res.* 2005;37:66–85.
40. Cheraghi MA, Salasli M, Ahmadi F. Iranian nurses' perceptions of theoretical knowledge transfer into clinical practice: a grounded theory approach. *Nurs Health Sci.* 2007;9:212–20.
41. Scott SD, Estabrooks CA, Allen M, Pollock C. A context of uncertainty: how context shapes nurses' research utilisation behaviors. *Qual Health Res.* 2008;18:347–57.
42. Gerrish K, Ashworth P, Lacey A, Bailey J, Cooke J, Kendall S, McNeilly E. Factors influencing the development of evidence-based practice: a research tool. *J Adv Nurs.* 2007;57:328–38.

43. Cheater F, Baker R, Gillies C, Hearnshaw H, Flottorp S, Robertson N, Shaw EJ, Oxman AD. Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2005;3:Art. No.: CD005470. doi: 10.1002/14651858.CD005470.

44. Rappold E. Österreichs Pflege in Bewegung? *Pflege*. 2008;21:147–8.

45. Flemmich G, Nöstlinger W, editors. *Gesundheits- und Krankenpflegegesetz. Gesetze und Kommentare NR 180*. Wien: Verlag des Österreichischen Gewerkschaftsbundes GmbH; 2004.

46. Federal Act on the Quality of Health Services (Health-Care Quality Act—Gesundheitsqualitätsgesetz—GQG). Excerpt from the 2005 Health Reform Act, Fed. Law Gaz. I no. 179/2004. [http://www.bmg.gv.at/cms/home/attachments/3/4/1/CH1063/CMS1043931577060/health_care_quality_act.pdf].

47. Funk SG, Champagne MT, Wiese RA, Tornquist EM. Barriers: the barriers to research utilisation scale. *Appl Nurs Res.* 1991;4:39–45.

48. McColl E, Christiansen T, König-Zahn C. Making the right choice of outcome measure. In: Hutchinson A, Bentzen N, König-Zahn C, editors. *Cross cultural health outcome assessment: A user's guide.* ERGHO European Research Group on Health Outcomes; n.d. p. 12–26.

49. Closs SJ, Bryar RM. The Barriers scale: does it 'fit' the current NHS research culture? *J Res Nurs.* 2001;6:853–65.

50. Polit DF, Beck CT. *Nursing Research. Generating and Assessing Evidence for Nursing Practice,* 8th ed. Philadelphia: Lippincott Williams & Wilkins, a Wolters Kluwer business; 2008.

51. Bonis SA. Knowing in nursing: a concept analysis. *J Adv Nurs.* 2009;65:1328–41.

52. Luker KA. Nursing research: coming of age? *J Adv Nurs.* 2006;54:526–7.

53. Andersson N, Cederfjäll C, Jylli L, Kajermo KN, Klang B. Professional roles and research utilisation in paediatric care: newly graduated nurses' experiences. *Scand J Caring Sci.* 2007;21:91–7.

54. Adamsen L, Larsen K, Bjerregaard L, Madsen JK. Danish research active clinical nurses overcome barriers in research utilisation. *Scand J Caring Sci.* 2003;17:57–65.

55. Oranta O, Routasalo P, Hupli M. Barriers to and facilitators of research utilisation among Finnish registered nurses. *J Clin Nurs.* 2002;11:205–13.

56. Hutchinson AM, Johnston L. Bridging the divide: a survey of nurses' opinions regarding barriers to and facilitators of, research utilisation in thepractice setting. *J Clin Nurs.* 2004;13:304–15.

57. Rodgers SE. A study of the utilisation of research in practice and the influence of education. *Nurse Educ Today.* 2000;20:279–87.

58. Statistik Austria, editors. *Jahrbuch der Gesundheitsstatistik* 2007. Wien: Bundesanstalt Statistik Österreich; 2008. [http://www.statistik.at/web_de/dynamic/statistiken/gesundheit/gesundheitsversorgung/personal_im_gesundheitswesen/publikationen?id=4&webcat=123&nodeId=278&frag=3&listid=123].

59. Closs SJ, Cheater FM. Evidence for nursing practice: a clarification of the issues. *J Adv Nurs.* 1999;30:10–7.

Chapter 4

Implementation interventions used in nursing homes and hospitals: a descriptive, comparative study between Austria, Germany, and The Netherlands

Breimaier HE, Halfens RJG, Wilborn D, Meesterberends E, Haase Nielsen G, Lohrmann C. Implementation interventions used in nursing homes and hospitals: a descriptive, comparative study between Austria, Germany, and The Netherlands. *ISRN Nurs*. 2013. http://dx.doi.org/10.1155/2013/706054.

Received 10 May 2013; Accepted 23 June 2013

© 2013 Helga E. Breimaier et al.
This is an open access article distributed under the Creative Commons Attribution License (https://creativecommons.org/licenses/by/3.0/), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Translating guidelines into nursing practice remains a considerable challenge. Until now, little attention has been paid to which interventions are used in practice to implement guidelines on changing clinical nursing practice. This cross-sectional study determined the current ranges and rates of implementation-related interventions in Austria, Germany, and The Netherlands and explored possible differences between these countries. An online questionnaire based on the conceptual framework of implementation interventions (professional, organizational, financial, and regulatory) from the Cochrane Effective Practice and Organization of Care (EPOC) data collection checklist was used to gather data from nursing homes and hospitals. Provision of written materials is the most frequently used professional implementation intervention (85%), whereas changes in the patient record system rank foremost among organisational interventions (78%). Financial incentives for nurses are rarely used. More interventions were used in Austria and Germany than in The Netherlands (20.3/20.2/17.3). Professional interventions are used more frequently in Germany and financial interventions more frequently in The Netherlands. Implementation efforts focus mainly on professional and organisational interventions. Nurse managers and other responsible personnel should direct their focus to a broader array of implementation interventions using the four different categories of EPOC's conceptual framework.

INTRODUCTION

Nurses are expected to deliver care that is regularly updated with research findings, and the volume of new scientific evidence for good clinical practice is growing quickly. This research-based knowledge should be used, for example, as a basis for decision making [1] and for providing evidence-based care to promote positive patient outcomes [2, 3]. Legal regulations commit governments to providing their citizens with healthcare based on the acknowledged state of scientific knowledge; for example, in Austria, there is the Health Care Quality Act (Section 3) [4]. Regulations also require nurses to update their knowledge and skills according to the latest scientific findings in nursing science. In Austria, this is governed by the Nursing Act (Section 4, paragraphs 1 and 2) [5]. However, numerous studies over the past decade have highlighted a failure to routinely translate research findings into daily practice [6 - 11]. A large gap between what is known from research and what happens in practice still exists [10, 12], and introducing change is far from straightforward [13]. As a consequence of this theory-practice gap, patients may suffer unnecessarily from inconveniences such as pain, pressure ulcers, and/or prolonged hospitalization [11, 14].

Much effort has been undertaken to implement new knowledge to change nursing practice. Clinical practice guidelines are seen as one means by which new knowledge can be instilled in practice [15] in order to change the process and the outcome of care provided by allied medical professionals [16]. However, knowledge distillation and the publication of research findings or guidelines do not ensure that practitioners will use them in their daily clinical practice [17, 18]. Translating research into healthcare decision making and practice remains a considerable challenge [19]. There are several reasons why research results are not implemented successfully in clinical practice, including, for example, characteristics of innovations [20], insufficient education/information, or inadequate organisational support [21]. Over the past decade, a growing number of articles have discussed interventions that implement new knowledge in healthcare [22 - 26]. This is especially true for medical but also, to an increasing extent, for nursing care. These articles show, among other things, why the effectiveness of implementation interventions varies in healthcare [27 - 30]. Alanen et al. revealed, for example, that the method of implementing a hypertension guideline in Finnish health centres varied widely. Health centres categorized as implementers used multiple strategies to pro-

mote the adoption of the guideline. Health centres categorised as disseminators did little to facilitate their adoption [31]. Earlier research disclosed that methods utilized to implement guidelines in primary healthcare were usually directive and passive [32]. According to Kortteisto et al., profession also has an effect on the intention to use clinical guidelines in patient care, and the authors recommended the use of different strategies when clinical guidelines are targeted at different professional groups [33].

There is a broad array of implementation interventions from which nurse managers, for example, may choose to implement new knowledge in their respective practical fields. The Cochrane Effective Practice and Organisation of Care Review Group compiled a checklist with a short description of each intervention, which was then grouped into four non-mutually exclusive categories: professional interventions (e.g., distribution of educational materials), organisational interventions (e.g., changes in medical records systems), financial interventions (e.g., fee-for-service), and regulatory interventions (e.g., changes in medical liability) [34, 35]. These implementation interventions are thought to facilitate the use of known knowledge and help to overcome barriers to its adoption in clinical settings [34]. In a systematic review, Medves et al. focussed on dissemination and implementation strategies of practice guidelines for healthcare teams and team-based practice. They identified 88 relevant studies that investigated 16 dissemination and implementation strategies. Four of these strategies are ranked as organisational interventions, one as patient-oriented, and one as structural interventions. Ten of these strategies were aimed at healthcare professionals and included the distribution of educational materials and educational meetings as the most common strategies [36]. In an explorative study, Meesterberends et al. found that interventions used in disseminating pressure-ulcer guidelines in nursing homes of six European countries differed in terms of number (2 - 4) and type. The most common implementation interventions were the use of the Internet and the presentation of the guideline at national or regional seminars or congresses [37]. According to the typology of EPOC, both interventions belong to the category of professional interventions [35]. However, the evidence supporting the use of the electronic retrieval of healthcare information (including the internet) by healthcare providers to improve practice and patient care was found to be insufficient [38]. Furthermore, attendance at seminars or congresses is a passive educational approach which is considered a less effective implementation intervention [39].

This indicates that interventions used are not in line with existing evidence regarding implementation and may be one of the reasons why innovations are not implemented sustainably. To resolve this inconsistency, the effectiveness of implementation interventions aimed at instilling new knowledge into nursing practice must be understood. To this end, this study sets out to discover which implementation strategies are actually used in nursing practice and whether the most frequently used implementation strategies are indeed effective ones. This can help nurse managers to find the best methods for implementing new knowledge and/or guidelines. To date, however, only little is known about which interventions are actively used to implement guidelines in nursing - be it in hospitals or in nursing homes.

To shed more light on this issue, an international research group from Austria, Germany and The Netherlands set itself the objective of (1) determining the current range and rates of the interventions used for implementation purposes regarding guidelines in nursing in these countries and (2) exploring whether there are any differences in the interventions employed between the three countries. For this purpose, four care problems were chosen on an exemplary basis - discharge management (in hospitals), urinary incontinence (in nursing homes), and malnutrition and pressure ulcers (in both settings) - as these are among the more common care problems in hospitals and nursing homes [40 - 42].

METHODS

Design

Using a cross-sectional design, data were gathered from nursing homes and hospitals in Austria (A), Germany (D), and The Netherlands (NL).

Sample

Austrian, German, and Dutch hospitals and nursing homes were invited to participate in the study via email. In Austria, all nursing homes (692) and hospitals (268) nationwide were asked to participate. In Germany, for purposes of convenience, the survey was limited to the two federal states of Berlin and Hesse but included all nursing homes (Berlin: 228 and Hesse: 908) and hospitals (47 and 166, resp.). In The Netherlands, all 210 nursing homes and 70 hospitals which participated in the yearly National Prevalence Measurement

of Care Problems (Landelijke Prevalentiemeting Zorgproblemen, LPZ) were invited to participate.

The ethical principles of good scientific practice according to the Declaration of Helsinki [43] were observed throughout the entire research process. In a cover letter, participating institutions were informed about the study. Anonymity and confidentiality were assured, and voluntary participation was guaranteed. Contact information for further questions was made available for all three institutions carrying out this project. Approval for filling out the questionnaire was given by the participating institutions. Consent was assumed on the basis of a returned and completed questionnaire.

Procedure and data collection

The management and nursing directors of nursing homes and hospitals received an email notification about the intention to investigate interventions used to implement guidelines in nursing practice. The contact details of the institutions in Austria were acquired through an extensive internet search and from lists of nursing homes published by the Federal Ministry of Labour, Social Affairs and Consumer Protection. Contact details in Germany were acquired from lists published by the Ministry of Health, by the Public Inspecting Authorities for Nursing Homes of Hesse, and by searching the internet. In The Netherlands, all participants of the National Prevalence Measurement of Care Problems (LPZ) [41] were contacted. Two weeks later, all managers and nursing directors received detailed information about the purpose of the proposed study, the researchers' intention to disseminate the results, the data collection procedure, the return of the questionnaire, and the time requirements (45 minutes) for completing the questionnaire. A link to the online questionnaire was attached. The email contact and collection of the completed questionnaires were carried out by an external organisation (Flycatcher, Internet Research, Maastricht). Two reminders were sent to all managers and nursing directors, and the deadline was extended twice to increase the response rate. After completing the data collection, the anonymized final data file was forwarded to authors 1, 2, and 3 for analysis. Thus, anonymity was ensured for all participants. The managers and nursing directors were asked to forward the questionnaire to the nurse responsible for implementing guidelines in their institution and to return it by June 2008.

Instrument

For comparison purposes, the modified typology of implementation interventions of the Cochrane Effective Practice and Organisation of Care (EPOC) Review Group [34, 35] was used for this study. The questionnaire included a total of four sets of questions based on the conceptual framework of four implementation interventions, namely, professional interventions, organisational interventions, financial interventions, and regulatory interventions [34, 35]. For each category of intervention, single interventions varying from bottom-up approaches (through participation) to top-down approaches (through instructions) were presented. Each intervention could be answered with *yes*, *no*, or *I do not know*. All questions were asked in relation to specific clinical domains. They were chosen on the basis of their prevalence in the three countries and the specific setting. In nursing homes, all questions relating to prevention of pressure ulcers, urinary incontinence, and malnutrition were asked. In hospitals, the clinical domain of *urinary incontinence* is less prevalent [44, 45] and was arbitrarily replaced by *discharge management*; its importance for hospitals has been pointed out previously [46 - 48]. The questionnaire consisted of 22 pages all together.

Translation

The intervention part of the English EPOC-Checklist [35] was translated into German by authors 3, 5, and 6. Based on this translation, a German version of the instrument, addressing implementation issues of particular concern to nursing, was developed. This version was revised for Austria in order to take into account the localized nuances of Austrian German. In The Netherlands, the intervention part of the English EPOC-Checklist [35] was translated into Dutch by authors 2 and 4. The Dutch version was then translated into German by a professional translator. Both German versions were cross-checked, and unclear items were discussed within the research group.

Content validation

The questionnaire was developed by the researchers, and a content validation procedure was performed in all three countries. Three experts in the field (nursing and medicine) from each country were asked to indicate whether the included items were relevant to implementation issues in hospitals and nursing homes. Possible answers ranged from *agree completely, partly agree/ partly disagree*, to *disagree completely*. The instrument was amended using

the feedback from the content validation procedure. In this course, the existence of nursing guidelines and expert standards was highlighted in the questionnaire, and some items concerning financial interventions were modified or removed completely.

Pretest

After the process of content validation, an electronic web-based version of the questionnaire was developed. The questionnaire was piloted in three institutions per country to ensure that it was practical as well as easy to understand and read. The comments received were used to write the final electronic version of the questionnaire.

Data analysis

Data were analysed with SPSS 17.0. The percentage of each intervention was calculated by adding the answers of both the settings and the three care problems per intervention and dividing the result by the total number of institutions and then by three (care problems). The mean total number of each individual category of interventions and of the total interventions per setting and per care problem was calculated by adding the percentages of the respective individual items and dividing the result by 100. Next, the mean number of interventions of each category of intervention was calculated for each clinical domain and country. Differences between the three countries regarding the implementation interventions used were tested separately for each setting with one-way ANOVA. Due to the numerous tests, a *P* value of 0.01 was used for significance. The basis for the analysis was the net-response rates with N_{total} = 333.

RESULTS

The response rates varied from 12.8% to 55.7%. In all countries, the response rate of hospitals was higher than nursing homes (between 8.3% and 28.6%). However, not all questionnaires were fully completed, so the net response of completed questionnaires (*n* = 333) was lower (8.7% - 47.1%).

Implementation interventions

In the three countries, various interventions were used during implementation, with a mean total of 19.6 interventions per setting per care problem. An overview of the interventions is shown in Table 1. The percentages presented are mean percentages calculated over the three care problems and over the institutions, which means that, for example, in Austria, professional internal written materials are used in 90% of the cases when implementing a guideline. The most frequently used implementation intervention is from the category of professional interventions, namely, providing written materials. On average this is used in 85% of cases. Other commonly used professional interventions (63% - 66%) are internal consultations, internal audits and internal lectures. The organisational interventions used mostly (65% - 78%) are changes in the patient record system, individual patient participation in treatment decisions, efforts to increase nurses' work satisfaction, regular use of assessment instruments, changes in structure and facilities of the institution, and management of patient complaints.

External electronic training and the *use of telemedicine* are the professional and organisational interventions which are least used (≤ 12%). Financial interventions for nurses are rarely used (10%), while an average of 1.3 regulatory interventions is used per setting per care problem.

Implementation interventions per country

When looking at the mean total of interventions used per country, it becomes apparent that settings in Austria and Germany used slightly more interventions than those in The Netherlands (resp., 20.3, 20.2, and 17.3; $P = 0.007$) (Table 1). This is also true for the mean total of professional (A: 10.6, D: 10.3, NL: 8.2; $P < 0.001$) and organisational (A: 8.5, D: 8.3, NL: 7.0; $P = 0.004$) interventions. Regulatory interventions are, however, used less in Austria (A: 1.0, D: 1.4, NL: 1.5; $P = 0.001$).

The most frequently used professional interventions with significant differences between the countries are *internal audits, internal lectures, regular team meetings about a clinical topic, local opinion leaders,* and *written/manual reminders* (Table 1). *Internal written materials, internal consultations* and *external lectures* are used less in The Netherlands. The least frequently used professional intervention with a significant difference is *external conferences.* With regard to organisational interventions, the results show differences be-

tween the *regular use of assessment instruments*, *efforts to improve nurses' work satisfaction, case management, changes in right to access documentation*, and *changes in number of staff.* Compared to Austria and Germany, *financial incentives* for nurses are used more frequently in The Netherlands. Within the regulatory interventions, *inspecting authorities* and *insurance-related regulations* differ significantly (Table 1).

The use of *internal written materials* ranks among the most frequently used professional interventions in all three countries, followed by *internal audits* and *internal lectures* in Germany, and *internal consultations, external conferences* as well as *internal audits* and *internal lectures* in Austria. In The Netherlands, the use of *internal written materials* is preceded by *regular team meetings about a clinical topic* and *manual reminders*. The three countries differ regarding the rank order of the most frequently used organisational interventions: in Austria these are *efforts to increase nurses' work satisfaction, changes in patient record systems* and *individual patient participation in treatment decisions*. In Germany the *regular use of assessment instruments* ranks first, whereas in The Netherlands *additional staff qualifications* is the third most frequent organisational intervention. The most often used regulatory intervention in Austria and The Netherlands is *inspecting authorities*, whereas in Germany *insurance-related regulations* is used most often (Table 1). An overview of the five most frequently used implementation interventions per country is provided in Table 2. In Austria and Germany, these are two professional and three organisational interventions. In The Netherlands, these are one regulatory, one organisational and three professional interventions.

Implementation interventions per care problem and clinical setting

These results are presented for each individual category of intervention.

Professional interventions

The number of professional interventions used in nursing homes and hospitals does not differ between the countries regarding the care problems of *pressure ulcers* and *malnutrition* (Table 3). However, there are significant differences regarding the care problems of *incontinence* in nursing homes and *discharge management* in hospitals. In both cases, the number of professional interventions is less in The Netherlands. Regarding *incontinence*, an average of 7.4 professional interventions was used to implement guidelines in Dutch nursing

Table 1 Percentage of implementation interventions used per setting per care problem in Austria, Germany and the Netherlands

		Total %	Austria %	Germany %	The Netherlands %	F-values*	P
(1)	Professional interventions (22 items)						
	Internal written materials	85	90	90	67	22.584	<.001
	Internal consultations	66	71	71	47	13.433	<.001
	Internal audits	65	62	80	43	22.050	<.001
	Internal lectures	63	62	73	45	13.896	<.001
	Regular team meetings about a clinical topic	58	51	55	74	7.026	.001
	External lectures	56	63	64	31	19.055	<.001
	Local opinion leaders	55	70	58	21	33.755	<.001
	Written/manual reminders	52	54	42	68	8.206	<.001
	Patient- and relative-mediated interventions	50	56	51	36	6.109	.002
	Internal electronic materials	49	56	47	39	3.388	.035
	External conferences	49	69	47	19	36.794	<.001
	Internal workshops	46	44	46	48	.184	.832
	External consultations	43	51	41	33	5.137	.006
	External audits	42	34	52	39	5.562	.004
	Computerised reminders	42	51	42	28	6.082	.003
	External workshops	39	45	39	31	3.423	.034
	Supervision	36	35	33	44	1.605	.202
	Internal training sessions	35	30	37	39	2.045	.131
	External training sessions	28	34	23	25	3.022	.050
	Other internal interventions	16	13	17	21	1.262	.284
	External electronic training	12	13	14	7	1.121	.327
	Other external interventions	7	3	8	12	4.264	.015
Mean total number of professional interventions		*9.7*	*10.6*	*10.3*	*8.2*	*10.430*	*<.001*
(2)	Organisational interventions (19 items)						
	Changes in patient record systems	78	78	82	69	3.781	.024
	Individual patient participation in treatment decisions	74	77	75	65	2.889	.057

	Efforts to improve nurses' work satisfaction	70	82	78	34	41.201	<.001
	Regular use of assessment instruments	67	54	84	58	30.744	<.001
	Changes in structure and facilities of institution	66	70	68	56	3.806	.023
	Management of patient complaints	65	66	70	56	2.314	.101
	Additional staff qualifications	58	58	56	62	.458	.633
	Changes in size and type of services of the institution	56	60	59	42	5.161	.006
	Multidisciplinary teams to support nursing	52	53	47	57	1.354	.260
	Changes in professional responsibilities	49	55	50	39	3.626	.028
	Case management	41	40	34	57	6.754	.001
	Changing the right to access documentation	38	48	38	19	9.656	<.001
	Changes in number of staff	26	36	24	13	7.924	<.001
	Changes in composition of staff	16	19	13	14	1.176	.310
	Participation of patient groups	14	18	12	9	2.304	.101
	Use of telemedicine	11	15	8	11	1.449	.236
	Other patient interventions	10	9	10	12	.144	.866
	Other structural changes	9	6	7	17	5.713	.004
	Other personal changes	9	6	10	12	1.251	.288
Mean total number of organisational interventions		*8.1*	*8.5*	*8.3*	*7.0*	*5.595*	*.004*
(3)	Financial intervention (1 item)						
	Availability of financial incentives for nurses	10	7	8	21	8.070	<.001
(4)	Regulatory interventions (4 items)						
	Inspecting authorities	46	37	42	69	12.872	<.001
	Insurance companies	34	25	45	31	7.473	.001
	Law	33	28	40	27	3.093	.047
	Other regulatory interventions	12	7	13	19	3.708	.026
Mean total number of regulatory interventions		*1.3*	*1.0*	*1.4*	*1.5*	*6.975*	*.001*
Mean total number of interventions used		**19.6**	**20.3**	**20.2**	**17.3**	**5.024**	**.007**

*$d.f.$ = 2, 330

Table 2 Overview of the five most used implementation interventions per country

Austria	Germany	The Netherlands
Internal written materials (professional intervention)	Internal written materials (professional intervention)	Regular team meetings about a clinical topic (professional intervention)
Efforts to increase nurses' work satisfaction (organisational interventions)	Regular use of assessment instruments (organisational interventions)	Changes in patient record systems (organisational interventions)
Changes in patient record systems (organisational interventions)	Changes in patient record systems (organisational interventions)	Inspecting authorities (regulatory interventions)
Individual patient participation in treatment decisions (organisational interventions)	Internal audits (professional intervention)	Written/manual reminders (professional intervention)
Internal consultations (professional intervention)	Efforts to increase nurses' work satisfaction (organisational interventions)	Internal written materials (professional intervention)

homes compared to 10.9 in Austria and 10.1 in Germany ($P = 0.001$). In terms of *discharge management*, an average of 2.1 professional interventions was used to implement guidelines in hospitals in The Netherlands compared to 9.6 in Austria and 9.3 in Germany ($P < 0.001$).

Organisational interventions

The evaluation of the organisational interventions yields a similar picture regarding differences between the settings and care problems in the three countries (Table 3). Regarding *incontinence*, an average of 6.3 organisational interventions were used to implement guidelines in Dutch nursing homes compared to 8.6 in Austria and 8.1 in Germany ($P = 0.003$). Regarding *discharge management*, an average of 3.2 organisational interventions was used to implement guidelines in hospitals in The Netherlands compared to 8.2 in Austria and 7.9 in Germany ($P < 0.001$).

Financial intervention

Financial incentives for the implementation of guidelines regarding care problems are available in only a few organizations (Table 3). In Dutch nursing homes they are used in total significantly more often (19.7%) than in Austrian (6.1%) and German (5.1%; $P = 0.004$) ones. This also holds true for the care problem of *pressure ulcers* (28.2%/6.5%/7.1%; $P < 0.001$). In hospitals, financial interventions are used less in Austria (6.7%) compared to Germany

(17.1%) and The Netherlands (23.2%; $P = 0.041$) with the exception of d*ischarge management* ($P = 0.031$).

Regulatory interventions

The mean number of regulatory interventions is significantly lower in Austrian nursing homes (1.1) than in German (1.5) and Dutch ones (1.8; $P = 0.002$) (Table 3). The same is true for the individual care problem of *pressure ulcers* (1.2/1.5/1.9; $P < 0.005$) and *malnutrition* (1.0/1.6/1.8; $P < 0.001$). There is no significant difference between hospitals in the three countries, neither in total nor for the individual care problems.

DISCUSSION

Until now, “studies on the implementation of evidence based practice in nursing care make a very small contribution to the overall evidence on effective implementation” ([49], p. 1163). This study sought to gain an insight into ranges and rates of interventions used to implement nursing guidelines in Austria, Germany, and The Netherlands.

Ranges and rates of implementation interventions

The results describing implementation interventions revealed that, on average, a broad array of implementation interventions was used. The most frequent ones were found within professional and organisational strategies. Financial and regulatory interventions were rarely used. This is in line with findings from the literature [36, 50] and, although indirectly, comparable with findings of a systematic review about the effectiveness of the dissemination and implementation interventions of practice guidelines for (multidisciplinary) healthcare teams. In this review, Medves et al. revealed that of the 16 interventions (classified according to the EPOC taxonomy), ten were professional and five were organisational/structural interventions [36]. Robertson and Jochelson conclude from their review that there is less research into organisational-level interventions than those targeted at individuals [51].

Among the five most frequently used interventions, the distribution of *written materials* as a professional intervention ranks first. This may be due to the advantage that printed educational materials can be distributed relatively cheaply and easily to a large number of professionals. Furthermore, its dis-

Table 3 Mean number of professional, organisational, financial and regulatory implementation interventions

	Professional interventions (*n* = 22)		Organisational interventions (*n* = 19)		Financial intervention (*n* = 1)		Regulatory interventions (*n* = 4)	
	Nursing homes	Hospitals	Nursing homes	Hospitals	Nursing homes	Hospitals	Nursing homes	Hospitals
Pressure ulcers								
Austria	11.0	12.1	9.0	9.5	6.5%	8.0%	1.2	.8
Germany	10.9	13.2	8.8	9.7	7.1%	20.0%	1.5	1.3
The Netherlands	11.6	11.6	9.0	9.6	28.2%	39.4%	1.9	1.6
F-values*	.412	1.231	.122	.046	8.122	6.568	5.438	4.493
P-values	.663	.296	.885	.995	<.001	.002	.005	.013
Malnutrition								
Austria	10.3	9.1	8.3	7.5	6.5%	6.0%	1.0	.6
Germany	10.3	7.3	8.4	5.6	3.0%	11.4%	1.6	.7
The Netherlands	8.3	7.5	7.2	6.6	12.8%	27.3%	1.8	1.1
F-values*	3.876	1.533	2.022	1.887	2.401	4.108	9.820	2.819
P -values	.022	.220	.135	.156	.093	.019	<.001	.064
Incontinence								
Austria	10.9	—	8.6	—	6.5%	—	1.1	—
Germany	10.1	—	8.1	—	5.1%	—	1.5	—
The Netherlands	7.4	—	6.3	—	17.9%	—	1.6	—
F-values*	9.042		6.022		3.421		3.347	
P -values	<.001	—	.003	—	.035	—	.037	—

Discharge management								
Austria	—	9.6	—	8.2	—	6.0%	—	1.0
Germany	—	9.3	—	7.9	—	20.0%	—	1.0
The Netherlands	—	2.1	—	3.2	—	3.0%	—	.6
F-values*		33.352		16.124		3.582		1.957
P -values	—	<.001	—	<.001	—	.031	—	.146
Mean								
Austria	10.7	10.3	8.6	8.4	6.1%	6.7%	1.1	0.8
Germany	10.4	10.0	8.4	7.8	5.1%	17.1%	1.5	1.0
The Netherlands	9.1	7.1	7.5	6.4	19.7%	23.2%	1.8	1.1
F-values*	2.697	7.832	1.898	3.258	5.576	3.288	6.202	1.045
P -values	.070	.001	.152	.042	.004	0.041	.002	.355

**d.f.* (nursing homes) = 2, 212; *d.f.* (hospitals) = 2, 115

semination aims at improving the awareness, knowledge, attitudes, skills, and professional practice of nurses as well as patient outcomes [52]. This intervention is also among the five most frequently used interventions of a study investigating described implementation strategies in published abstracts [50], and it is the most commonly investigated one [36]. Although the majority of reviewed studies reported significant findings, it was not possible to attribute this intervention to the described effect. Grimshaw et al. concluded from their review that the distribution of written materials is a less effective method and that the addition of educational materials to other interventions did not seem to increase effectiveness [27]. This is supported by Farmer et al., who found a slightly beneficial effect on process outcomes but not on patient outcomes [52].

Four organisational interventions are ranked next: *changes in the patient record system, individual patient participation in treatment decisions, efforts to increase nurses' work satisfaction*, and *regular use of assessment instruments*. These measures do not force nurses to actively react to recommendations of an implemented guideline. Nonetheless, these measures seem to be a necessary basis which makes their use possible, in that, for example, it should be possible to record recommended care once it is carried out. Work satisfaction, which is associated with autonomy, good collaboration between nurses and physicians along with reduced job stress [53], was found to be an important individual characteristic of research utilization [54]. Out of these four most often used organisational interventions, *changes in the patient record system* was the only one included in Medves et al.'s work [36]. No conclusions could be drawn as to their effectiveness. In a former systematic review, however, Urquhart et al. found some limited evidence of effects on practice attributable to changes in nursing record systems [55]. A systematic review of reviews about organisational interventions found limited evidence in organisational interventions. None of the interventions produced consistent effects [56].

Additional frequently used interventions directed to professionals include *internal consultations*, *internal audits* and *internal lectures*. In these internally directed interventions, nursing managers may see a possible advantage in tailoring the specific content to the necessities of the respective setting in which they are delivered and/or a cost effective intervention possibility to introduce change. Often, audits are found to be investigated together with feed-

back as an implementation intervention. In general, their effect is consistently described as small to moderate for health practitioners [27, 28, 51, 57 - 60], yet not mandatory [61], and their effect could be increased where baseline adherence to recommended practice is low and when feedback is delivered more intensively [28]. An investigation by Dulko et al. in acute nursing care also showed their effectiveness [25].

Internal lectures are part of educational interventions which are usually regarded to be of limited [62] or no effect when used as a single intervention [39, 51, 57]. Simpson and Doig unexpectedly found that in-servicing (didactic lectures) was ranked highly, that is, as an effective practice change intervention, by participants [63]. In general, it can be said that educational meetings which include courses, conferences, lectures, workshops, seminars, and symposia can have a small effect on improving professional practice and healthcare outcomes [27, 39]; however, interactive educational strategies such as small-scale interactive meetings and workshops appear to be more successful in changing practice [51] and were consistently reported as effective [57, 64]. Yet, workshops, on average, were offered in less than half of the participating settings. Studies which reveal the effects of different educational implementation interventions showed only modest or moderate effects on processes or outcomes of care [27, 29, 39].

In general, financial and regulatory interventions were rarely used. Financial interventions, especially *financial incentives*, are seldom used to implement innovations in hospitals and nursing homes. The industrial sector, on the other hand, makes widespread use of financial incentives to encourage employees to achieve certain goals in their individual fields of responsibility. In the healthcare sector, however, this seems to be a rare measure to foster and implement quality improvement policies - at least in nursing. Actually, the use of financial incentives seems almost impossible considering that a separate budget for innovation implementation, which might be used for providing financial incentives, is very rare in the healthcare sector [16, 37]. Nevertheless, the effect of financial incentives was found to be inconclusive and provided no evidence that the magnitude of the incentive influenced compliance [57]. Flodgren et al. concluded that financial incentives may be effective in changing healthcare professional practice but not in improving patient outcomes [65]. Based on sparse observational studies found regarding regulatory inter-

ventions, Robertson and Jochelson summarized that regulation is associated with improvements in healthcare quality [51].

Comparison between the three countries

A count of the amount of implementation interventions shows that more interventions were used in Austria and Germany than in The Netherlands. However, when evaluating implementation interventions, limiting the perspective to mere numbers is not necessarily useful. Studies have revealed no relationship between the number of component interventions and the effects of multifaceted interventions on improvements in care [27]. It is still not clear how many and which combination of strategies are required to be successful [36].

For this reason, the authors of this study have focused their evaluation on the most common implementation interventions. In Austria and Germany, the five implementation interventions used most frequently are part of professional and organisational interventions with a ratio of 2 : 3. In The Netherlands they are part of professional, organizational, and regulatory interventions with a ratio of 3 : 1 : 1. The configuration of the used categories of implementation interventions shows a broader approach of implementation interventions in Dutch nursing homes and hospitals than in Germany and Austria. Moreover, in The Netherlands, interventions are also used which seem to focus on the ward-level, such as *regular team meetings about a clinical topic* and *written/ manual reminders*, in addition to interventions applied on an institutional level. This might address nurses more directly and force them to react in a short time frame. According to Prior et al., the use of reminders consistently resulted in significant practical improvements, and computer-delivered reminders had a slightly greater effect than manual- or paper-based reminders [57]. Furthermore, in all but one of the five most used interventions per country, there was a significant difference between the countries. This exception is *individual patient participation in treatment decisions*, although ranked differently in the top-five list. Robertson and Jochelson found some evidence that providing educational materials to patients can help in the implementation of guidelines [51]. *Inspecting authorities* was among the five most used interventions in Dutch settings and is significantly more applied there than in Austrian and German settings. Inspection in its function of external oversight refers to surveillance and enforcement to ensure minimum standards are met [51]. The differences between the countries regarding these top-five interven-

tions might be due to a higher awareness of the relevance of the process and steps of implementation in Dutch hospitals and nursing homes than in German and Austrian settings because of the longer history of nursing science in The Netherlands. Furthermore, The Netherlands started to develop national guidelines, for example, for pressure-ulcer prevention and treatment, as early as 1985 [66], whereas, in Germany, this process was started in 1999 with the development of *expert standards* (a type of guideline) [67], and education as the recommended implementation intervention [68]. In Austria, there exists no equivalent institution on a national level which is responsible for the development of national guidelines for relevant care problems in nursing. The difference regarding *inspecting authorities* might be due to the fact that, in The Netherlands, the Health Care Inspectorate regularly controls whether healthcare institutions meet their standards. Dutch healthcare settings are obliged to collect data about the so-called “norms of safe care”, for example, in the form of the annual prevalence survey, which was launched in 1998 [69].

Implementation interventions per care problem

With regard to the amount of used professional and organisational interventions, no differences were found for *pressure ulcers* and *malnutrition* in the three countries. A possible explanation may be that these problems occur to a similar extent and that the amount of intervention reflects the magnitude of the care problems. This applies to malnutrition where prevalence rates are similarly high in nursing homes and hospitals: 25.7% / 25.1% (A), 20.2% / 22.8% (NL), and 23.0% in German nursing homes. In contrast, the prevalence rates of pressure ulcers are found to be highest in Dutch hospitals (10.2%) and lowest in German nursing homes (4.0%) [45]. In the field of incontinence care in nursing homes and discharge management in hospitals, there was a remarkably lower amount of professional and organisational implementation interventions in The Netherlands. It might be that these topics are regarded as less essential in Dutch nursing care. *Pressure ulcers, malnutrition,* and *incontinence* seem to be equally important areas in nursing care in Austria and Germany, and this might be due to their epidemiological relevance. Furthermore, since 2008 it has been mandatory for German nursing homes to implement what are known as *expert standards* [70], a kind of guideline focusing, among other things, on these care problems. Therefore, the high number of implementation interventions used in relation to those problems seems reasonable. Financial and regulatory interventions do not seem to play an important role regarding

specific care problems, although they are used more frequently in The Netherlands relating to *pressure ulcers*.

Finally one should consider that the majority of the cited literature did not focus on the nursing profession but on healthcare professionals and medical doctors. Yet, interventions to implement guidelines should be tailored to different groups of stakeholders [15]. For this reason we should know the effectiveness of the used interventions.

Limitations

The results of this study might be limited due to low response rates - especially from nursing homes, which made comparison between hospitals and nursing homes difficult. Although low response rates are rather common nowadays [71, 72], several aspects could have had a negative influence, such as the use of a web-based questionnaire. Even though the questionnaire was developed in a very user-friendly way and tested for applicability, it could have been a problem for some respondents to fill in a web-based questionnaire. Also, the persons contacted might have considered the completion time for this task to be too long. Proposed participants were, however, notified beforehand of the forthcoming study. One further reason for low response rates may be that the questionnaire was distributed by a Dutch company, thus influencing possible participants from Austria and Germany. Furthermore, a high percentage of questionnaires was not fully completed; that is, the respondents stopped after the first few questions. In those cases, we decided to only use completely filled-out questionnaires.

Another limitation might lie in the fact that neither the characteristics of the person who filled out the questionnaire nor their role in the nursing team of each respective institution was identified. It is, therefore, possible that nurses in different positions with a variety of views about and responsibilities regarding implementation interventions filled in the questionnaire and this may, in turn, have influenced the results.

CONCLUSIONS

This study suggests that the most widely used implementation interventions to translate guidelines into nursing practice focus on professionals and organisations. There are only a few marked differences between the three countries,

a fact which may be attributed to different familiarity with the field of nursing science and a different significance of problems in nursing care. After investigating the effectiveness of the most frequently used single interventions in the literature, it can be concluded that these are either of little or modest to moderate effect or that their effectiveness still lacks evidence. Furthermore, one should consider that the majority of the cited literature did not focus on the nursing profession.

Nurses responsible for implementing nursing guidelines in practice should not focus mainly on a few implementation interventions with modest or even unknown effectiveness. On the contrary, at the beginning of an implementation process it might be worth considering what exactly has to be achieved and, based on this, selecting appropriate implementation strategies from all four different implementation categories. Yet to date, it is unknown how many implementation interventions, in which combination and from which EPOC-framework category [34, 35], would be effective in implementing a guideline into nursing practice. More research is necessary to explore whether a wide variety of implementation interventions is more effective than focussing on professional and organisational interventions alone.

ACKNOWLEDGMENTS

Upon request, a list of all nursing homes in Hesse was kindly made available by the Public Inspecting Authorities for Nursing Homes (Heimaufsicht) of the Regional Administrative Authority of the Federal State of Hesse in Gießen (Regierungspräsidium in Gießen). The Regional Administrative Authority in Gießen also very kindly supported the survey in Hesse by conveying greetings to all nursing homes as part of the introduction to the electronic questionnaire encouraging nursing homes to participate in the study.

REFERENCES

1. McCloskey DJ. Nurses' perceptions of research utilization in a corporate health care system. *J Nurs Scholarsh*. 2008;40:39–45.
2. Hart P, Eaton LA, Buckner M, Morrow BN, Barrett DT, Fraser DD, Hooks D, Sharrer RL. Effectiveness of a computer-based educational program on nurses' knowledge, attitude, and skill level related to evidence-based practice. *Worldviews Evid Based Nurs.* 2008;5:75–84.
3. Kirshbaum M. Translation to practice: a randomised, controlled study of an evidence-based booklet for breast-care nurses in the United Kingdom. *Worldviews Evid Based Nurs.* 2008;5:60–74.
4. Federal Act on the Quality of Health Services (Health-Care Quality Act—Gesundheitsqualitätsgesetz—GQG). Excerpt from the 2005 Health Reform Act, Fed. Law Gaz. I no. 179/2004. [http://www.bmg.gv.at/cms/home/attachments/3/4/1/CH1063/CMS1043931577060/health_care_quality_act.pdf].
5. Flemmich G, Nöstlinger W, editors. *Gesundheits- und Krankenpflegegesetz. Gesetze und Kommentare NR 180.* Wien: Verlag des Österreichischen Gewerkschaftsbundes GmbH; 2004.
6. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. *Med Care.* 2001;39:II46–54.
7. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet*. 2003;362:1225–30.
8. Grimshaw J, Eccles M, Tetroe J. Implementing clinical guidelines: current evidence and future implications. *J Contin Educ Health Prof.* 2004;24:supplement 1, S31–7.
9. Thompson DS, Estabrooks CA, Scott-Findlay S, Moore K, Wallin L. Interventions aimed at increasing research use in nursing: a systematic review. *Implement Sci.* 2007;2:15. doi: 10.1186/1748-5908-2-15.
10. van Achterberg T, Schoonhoven L, Grol R. Nursing implementation science: how evidence-based nursing requires evidence-based implementation. *J Nurs Scholarsh.* 2008;40:302–10.
11. Meesterberends E, Halfens RJG, Lohrmann C, Schols JMGA, de Wit R. Evaluation of the dissemination and implementation of pressure ulcer guidelines in Dutch nursing homes. *J Eval Clin Pract.* 2011;17:705–12.
12. Koehn ML, Lehman K. Nurses' perceptions of evidence-based nursing practice. *J Adv Nurs.* 2008;62:209–15.
13. Gerrish K. Evidence-based practice. In: Gerrish K, Lacey A, editors. *The Research Process in Nursing*. 5th ed. Oxford: Blackwell Publishing; 2007. p. 491–505.
14. Wallin L. Knowledge translation and implementation research in nursing. *Int J Nurs Stud.* 2009;46:576–87.
15. Ploeg J, Davies B, Edwards N, Gifford W, Miller PE. Factors influencing best-practice guideline implementation: lessons learned from administrators, nursing staff, and project leaders. *Worldviews Evid Based Nurs.* 2007;4:210–9.
16. Thomas LH, Cullum NA, McColl E, Rousseau N, Soutter J, Steen N. Guidelines in professions allied to medicine. *Cochrane Database Syst Rev.* 2009;1:Art. No.: CD000349. doi: 10.1002/14651858.CD000349.
17. Campbell S, Hancock H, Lloyd H. Implementing evidence-based practice. In: Gerrish K, Lacey A, editors. *The Research Process in Nursing.* 5th ed. Oxford: Blackwell Publishing; 2007. p. 506–20.
18. Straus SE, Tetroe J, Graham I. Defining knowledge translation. *Can Med Assoc J.* 2009;181:165–8.

19. Seers K, Cox K, Crichton NJ, Edwards RT, Eldh AC, Estabrooks CA, Harvey G, Hawkes C, Kitson A, Linck P, McCarthy G, McCormack B, Mockford C, Rycroft-Malone J, Titchen A, Wallin L. FIRE (Facilitating Implementation of Research Evidence): a study protocol. *Implement Sci.* 2012;7:25. doi: 10.1186/1748-5908-7-25.
20. Grol R, Wensing M. Characteristics of successful innovations. In: Grol R, Wensing M, Eccles M, editors. *Improving patient care. The implementation of change in clinical practice*. Edinburgh: Elsevier; 2005. p. 60–70.
21. Breimaier HE, Halfens RJG, Lohrmann C. Nurses' wishes, knowledge, attitudes and perceived barriers on implementing research findings into practice among graduate nurses in Austria. *J Clin Nurs*. 2011;20:1744–56.
22. Eccles M, McColl E, Steen N, Rousseau N, Grimshaw J, Parkin D, Purves I. Effect of computerised evidence based guidelines on management of asthma and angina in adults in primary care: cluster randomised controlled trial. *Br Med J.* 2002;325:941–4.
23. Rashotte J, Thomas M, Grégoire D, Ledoux S. Implementation of a two-part unit-based multiple intervention: moving evidence-based practice into action. *Can J Nurs Res.* 2008;40:94–114.
24. Dobbins M, Robeson P, Ciliska D, Steve H, Cameron R, O'Mara L, DeCorby C, Mercer S. A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implement Sci.* 2009;4:23. doi: 10.1186/1748-5908-4-23.
25. Dulko D, Hertz E, Julien J, Beck S, Mooney K. Implementation of cancer pain guidelines by acute care nurse practitioners using an audit and feedback strategy. *J Am Acad Nurs Pract.* 2010;22:45–55.
26. Fineout-Overholt E, Williamson KM, Kent B, Hutchinson AM. Teaching EBP: strategies for achieving sustainable organizational change toward evidence-based practice. *Worldviews Evid Based Nurs.* 2010;7:51–3.
27. Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, Whitty P, Eccles MP, Matowe L, Shirran L, Wensing M, Dijkstra R, Donaldson C. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess.* 2004;8:iii–iv, 1–72.
28. Jamtvedt G, Young JM, Kristoffersen DT, O'Brien MA, Oxman AD. Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2006;2:Art. No.: CD000259. doi: 10.1002/14651858.CD000259.pub2.
29. O'Brien MA, Rogers S, Jamtvedt G, Oxman AD, Odgaard-Jensen J, Kristoffersen DT, Forsetlund L, Bainbridge D, Freemantle N, Davis DA, Haynes RB, Harvey EL. Educational outreach visits: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2007:4:Art. No.: CD000409. doi: 10.1002/14651858.CD000409.pub2.
30. Shojania KG, Jennings A, Mayhew A, Ramsay CR, Eccles MP, Grimshaw J. The effects of on-screen, point of care computer reminders on processes and outcomes of care. *Cochrane Database Syst Rev.* 2009;3:Art. No.: CD001096. doi: 10.1002/14651858.CD001096.pub2.
31. Alanen SI, Johannala-Kemppainen R, Ijäs JJ, Kaila M, Klockars M, Mäkelä M, Välimäki MA. Evaluation of current care effectiveness: a survey of hypertension guideline implementation in Finnish health centres. *Scand J Prim Health Care.* 2007;25:232–6.
32. Miilunpalo S, Toropainen E, Moisio P. Implementation of guidelines in primary health care: a challenge for the municipal health centres in Finland. *Scand J Prim Health Care.* 2001;19:227–31.
33. Kortteisto T, Kaila M, Komulainen J, Mäntyranta T, Rissanen P. Healthcare professionals' intentions to use clinical guidelines: a survey using the theory of planned behaviour. *Implement Sci.* 2010;5:51. doi: 10.1186/1748-5908-5-51.

34. Thorsen T, Mäkelä M. A framework for guidelines implementation studies. In: Thorsen T, Mäkelä M, editors. *Changing Professional Practice. Theory and Practice of Clinical Guidelines Implementation.* Copenhagen: Danish Institute for Health Services Research and Development; 1999. p. 23–53.
35. Cochrane Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist. 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].
36. Medves J, Godfrey C, Turner C, Paterson M, Harrison M, MacKenzie L, Durando P. Systematic review of practice guideline dissemination and implementation strategies for healthcare teams and team-based practice. *Int J Evid Based Healthc.* 2010;8:79–89.
37. Meesterberends E, Halfens R, Lohrmann C, de Wit R. Pressure ulcer guideline development and dissemination in Europe. *J Clin Nurs.* 2010;19:1495–503.
38. McGowan JL, Grad R, Pluye P, Hannes K, Deane K, Labrecque M, Welch V, Tugwell P. Electronic retrieval of health information by healthcare providers to improve practice and patient care. *Cochrane Database Syst Rev.* 2009;3:Art. No.: CD004749. doi: 10.1002/14651858.CD004749.pub2.
39. Forsetlund L, Bjørndal A, Rashidian A, Jamtvedt G, O'Brien MA, Wolf F, Davis D, Odgaard-Jensen J, Oxman AD. Continuing education meetings and workshops: effects on professional practic and health care outcomes. *Cochrane Database Syst Rev.* 2009;2:Art. No.: CD003030. doi: 10.1002/14651858.CD003030.pub2.
40. Dassen T, editor. *Bundesweite Erhebung zu Pflegeproblemen 2009, Studie aus Pflegeheimen und Krankenhäusern.* Berlin: Charité-Universitätsmedizin Berlin, Centrum 1 Human- und Gesundheitswissenschaften, Institut für Medizin-, Pflegepädagogik und Pflegewissenschaft; 2009.
41. Halfens RJG, Meijers JMM, Neyens JCL, Schols JMGA. *Rapportage resultaten. Landelijke Prevalentiemeting Zorgproblemen 2009. Report of the National Prevalence Measurement.* Maastricht: Universiteit Maastricht, Onderzoeksinstituut Caphri, Department of Health Care and Nursing Science; 2009.
42. Lohrmann C, editor. *Prävalenzerhebung 07. April 2009*, Graz: Medizinische Universität Graz, Institut für Pflegewissenschaft; 2009.
43. WMA (World Medical Association). Declaration of Helsinki – Ethical principles for medical research involving human subjects. 2008. [http://www.wma.net/en/30publications/10policies/b3/].
44. Schmitz G. Inkontinenz. In: Dassen T, editor. *Pflegeprobleme in Deutschland. Ergebnisse von 10 Jahren Forschung in Pflegeheimen und Kliniken 2001–2010*. Berlin: Charité-Universitätsmedizin Berlin; 2010. p. 51–7.
45. Halfens RJG, Schols JMGA, Bartholomeyczik S, Reuter S, Saxer S, Lohrmann C, Schönherr S, Weststrate J, van Nie NC. *International Prevalence Measurement of Care Problems (LPZ): 2009-2010. At a glance.* Maastricht: Datawyse; 2011.
46. Bartholomeyczik S. Reparaturbetrieb Krankenhaus. DRGs und ihre Auswirkungen aus Sicht der Pflege. Langfassung des Artikels aus Dr. med. Mabuse 2007, 166, März/April. [http://www.mabuse-verlag.de/chameleon/outbox/public/4/166 Bartholomeyczik.pdf].
47. Braun B, Buhr P, Müller R. P*flegearbeit im Krankenhaus. Ergebnisse einer wiederholten Pflegekräftebefragung und einer Längsschnittanalyse von GEK-Routinedaten.* GEK-Edition, Schriftenreihe zur Gesundheitsanalyse, Band 60, St. Augustin: Asgard-Verlag; 2008. [http://www.barmer-gek.de/barmer/web/Portale/Presseportal/Subportal/Infothek/Studien-und-Reports/GEK-Schriftenreihe-Gesundheitsanalyse/Berufsleben-Gesundheit/PDF-Pflegekraefte-60,property=Data.pdf].

48. Deutsches Netzwerk für Qualitätsentwicklung in der Pflege (DNQP), editors. *Expertenstandard Entlassungsmanagement in der Pflege.* Aktualisierung. Osnabrück: University of Applied Sciences Osnabrück; 2009. [http://www.dnqp.de/ExpertenstandardEntlassungsmanagement Atk.pdf].
49. van Achterberg T, Sales AE. Implementation science for nursing: evidence needed! Call for papers for a special issue. *Int J Nurs Stud.* 2011;48:1163–4.
50. Mazza D, Bairstow P, Buchan H, Paubrey Chakraborty S, van Hecke O, Grech C, Kunnamo I. Refining a taxonomy for guideline implementation: results of an exercise in abstract classification. *Implement Sci.* 2013;8:32. doi: 10.1186/1748-5908-8-32.
51. Robertson R, Jochelson K. *Interventions that change clinician behaviour: mapping the literature.* London: NICE; 2006. [http://www.nice.org.uk/media/AF1/42/HowTo-GuideKingsFundLiteratureReview.pdf].
52. Farmer AP, Légaré F, Turcot L, Grimshaw J, Harvey E, McGowan J, Wolf FM. Printed educational materials: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2008;3:Art. No.: CD004398. doi: 10.1002/14651858.CD004398.pub2.
53. Zangaro GA, Soeken KL. A meta-analysis of studies of nurses' job satisfaction. *Res Nurs Health*. 2007;30:445–58.
54. Squires JE, Estabrooks CA, Gustavsson P, Wallin L. Individual determinants of research utilization by nurses: a systematic review update. *Implement Sci.* 2011;6:1. doi: 10.1186/1748-5908-6-1.
55. Urquhart C, Currell R, Grant MJ, Hardiker NR. Nursing record systems: effects on nursing practice and healthcare outcomes. *Cochrane Database Syst Rev.* 2009;1:Art. No.: CD002099. doi: 10.1002/14651858.CD002099.pub2.
56. Wensing M, Wollersheim H, Grol R. Organizational interventions to implement improvements in patient care: a structured review of reviews. *Implement Sci.* 2006;1, Art. No.: 2. doi: 10.1186/1748-5908-1-2.
57. Prior M, Guerin M, Grimmer-Somers K. The effectiveness of clinical guideline implementation strategies - a synthesis of systematic review findings. *J Eval Clin Pract.* 2008;14:888–97.
58. Gardner B, Whittington C, McAteer J, Eccles MP, Michie S. Using theory to synthesise evidence from behaviour change interventions: the example of audit and feedback. *Soc Sci Med.* 2010;70:1618–25.
59. Boaz A, Baeza J, Fraser A and for the European Implementation Score Collaborative Group (EIS). Effective implementation of research into practice: an overview of systematic reviews of the health literature. *BMC Res Notes.* 2011;4:212. doi: 10.1186/1756-0500-4-212.
60. Sinuff T, Cahill NE, Dhaliwal R, Wang M, Day AG, Heyland DK. The value of 'audit and feedback reports' in improving nutritional therapy in the intensive care unit: a multicentre observational study. American Society for Parenteral and Enteral Nutrition ASPEN. s.a. [http://www.nutritioncare.org/Index.aspx?id=4568].
61. Sudsawad P. K*nowledge Translation: Introduction To Models, Strategies, and Measures.* Austin: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research; 2007. [http://www.ncddr.org/kt/products/ktintro/ktintro.pdf].
62. Opiyo N, English M. In-service training for health professionals to improve care of the seriously ill newborn or child in low and middle-income countries. *Cochrane Database Syst Rev.* 2010;4:Art. No.: CD007071. doi: 10.1002/14651858.CD007071.pub2.
63. Simpson F, Doig GS. The relative effectiveness of practice change interventions in overcoming common barriers to change: a survey of 14 hospitals with experience implementing evidence-based guidelines. *J Eval Clin Pract*. 2007;13:709–15.
64. Kim SC, Brown CE, Fields W, Stichler JF. Evidence-based practice-focused interactive teaching strategy: a controlled study. *J Adv Nurs.* 2009;65:1218–27.

65. Flodgren G, Eccles MP, Shepperd S, Scott A, Parmelli E, Beyer FR. An overview of reviews evaluating the effectiveness of financial incentives in changing healthcare professional behaviours and patient outcomes. *Cochrane Database Syst Rev.* 2011;7:Art. No.: CD009255. doi: 10.1002/14651858.CD009255.

66. Buss IC, Halfens RJG, Abu-Saad HH, Kok G. Pressure ulcer prevention in nursing homes: views and beliefs of enrolled nurses and other health care workers. *J Clin Nurs.* 2004;13:668–76.

67. Deutsches Netzwerk für Qualitätsentwicklung in der Pflege (DNQP). Expertenstandards in der Pflege: Zur Entwicklung wissenschaftsbasierter Expertenstandards. s.a. [http://www.dnqp.de/Projekte.htm].

68. Deutsches Netzwerk für Qualitätsentwicklung in der Pflege (DNQP), editors. *Methodisches Vorgehen zur Entwicklung, Einführung und Aktualisierung von Expertenstandards in der Pflege*, Osnabrück: University of Applied Sciences Osnabrück; 2011.

69. CAPHRI School for Public Health and Primary Care. *LPZ—Résumé*. Maastricht University. s.a. [http://www.lpz-um.eu/eng/home].

70. Bundesgesetzblatt, Gesetz zur strukturellen Weiterentwicklung der Pflegeversicherung (Pflege-Weiterentwicklungsgesetz) vom 28. Mai 2008. Bundesgesetzblatt Jahrgang 2008 Teil I Nr. 20, ausgegeben zu Bonn am 30. Mai 2008, § 113a (3). [http://www.mdk-qualitaetsberichte.de/files/080528-pfwg-mit-aenderungen.pdf].

71. Hamilton MB. Online survey response rates and times. Background and guidance for industry. 2009. [http://www.supersurvey_white_paper_response_rates.pdf].

72. Polit DF, Beck CT. *Nursing research. Generating and assessing evidence for nursing practice.* 9th ed. Philadelphia: Wolters Kluwer Health, Lippincott Williams and Wilkins; 2012.

Chapter 5

Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before- and after, mixed-method study using a participatory action research approach

Breimaier HE, Halfens RJG, Lohrmann C. Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nurs*. 2015;14:18. doi: 10.1186/s12912-015-0064-z.

Received 3 March 2014; Accepted 11 March 2015

© 2015 Breimaier et al.; licensee Biomed Central
This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

ABSTRACT

Background: Research- and/or evidence-based knowledge are not routinely adopted in healthcare and nursing practice. It is also unclear which implementation strategies are effective in nursing practice and what expenditures of time and money are required for the successful implementation of clinical practice guidelines (CPGs). The aim in this study was to assess the effectiveness and required time investment of multifaceted and tailored strategies for implementing an evidence-based fall-prevention guideline (Falls CPG) into nursing practice in an acute care hospital setting.

Methods: A before-and-after, mixed-method design was used within a participatory action research approach (PAR). The study was carried out in two departments of an Austrian university teaching hospital and included all graduate and assistant nurses. Data were collected through a questionnaire, group discussions and semi-structured interviews. Qualitative data were content-analysed using a template based on the *Consolidated Framework for Implementation Research (CFIR)*, which also served as a theoretical framework for the study. Quantitative data were descriptively analysed using appropriate tests for independent groups.

Results: By applying multifaceted and tailored implementation strategies, the graduate and assistant nurses' knowledge on fall prevention, how to access the Falls CPG and the guideline itself increased significantly between baseline and final assessment ($p \leq .001$). Qualitative data also revealed an increase in participant awareness of fall prevention. A baseline positive attitude towards guidelines improved significantly towards the end of the project ($p = .001$). Required fall prevention equipment like baby monitors or one-way glide sheets were available for use and any required environmental adaptations, e.g. a handrail in the corridor, were made. Hospital nursing personnel (approximately 150) invested a total of 1192 hours of working time over the course of the project.

Conclusion: Multifaceted strategies tailored to the specific setting within a PAR approach and guided by the *CFIR* enabled the effective implementation of a CPG into acute care nursing practice. Nursing managers now have sound knowledge of the time resources required for CPG implementation.

Key words: Participatory action research, before-and-after design, effectiveness, implementation strategies, guidelines, nursing, fall prevention

BACKGROUND

The quote “Knowledge is not enough, we must apply it. Being willing is not enough, we must do” by the famous German poet Johann Wolfgang von Goethe highlights the fact that knowledge and scientific evidence must be put into practice. However, the implementation of evidence-based care into health-care systems is not typically the norm [1]. This also applies to nursing, despite the increasing expectation, and in some countries even a legal obligation, to work according to research-based standards/knowledge [2, 3] in order to promote positive patient outcomes [4, 5]. After nearly four decades of work implementing research- and evidence-based knowledge into healthcare and nursing, there is still a notorious mismatch between target and current conditions [6 - 8]. This mismatch threatens the safety and quality of patient care [8] as it may lead to unnecessary suffering [9].

Patient falls is one example which can lead to serious physical consequences such as fractures, which carry the risk of invalidity or even mortality. Falls may also have psychological consequences, like fear of further falls or a loss of self-confidence, in turn leading to a reduction in social activities [10, 11]. Subsequently, falls may cause prolonged hospitalisation and increased treatment costs. Falls are a common problem in hospitals [12, 13], particularly in patients aged 65 and older [14]. Around 30% of all persons aged 65 or older suffer a fall each year [15, 16]. Heinze et al. found that between 3.2% and 37% of patients fell during a hospital stay, depending on the department [17]. An Austrian prevalence study revealed in 2011 that 2.1% of all patients suffered a fall during their hospitalisation. Furthermore, in nearly 40% of the hospitalised patients, no fall-prevention measures were taken, and only a minimum (less than 10%) of measures to prevent fall-related injuries were reported for patients who had experienced a fall [14].

As long as research-based recommendations are not adopted and acted upon, potential positive effects on patient health outcomes, such as a reduction in fall incidents, cannot be realised [18]. To facilitate the delivery of evidence- and research-based nursing care, scientific knowledge is frequently translated into inter-/national clinical practice guidelines (CPGs), such as the evidence-based guideline “Fall prevention for older and elderly persons in hospitals and chronic care facilities” [19] (subsequently named the Falls CPG). This guideline has compiled research-based recommendations on

fall-preventive measures and their effectiveness and was made available to hospital nursing staff in 2009 via the hospital's intranet. A paper version was delivered to each ward and all nurses were obliged to read the Falls CPG and to confirm this by signature. Despite this, the guideline was not applied in daily nursing practice.

We already know from the literature that the publication of CPGs does not guarantee their implementation or application [20]. Summarising good quality research evidence on fall prevention is, according to Wadell, a necessary first step in an institution, but is not sufficient in and of itself to effect change [21]. It should also be considered that the implementation of nursing guidelines in a hospital setting can be arduous [22] and presents a considerable challenge [23]. Numerous hindering factors with regard to the intervention itself, the context, characteristics of the individuals involved and the particular process level [24] may interfere with successful implementation.

As guideline implementation into a healthcare setting comprises various interconnecting steps and elements, it is generally considered to be a complex intervention [25, 26]. Additionally, healthcare organisations are complex adaptive systems that encompass individuals who learn, interrelate, and self-organise to complete tasks. These individuals interact with their environment and consequently both, the respective system and the context, are reshaped through this interaction. Thus, by implementing an innovation like a Falls CPG, a healthcare organisation - or system - is reshaped and evolves over time. As these interactions are non-linear, their outputs are not entirely predictable [22, 27]. Hence, a standardised approach is unsuitable and local circumstances must be taken into account when planning guideline implementation.

Even after having scrutinised scientific studies and systematic reviews, it remained unclear which strategies alone or in combination are the most effective in implementing guidelines into daily nursing practice and the circumstances under which it should be done [28, 29]. Furthermore, most systematic reviews on the effectiveness of implementation strategies focus on medical doctors in primary care settings and healthcare personnel in general, often failing to specify the percentage of participating nursing staff. However, it must be noted that groups of health professional differ widely with regard to training, education, organisational structure and scope of practice and knowledge [30] and that the type of profession undoubtedly affects the intention to use

CPGs in patient care [31], which is why implementation strategies that succeed in one profession may well fail in another. For this reason, the authors recommend using different strategies that target different professional groups [30, 31].

Moreover, the use of multifaceted strategies [32, 33] targeting existing barriers and other influencing factors - such as context, the innovation itself and characteristics of the professionals involved - are recommended in order to successfully meet the challenge of implementing guidelines into daily routine [24, 34 - 37]. Tailored interventions that meet the contextual needs [38] can improve professional practice [39]. It can be concluded that multifaceted strategies tailored to the respective needs of a setting appear to be appropriate when implementing a CPG.

The consideration of cost and resource use is also important when implementing a guideline. Simpson and Doig recommend assessing the available resources when designing a change intervention [40], and Ploeg et al. emphasise recognising the 'real' costs associated with successful implementation of CPGs at the onset [41]. Nevertheless, the cost-effectiveness of guideline implementation strategies is rarely reported [32]. While keeping a budget-constrained health system in mind, it is crucial to consider the costs (and resources required) as well as the effects of an implementation [42].

Scientific framework

The scientific framework of this study includes:

1. A participatory action research (PAR) approach [43 - 48]
2. The *Consolidated Framework for Implementation Research (CFIR)* [24, 49]
   The *CFIR* formed the theoretical framework and underpinned the PAR approach, but each element influenced the other. The *CFIR* was used to identify influencing factors in an implementation project; the PAR approach, in turn, facilitated the identification of each procedural step in the implementation process, while taking into consideration the influencing factors.
3. The framework for implementation interventions/strategies provided by the Cochrane *Effective Practice and Organisation of Care (EPOC)* Review Group [50, 51]

> Mazza et al. defined an *implementation strategy* as "a purposeful procedure to achieve clinical practice compliance with a guideline recommendation" ([52], p. 1 of 10).

More information about the scientific framework is provided in Additional file 1.

Aim

As it was unclear which implementation strategies are effective in nursing and what resources are required to implement a CPG, this study aimed to assess the effectiveness of multifaceted and tailored strategies in implementing an evidence-based fall-prevention guideline into nursing practice in an acute care hospital setting. Effective implementation was defined as an increase in the nursing personnel's knowledge about fall-prevention measures; a positive change in their attitude towards evidence-based guidelines; and the fulfilment of successful implementation criteria as defined by the participants. The time invested by the nursing personnel in implementing the Falls CPG was of additional interest.

METHODS

Design

A before and after, mixed-methods study was used within a PAR approach guided by the empirical-analytic approach according to Kemmis [48]. The *CFIR* [24] served as a theoretical framework for the study.

Participants and setting

All graduate and assistant nurses (subsequently referred to as nursing personnel) of an Ophthalmic (OD) and Accident Surgery (ASD) Department of an Austrian university teaching hospital were included. Both departments were selected by the nurse director in agreement with all head nurses. Both clinics were deemed suitable for implementing the Falls CPG based on their patient clientele.

Procedure

Informing nursing personnel

Nursing personnel were invited to attend a presentation on the aims and scope of the project and the study. These information sessions and the subsequent sessions on data collection were offered on different days of the week to accommodate participant work schedules. All participants received an information flyer including an informed consent form.

Data collection

Data were collected at three scheduled time points (t1 = baseline, t2 = midterm, t3 = end of the project) through a questionnaire, guided group discussions and semi-structured interviews. Additionally, individual interviews were conducted at each data collection point. Details about the course of the project are outlined in Figure 1. Data collected at t1 and t3 were used to compare the main outcomes. As each data collection point focussed on different content, interview data from t2 are also included to illustrate the main outcomes.

Nursing personnel involvement

Nursing personnel involvement throughout the implementation process was guaranteed through (1) collaboration of both department representatives in steering groups held between January and July 2011; and (2) the opportunity to present ideas and/or critiques, either in person during a steering group meeting or indirectly through a representative. Furthermore, all parties were kept formally and informally up-to-date through steering group minutes sent to each unit and to the head nurse; through several meetings held with different combinations of involved persons; and via discussions between steering group members and their team. Further information detailing the steering group and its functions is provided in Additional file 2.

Implementation strategies applied

Six implementation strategies were tailored to the needs of each department, then applied and classified according to *EPOC* [50]: educational meetings, distribution of written materials, local opinion leaders, audit and feedback, adaptation of nursing record systems and changes in physical structure, facilities and equipment. A short description of each implementation strategy applied can be found in Additional file 2.

Figure 1 Course of the project

Data collection tools

A structured questionnaire and semi-structured interview guidelines were used to obtain information about nurses' knowledge of fall prevention and the Falls CPG; their attitudes towards evidence-based guidelines; and influencing factors based on the *CFIR*. The amount of total staff time invested in the implementation of the Falls CPG was consistently recorded in hours. The first investigator was responsible for recording the length of all research-related sessions, steering group meetings and interviews. The head nurse and steering group members were responsible for recording the amount of preparation and length of meetings held with ward nurses and for the educational sessions. The tools applied are described below.

Questionnaire

The same questionnaire relating to various aspects of the implementation project was employed for each collection of data. It captured demographic data, knowledge and attitudes. The influencing factors - i.e. competing values, self-efficacy, organisational learning, several characteristics of participating nursing personnel and, for the final assessment, the process evaluation - will be described in detail elsewhere. The final questionnaire was piloted on 22 graduate and assistant nurses working in two different departments at the same hospital. No major revisions were necessary. It took staff approximately 40 minutes to complete the questionnaire.

Demographics The following demographic data were collected: age in years, gender, profession, year of diploma (<2001/≥2001), years of experience in current position, and full- or part-time employment status.

Knowledge 13 items were developed for this study that measured nursing personnel knowledge about the guideline in terms of risk of falls, fall prevention and recommended measures. The 7 single- and 6 multiple-choice items together contained 81 answer options. The questions were derived from the evidence-based guideline to be implemented and were drafted by HEB. They were refined within two Delphi rounds of four experts in the field, and pre-piloted with six students in a doctoral nursing programme. Internal consistency, measured with Cronbach's alpha, was α (t1) = 0.69. It was also of interest to discover whether nursing personnel knew where to find the Falls CPG in the hospital intranet and by whom it had been developed.

Attitudes The *Attitudes Towards Guidelines Scale (AGS)* consists of seven subscales: g*eneral attitude, usefulness, reliability, lack of individual or team competence, lack of organisational competence, impracticality* and *availability* [53]. Each subscale consists of two Likert-scaled items from 1 = strongly disagree to 4 = strongly agree. The English version of the scale was translated into German by HEB, with the following two adaptations having been made: in one item, *medical practice* was replaced with *practice* and the specificity of *care providers* was increased by substituting it for *nursing personnel*. Since the original version was in Finnish, a Finnish nursing scientist with a good understanding of German translated the German version into Finnish. Both Finnish versions were compared by one of the developers who also gave permission to use the scale with its adaptions. The internal consistency (Cronbach's alpha) of the seven subscales in the original study varied from 0.50 to 0.91 (sample 1) and from 0.42 to 0.79 (sample 2), respectively [53]. In the study by Alanen et al., Cronbach's alpha varied from 0.68 to 0.74 [54]. In the current study (t1), it varied from 0.12 to 0.72. The total scale alpha, however, was 0.73.

Semi-structured interview guide

Interview guides for the semi-structured interviews and discussions were designed for each data collection point (t1 - t3). They were based on the *CFIR* framework and featured open-ended questions pertaining to each respective implementation stage. At the baseline, the aim was to assess influencing factors for the intervention; i.e.: intervention characteristics (e.g. familiarity with the Falls CPG content), inner and outer settings (e.g. local workflow) as well as characteristics of the individuals (e.g. participants' self-efficacy). The *process* domain, with questions focussing, for example, on impact of the Falls CPG on nursing personnel's daily work, satisfaction with the goals achieved or with the implementation strategies, was introduced at t2 and was the main focus at t3.

Data analysis

Descriptive analyses (mean, standard deviation, percentages, frequency count) were performed with IBM SPSS Statistics 18. The mean values and standard deviations for the AGS composite score, its subscales and single items were calculated after all negatively keyed items had been reversed, meaning that higher scores express a more positive attitude. For comparison

purposes, chi-square was used for categorical and dichotomous variables and t-tests for continuous variables. Analysis of dependent-group tests was not possible because the same participants did not always take part in each of the three data collection points. Furthermore, despite having been prompted, participants rarely marked their questionnaire with a traceable personal identifier. Significance level was set at 0.05. Qualitative data were content-analysed and managed in MAXQDA 10, a computer-assisted qualitative data analysis software. The *CFIR*, supplemented with four constructs (established fall prevention measures and implementation strategies; participant aims and wishes), provided a template for the analysis. The time invested was added to the length of information sessions, steering/group meetings and educational sessions and was multiplied by the respective number of participants.

Ethical approval

Ethical approval was obtained from the university's Research Ethics Committee (EK-No. 21-334 ex 09/10) prior to initiating the study. All participants gave their written informed consent.

RESULTS

Response rates

The response rates were 82.8% (n = 106) at t1 and 94.8% (n = 110) at t3. Questionnaires were excluded if the participant did not belong to a nursing profession (t1 & t3 each 1x), or if they were returned either empty (t1: 20 x; t3: 3x) or only partly filled in (t1: 1x; t3: 2x); individual missing answers were accepted.

Demographics

Approximately two thirds of the participating nursing personnel worked in the OD (t1: 65.1%, n = 106; t3: 68.2%, n = 110). Participants were on average 38 years old (t1: 38.97, SD = 10.57, n = 102; t3: 38.27, SD = 10.42, n = 99), with the great majority being female (t1: 93.3%, n = 105; t3: 94.2%, n = 104). Nearly two thirds of the participants were employed as graduate nurses (t1: 66.3%, n = 104; t3: 74.3%, n = 105). More than 50% of the graduate nurses finished their educational training prior to 2001 (t1: 66.7%, n = 69; t3: 54.5%, n = 77), which was before the introduction of nursing science into the Austrian

nursing curriculum. A large proportion of all participants had more than 10 years of experience in their current position (t1: 55.4%, n = 101; t3: 44.2%, n = 104) and approximately one third were employed part time (t1: 32.7%, n = 104; t3: 40.8%, n = 103).

Main outcomes at the level of nursing personnel

Knowledge

Compared to t1, significantly more participants knew how to access the Falls CPG by the final data collection (t3). The proportion increased from 52.4% (n = 105) to 81.8% (n = 110, $p < .001$). Additionally, more participants knew by whom the Falls CPG had been developed: 61.5% (n = 104) compared to 37.4% (n = 99, $p < .001$). Nursing personnel knowledge about fall prevention and the Falls CPG improved significantly from 65.6% (SD = 8.221, n = 106) to 69.7% (SD = 9.150, n = 110, $p = .001$). This significant difference is particularly attributable to a knowledge gain in the group of assistant nurses. They showed an improvement from 61.3% (SD = 6.835, n = 35) to 68.0% (SD = 8.223, n = 28, $p = .001$) whereas in the group of graduate nurses the improvement lacked statistical significance: from 68.0% (SD = 7.821, n = 69) to 70.5% (SD = 9.189, n = 77, $p = .072$). Although at baseline both groups differed substantially in this regard ($p \leq .001$), the resulting difference was equalised at t3: $p = .201$. Figure 2 shows the distribution of correct answers (in %) in assistant and graduate nurses at t1 and t3, respectively.

Qualitative data (t2, t3) revealed participants' knowledge gain. The greatest and most beneficial change, as a result of this project, was perceived by participants as being their increased awareness of fall prevention. This was the most important issue of all discussions, meetings and interviews at t2 and t3. One participant stated that although there was nothing really new regarding the measures taken to prevent falls, the project had not been in vain:

Preventive actions are now taken with increased awareness. Instructions and explanations for patients are given more conscientiously in order to achieve compliance. Nursing students are instructed more consciously about fall prevention (t2_6_360).

The understanding of the significance of falls and fall prevention increased, and the understanding of the significance of restraints and their legal implications became clear (t2 & t3). This changed awareness also affected partici-

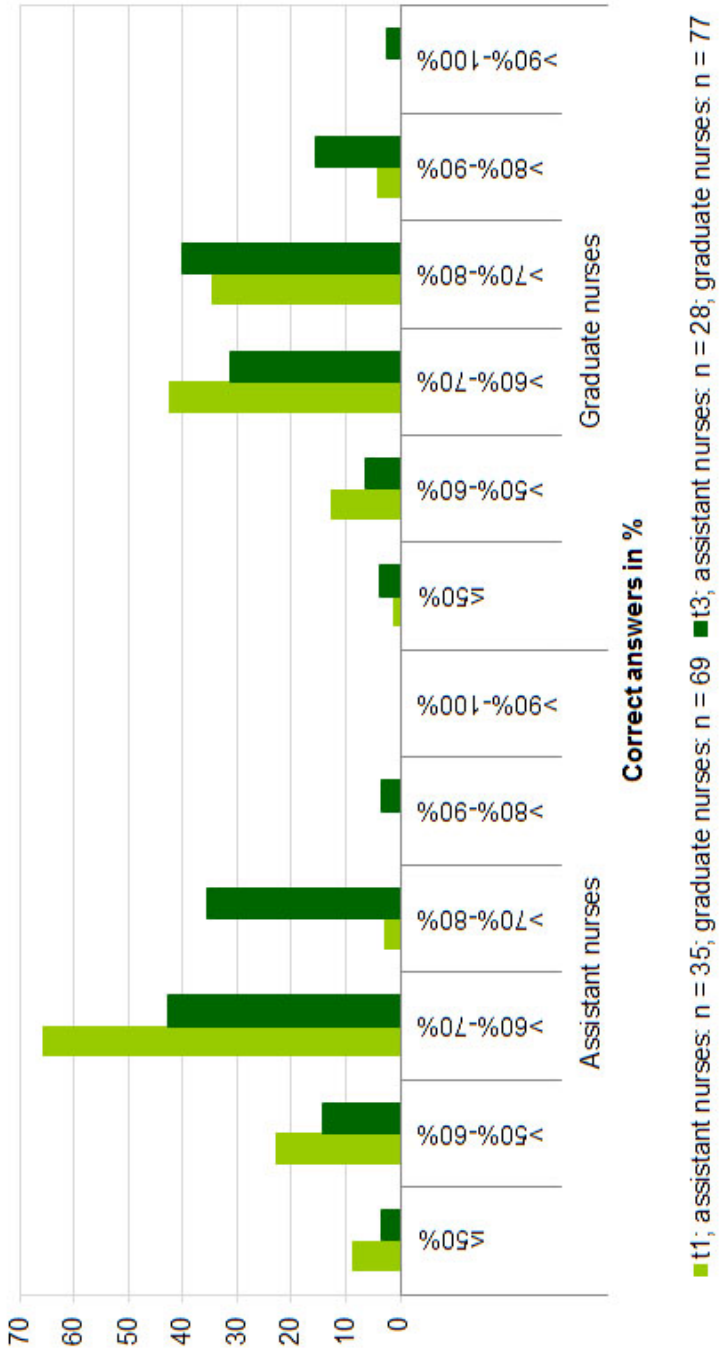


Figure 2 Distribution of correct answers (in %) in assistant and graduate nurses at t1 and t3

pant behaviour in that they reported, for example, having gained new insight into routine interventions which had up to that point been performed automatically. Present conditions began to be scrutinised and were no longer blindly accepted (t2). In the event of a patient's fall, graduate nurses learned how to fill in a detailed report form (t3). They also realised (t2 & t3) that fall assessment and documentation, as well as patient information regarding fall prevention, were to be performed in a standardised manner, with a clear focus on consistency and coherence. Furthermore they realised that the Falls CPG included useful recommendations for each field of work and that these recommendations were helpful in decision making.

Attitudes

The nursing personnel generally displayed a positive attitude towards guidelines from t1: mean = 3.014 (SD = .0353, n = 81), which actually improved significantly towards the end of the implementation project at t3: mean = 3.188 (SD = .0344, n = 101, p = .001). The values for the seven subscales and all individual items of the AGS are presented in Table 1. The most positive attitudes were related to the *general attitude toward guidelines* and the *usefulness of guidelines* throughout the project. At t1 and t3, guidelines were seen as improving the quality of healthcare, useful as an educational tool and a convenient source of advice. Furthermore, the nursing personnel denied not having seen any guidelines in their healthcare unit. A significant improvement in attitude between t1 and t3 occurred regarding *impracticality* and *availability of the guidelines* ($p \leq .001$). The attitudes regarding two single items remained negative throughout the implementation project: the nursing personnel believed that most of their team members harboured disapproving attitudes about guidelines and that they would oversimplify nursing practice (Table 1). However, with respect to one item, the nursing personnel's attitude changed from a negative to a positive one: by t3, they had stopped believing that guidelines challenged their autonomy.

A further consequence of this project was extracted from the qualitative data: a strengthening of participants' self-confidence. They felt a new ability to reasonably debate with third parties regarding fall prevention (t2). The debate about the Falls CPG changed their satisfaction with established practice and they reported realising what might be enhanced and improved (t2):

Table 1 Nursing personnel's attitudes toward guidelines (range 1-4, with higher scores signifying more positive attitudes)

	t1 n = 99-106*		**t3** n = 107-110*	
Attitudes towards guidelines	**Mean**	**SD§§**	**Mean**	**SD§§**
General attitude toward guidelines	*3.43*	*0.537*	*3.40*	*0.527*
1. Guidelines are useful as educational tools.	3.43	0.589	3.41	0.610
2. Guidelines are a convenient source of advice.	3.44	0.619	3.40	0.578
Usefulness of guidelines	*3.30*	*0.502*	*3.31*	*0.546*
3. Guidelines can facilitate communication with patients and families.	3.12	0.658	3.20	0.677
4. Guidelines can improve the quality of healthcare.	3.46	0.574	3.40	0.610
Reliability of guidelines	*3.10*	*0.696*	*3.23*	*0.728*
5. Guidelines are based on scientific evidence.	3.11	0.832	3.33	0.762
6. Guidelines are made by experts.	3.07	0.915	3.12	0.900
Lack of individual or team competence	*2.88*	*0.596*	*2.99*	*0.612*
7. My occupational competence is sufficient for adopting the latest guidelines.	3.30	0.698	3.35	0.599
8. Most of our team members have disapproving attitudes about guidelines.§	2.43	1.039	2.63	0.956
Lack of organisational competence	*3.01*	*0.601*	*3.15*	*0.614*
9. Guidelines are valued in our organisation.	3.06	0.651	3.18	0.722
10. Implementing guidelines is too expensive for us.§	2.96	0.803	3.12	0.832

*Impracticality of guidelines***	*2.32*	*0.702*	*2.70*	*0.677*
11. Guidelines challenge the autonomy of nursing personnel.§	2.75	0.805	3.13	0.721
12. Guidelines oversimplify nursing practice.§	1.89	0.795	2.26	0.886
*Availability of guidelines****	*3.15*	*0.643*	*3.42*	*0.540*
13. Guidelines are difficult to find if needed.§	2.69	0.841	3.00	0.828
14. I have not seen any guidelines in our healthcare unit.§	3.62	0.791	3.83	0.448

*Variation in number of respondents because of some missing answers; **p < .001; ***p = .001.
§Reversed item; §§Standard deviation.

I believe that everybody had heard something about the guideline at some point, and it was actually compulsory to read it. Well, at least the registered nurses [were obliged to read it], *as far as I know. And somehow we believed that we were already able to do all this* [and] *we were already* [taking measures against fall prevention] *anyway. But then, only when we went into detail, it became apparent what we could improve upon and what we could pay more attention to. It was only at this point that it actually became important* (t2_9_76).

Main outcomes at organisational and process levels

Availability of necessary means/equipment for fall prevention

The second most important benefit from the participants' point of view was the availability of more fall-prevention devices, acquired to assist nursing personnel in daily practice, and some modifications of surroundings. A baby monitor is now in use to facilitate the monitoring of high-risk patients such as those suffering from dementia, especially during the night shift. Several devices for the safe and easy transfer of patients were obtained; for example a transfer board, one-way glide sheets and a transfer turntable. Additional walking aids were also acquired, such as wheelchairs and Zimmer frames, toilet seat raisers, commode chairs, gel cushions to prevent patients from slipping out of a wheelchair, and crutch holders for the beds. A manoeuvrable examination chair was purchased for the OD's walk-in clinical department to avoid difficult transfer of wheelchair dependent patients. A handrail was installed in the ASD corridor. A nurse call was also installed on the balcony so that patients could ring for help to safely cross a doorframe ramp, which had been identified as risk factor. Moreover, written patient information materials for a planned hospital admission were updated.

Supplementary information folders

During the working-group meetings, supplementary information folders were compiled, which are now readily available to nursing personnel in each field. The folders contain the Falls CPG accompanied by concise information on fall-related risk assessment, a list of context-relevant risk factors and a list outlining groups of drugs with their potential to increase the risk of a fall, e.g. by causing dizziness. The folder also includes practical guidance and prompts on instructing patients as well as examples/illustrations of writing fall reports.

Participant feedback - process level

At the end of the implementation project, participants reported having valued the course taken; they found the change straightforward and comprehensible and the implementation easily applicable. It was emphasised that further implementation projects should be carried out in the same manner.

Supplementary outcomes at patient level

In this study, patient falls during hospitalisation would have been an appropriate outcome measure on a patient level. Unfortunately, fall incidences were not being consistently recorded and no valid baseline data were available. This fact hindered a before-and-after comparison. With the implementation of the fall-prevention guideline, however, the procedure for recording patient falls in the case of an incidence has been established. This will now be available for further evaluation not only within the two departments but also for the hospital.

Resource use

In total, 1192 hours of working time were invested in the project by the hospital's nursing personnel (details are presented in Table 2). Taking into account the basic wage of a graduate nurse with 10 years of work experience, this would amount to a project expense of about 14,600 € / 11,600 £.

Table 2 Resource use in terms of invested time of involved hospital nursing personnel

Type of resource use	Hours invested
Participation in nursing personnel's information (1h/session)	110 h
Participation in group meetings – data collection (1 ½ - 2 h/ session)	598 h
Participation in interviews (app. 0.75 h/session)	41 h
Steering group meetings (1 ½ - 2 h/session)	147 h
Preparation for steering group meetings, meetings with ward nurses and head nurse (0.5 – 4 h/session)	109 h
Educational sessions (app. 1.5 h/session)	187 h
Σ	**1192 h**

DISCUSSION

This study aimed to assess the effectiveness of multifaceted and tailored strategies in implementing an evidence-based Falls GPG into an acute care hospital nursing practice as well as to assess the time resources used. Using a participatory action research approach, six implementation strategies were determined by participants and tailored to the necessities of each department and its units. The strategies were tailored based on the assessment of possible hindering and facilitating factors guided by the *CFIR* and its supplementation. Study findings at the nursing personnel and organisational/process levels supported the successful implementation of the Falls CPG in the two participating departments, whereby the time invested turned out to be relatively low.

Nursing personnel level

The multifaceted and tailored strategies improved nursing personnel's knowledge of how to access the Falls CPG and how to prevent falls. With regard to the latter point, however, although the gain in knowledge was statistically significant, the effect of 4.1% can be regarded as low. Three factors may have contributed to this:

1. At the onset of the project nursing personnel's knowledge was already satisfactory, and taking fall-prevention measures was routine practice. Dickinson et al. pointed out the importance of recognising "that it is often within the basics of care such as [the prevention of falls] that the rituals of nursing survive and changing practice in these areas requires the letting go of experiential knowledge built and handed on over many years" ([55], p. 40). Furthermore, it may be harder to substantially increase knowledge from a higher level starting point than from a lower one. This was supported by a closer examination of results. Applying the Dreyfus model from novice to expert adapted by Lester [56], the results revealed a remarkable shift between advanced beginner and fully competent assistant nurses; i.e. between having a working knowledge of key aspects of fall prevention to good working and background knowledge of fall prevention. The shift in graduate nurses, which mainly started with advanced beginners and competency and remained steady or moved to competency and proficiency, was less obvious. Nearly one third of participating graduate nurses remained advanced beginners

and only a few achieved competency and proficiency. The latter indicates a depth of understanding of the discipline and area of practice [56], in this case related to fall prevention.

2. The fluctuation of nursing staff in the OD was exceptionally high due to the retirement of ward managers and staff nurses who were then replaced by younger and therefore less experienced personnel. This may explain the relatively high percentage of graduate nurses who remained advanced beginners.
3. Additionally, the following three hindering factors may have contributed to an overall low knowledge gain:
   The first factor may have been the reluctance of OD operation theatre participants based on reasons found within four domains of the *CFIR: Intervention characteristics* (no special focus on working with patients in an operation theatre), *inner setting* (no perceived tension for change), *characteristics of individuals* (no recent experience with falls) and *process* (the representative could not always participate in the steering committee meetings). Unless there is, according to Dickinson et al., "sufficient discomfort or risk associated with current nursing practice, it is unlikely that nurses will immediately see the need for change and respond to the introduction of [a CPG]" ([55], p. 40). The decision to include this unit into the implementation project was made by the hospital's nursing management immediately before the start of the project. During the process, the head nurse acknowledged the fact that the Falls CPG was not equally relevant for all working areas within the OD. Secondly, the mode and content of the educational programme carried out in the OD was influenced by the head nurse and ward managers: It was carried out as a lecture for all nursing staff in one session and not, as previously intended, separately for each working unit. A further topic was included which, according to nursing personnel feedback, did not strongly grasp their attention, namely the hospital's underlying nursing theory related to fall prevention.
   Thirdly, ASD's *relative priority* (*implementation climate*) was also regarded as having been a limiting factor: Two other projects were being conducted at nearly the same time, or close to the start of this project, which limited attention and resources.

Apart from these potentially hindering factors, participants nevertheless appreciated the contribution of the Falls CPG implementation to their increased

awareness of fall prevention and interventions formerly performed automatically and without reflection. It can be said that the project helped bring to light a certain part of the invisible mass of an iceberg, i.e. nursing personnel's tacit knowledge that can be regarded as the 'treasure in our heads' [57]. This might also be of particular importance for nursing in German-speaking countries: verbalising/emphasising taken-for-granted areas of nurses' work entails giving it a voice and making it visible, as only this enables the valuing of the practice of nursing both monetarily and with respect to the time invested . When the implementation of the Falls CPG began, participants pointed out that they already did so many things to prevent falls. However, the Austrian version of the *International Prevalence Measurement of Care Problems*, conducted in Austrian hospitals and nursing homes in 2011, revealed that almost no fall prevention measures were reported as being taken [14]. This still supports Abt-Zegelin's statement that, for example, informing patients about risk factors in the hospital area is done 'en passant' leading to a lack of clarity about how to represent common nursing interventions in nursing documentation [58] and consequently in a survey where participants are asked to write down used measures.

Attitudes and beliefs are considered an important factor influencing implementation processes [54, 55]. Similar to the study of Alanen et al. [54], nursing personnel participating in the present study showed positive attitudes towards guidelines and further improved them. These findings support Alanen et al.'s assumption that implementation interventions improve attitudes toward guidelines [54]. The nursing personnel's retrospective feedback that the Falls CPG was now easily understandable also strengthens Alanen et al.'s assumption of positive attitudes improving familiarity with guidelines [54]. Although the nursing personnel remembered that they had once had to read the Falls CPG, and acknowledged having seen the guideline in their working unit, they seemed unable to remember where to find it on the hospital's intranet. The multifaceted and tailored strategies helped the nursing personnel to improve their attitude regarding its availability. This is in line with the nursing personnel's gain in knowledge as described above. Alanen et al. also noticed that nurses in implementer health centres saw guidelines as more available than nurses in disseminator centres [54].

Although the *impracticality of guidelines* remained negative at t3, there was a significant improvement towards the positive, especially with regard to one

item: In light of this project, nursing personnel revised their opinion that guidelines challenged their autonomy. This change may be attributable to their involvement in the project and the educational programme, where they had been informed that recommendations from a CPG did not have to be followed blindly, but rather on the basis of their profound clinical judgement of a patient's situation. The participants' negative assumption that most of their team members harboured disapproving attitudes about guidelines may be explained by a discrepancy between what was articulated among the nursing personnel, for assumed reasons of social acceptance, and what each participant actually believed, as the overall attitude among participants was mainly positive. The majority of nursing personnel still believe that guidelines oversimplify nursing practice, although a certain degree of improvement was visible. This may be explained by the fact that patients and patient contacts are seen as highly individual. Guidelines are therefore regarded as never being able to fully illustrate the complexity of each individual patient situation. In practice, however, nurses have to make individual patient decisions, taking into consideration his/her needs, resources, and of course, external evidence.

Implementing the Falls CPG strengthened nursing personnel's self-confidence. According to White, achieving self-confidence allows a more autonomous practice to be built which ultimately benefits the recipients of nursing care; and having self-confidence allows nurses to realise professional collaboration [59]. Participating nursing personnel confirmed that they now felt able to reasonably discuss fall prevention with third parties. The promotion of knowledge is one of the identified antecedents to the acquisition of self-confidence [59].

Organisational or process level

Guideline recommendations can only be adhered to if the necessary means and resources are available. Within this implementation project, several diverse resources and equipment were purchased and installed. Additionally, a supplementary information folder was compiled for each working unit with the respective relevant information. Thus, successful implementation criteria from nursing personnel's point of view were satisfyingly met even though no extra budget was provided for the implementation of the Falls CPG. In this respect it can therefore be argued that the approach to implementing the Falls CPG was effective.

All in all, this study strengthens results from existing literature [39, 60, 61], finding that multifaceted and tailored implementation strategies are an effective means to implement a CPG, not only into healthcare practice but also into acute care nursing. It is assumed that multifaceted strategies based on a diagnostic analysis are more effective than single strategies because, according to Hulscher et al., multiple barriers can be removed [61]. As requested by the authors, the choice of selected strategies in the implementation project depended on the results of a comprehensive diagnostic analysis. This should be carried out at the beginning of and throughout the implementation project through determining barriers and facilitators. PAR proved to be a helpful approach in carrying out this project and bringing it to a successful conclusion. Participants were satisfied with the approach and the obtained results.

Resource use

The second aim of this study was to determine the resources required to implement the Falls CPG because hardly any study informs readers about what expenditures of time and money have to be calculated for implementing a CPG. The results demonstrate the real expenditure of time necessary to implement the Falls CPG, allowing one to calculate staff-related costs, among others, as requested by Ploeg et al. [41].

Limitations

The following limitations have to be acknowledged: It was not possible to analyse the before and after changes with a paired t-test as intended. Participants were asked, as recommended by the consulted statistician, to mark their questionnaire with a traceable personal identifier. An example was given to allow its tracing during data collection while still maintaining anonymity: the initials of their mother's birth name and the two last ciphers of her year of birth. However, about one third of participants recorded 99 as an identifier and a substantial number recorded a combination of letters and ciphers which they could not recall at the following data collection point. Only a minority (<20%) recalled their personal identifier correctly. It was therefore decided that unpaired t-tests should be used to compare before-and-after results. One of the greatest challenges in this PAR project was its duration. Due to unforeseen circumstances it took nearly 18 months to complete the study. Firstly, the beginning was delayed because another project within the OD had not been finished as planned. This caused a further delay of the mid-term assess-

ment which could not be carried out immediately after finishing the working group meetings with less staff being available due to summer holidays. Thus, the mid-term assessment was only scheduled about three months before t3, which might have influenced the results. At the same time, this circumstance helped to keep the topic of fall prevention alive in nursing personnel's daily work. Shortly before the start of the implementation project, nursing management decided to also include the OD's operation theatre and its outpatient clinic. As the questionnaire did not specify the individual participant's working area, it was not possible to analyse the potential effect of this aspect, especially with respect to OD's operation theatre. Each completion of the questionnaire took about 40 minutes, which might have had a negative influence. The required time, however, was completed during work hours and approved as such. A clear strength of this study lies in the high response rate and the participatory approach.

CONCLUSIONS

Overall, this investigation showed that multifaceted strategies tailored to a specific setting using a PAR approach and guided by the *CFIR* were an effective means to implementing a CPG into nursing practice in an acute hospital setting. Recommendations for further implementation projects are available and nursing managers now have sound knowledge about the time resources required to implement a CPG into acute care nursing practice.

ADDITIONAL FILES

Additional file 1: Scientific framework. Description of the scientific framework used.

Additional file 2: Nursing personnel involvement and applied implementation strategies. Description of nursing personnel involvement during the implementation process and of the implementation strategies used.

ABBREVIATIONS

AGS: Attitudes towards guidelines scale; ASD: Accident Surgery Department; CFIR: Consolidated Framework for Implementation Research; CPG: Clinical

practice guideline; EPOC: Cochrane Effective Practice and Organisation of Care; i.e: that is to say; OD: Ophthalmic Department; PAR: Participatory action research; t1: Baseline data collection; t2: Mid-term data collection; t3: Final data collection.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS CONTRIBUTIONS

HEB was responsible for the study conception and design, development of the questionnaire, implementation strategies, data collection, data analysis and manuscript drafting. RJGH and CL were responsible for the study conception and design and critical revisions of the manuscript for important intellectual content. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

We wish to cordially thank all participating graduate and assistant nurses and the management of the two departments from the University Hospital Graz for their collaboration in preparing and during the implementation process as well as for spending their precious time to share their unique experiences with us.

Our sincere thanks are also given to Birgit Heckemann for her valuable feedback regarding the content of the interview and group discussion guides and for peer reviewing the qualitative data analysis (t2, t3).

FUNDING

The Austrian Federal Province of Styria: Land Steiermark, Abteilung 3 – Wissenschaft und Forschung (Project no.: A3-16.M-94/2010-15) financially supported this study.

REFERENCES

1. Mazurek Melnyk B, Fineout-Overholt E. Making the case for evidence-based practice and cultivating a spirit of inquiry. In: Mazurek Melnyk B, Fineout-Overholt E, editors. *Evidence-based practice in nursing & healthcare. A guide to best practice.* 2nd ed. Philadelphia: Wolters Kluwer | Lippincott Williams & Wilkins; 2011. p.3–24.
2. Bradley D, Dixon JF. Staff nurses creating safe passage with evidence-based practice. *Nurs Clin N Am.* 2009;44:71–81.
3. Breimaier HE, Halfens RJG, Wilborn D, Meesterberends E, Haase Nielsen G, Lohrmann C. Implementation interventions used in nursing homes and hospitals: a descriptive, comparative study between Austria, Germany and The Netherlands. *ISRN Nurs.* 2013. http://dx.doi.org/10.1155/2013/706054.
4. Hart P, Eaton LA, Buckner M, Morrow BN, Barrett DT, Fraser DD, Hooks D, Sharrer RL. Effectiveness of a computer-based educational program on nurses' knowledge, attitude, and skill level related to evidence-based practice. *Worldviews Evid Based Nurs.* 2008;5:75–84.
5. Kirshbaum M. Translation to practice: a randomised, controlled study of an evidence-based booklet for breast-care nurses in the United Kingdom. *Worldviews Evid Based Nurs.* 2008;5:60–74.
6. Matthew-Maich N, Ploeg J, Jack S, Dobbins M. Transformative learning and research utilization in nursing practice: a missing link? *Worldviews Evid Based Nurs.* 2010;7:25–35.
7. Christopher B-A, Flood S, Carlson E, Delaney K, Krch-Cole E. Standards of care. Are they being used? *J Nurs Care Qual.* 2011;26:273–8.
8. Van Achterberg T, Sales AE. Implementation science for nursing: evidence needed! Call for papers for a special issue. *Int J Nurs Stud.* 2011;48:1163–4.
9. Wallin L. Knowledge translation and implementation research in nursing. *Int J Nurs Stud.* 2009;46:576–87.
10. Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM, Lamb SE. Interventions for preventing falls in older people living in the community (Review). *Cochrane Database Syst Rev.* 2012;9:Art. No.: CD007146. doi: 10.1002/14651858.CD007146.pub3.
11. Siracuse JJ, Odell DD, Gondek SP, Odom SR, Kasper EM, Hauser CJ, Moorman DW. Health care and socioeconomic impact of falls in the elderly. *Am J Surg*. 2012;203:335–8.
12. Quigley PA, Palacios P, Spehar AM. Veterans' fall risk profile: a prevalence study. *Clin Interv Aging.* 2006;1:169–73.
13. Heinze C, Dassen T, Halfens R, Lohrmann C. Screening the risk of falls: a general or a specific instrument? *J Clin Nurs.* 2008;18:350–6.
14. Lohrmann C, editor. *Europäische Pflegequalitätserhebung. 5. April 2011*. Graz: Medical University of Graz, Institute of Nursing Science; 2011.
15. Al-Aama T. Falls in the elderly. Spectrum and prevention. *Can Fam Physician.* 2011;57:771–6.
16. Balzer K, Bremer M, Schramm S, Lühmann D, Raspe H. *Sturzprophylaxe bei älteren Menschen in ihrer persönlichen Wohnumgebung*. Schriftenreihe Health Technology Assessment. Bd. 116, Köln: Deutsches Institut für Medizinische Dokumentation und Information (DIMDI); 2012.
17. Heinze C, Halfens RJG, Dassen T. Falls in German in-patients and residents over 65 years of age. *J Clin Nurs.* 2007;16:495–501.
18. Kryworuchko J, Stacey D, Bai N, Graham ID. Twelve years of clinical practice guideline development, dissemination and evaluation in Canada (1994 to 2005). *Implement Sci.* 2009;4:49. doi: 10.1186/1748-5908-4-49.

19. Bachner D, Haas W, Semlitsch B, Schaffer S, Uhl C, Weiß R. *Evidence-based Leitlinie "Sturzprophylaxe für ältere und alte Menschen in Krankenhäusern und Langzeitpflegeeinrichtungen".* Graz: Steiermärkische Krankenanstaltengesellschaft mbH; 2009.
20. Campbell S, Hancock H, Lloyd H. Implementing evidence-based practice. In: Gerrisch K, Lacey A, editors. *The research process in nursing.* 5th ed. Oxford. Blackwell Publishing Ltd; 2007. p. 506–20.
21. Waddell C. So much research evidence, so little dissemination and uptake: mixing the useful with the pleasing. *Evid Based Nurs.* 2002;5:38–40.
22. May C. Towards a general theory of implementation. *Implement Sci.* 2013;8:18. doi: 10.1186/1748-5908-8-18.
23. Seers K, Cox K, Crichton NJ, Edwards RT, Eldh AC, Estabrooks CA, Harvey G, Hawkes C, Kitson A, Linck P, McCarthy G, McCormack B, Mockford C, Rycroft-Malone J, Titchen A, Wallin L. FIRE (Facilitating Implementation of Research Evidence): a study protocol. *Implement Sci.* 2012;7:25. doi: 10.1186/1748-5908-7-25.
24. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50. doi: 10.1186/1748-5908-4-50.
25. Campbell M, Fitzpatrick R, Haines A, Kinmonth AL, Sandercock P, Spiegelhalter D, Tyrer P. Framework for design and evaluation of complex interventions to improve health. *BMJ.* 2000;321:694–6.
26. MRC, prepared on behalf of the medical Research Council (MRC) by Craig P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: new guidance. 2006. [www.mrc.ac.uk/complexinterventionsguidance].
27. Leykum LK, Pugh JA, Lanham HJ, Harmon J, McDaniel Jr RR. Implementation research design: integrating participatory action research into randomized controlled trials. *Implement Sci.* 2009;4:69. doi: 10.1186/1748-5908-4-69.
28. Grol R, Ouwens M. Planning of change implementation. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: John Wiley & Sons, Ltd; 2013. p. 291–303.
29. Grol R, Bosch M, Wensing M. Development and selection of strategies for improving patient care. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: John Wiley & Sons, Ltd; 2013. p. 167–84.
30. Scott SD, Albrecht L, O'Leary K, Ball GDC, Dryden DM, Hartling L, Hofmeyer A, Jones CA, Kovacs Burns K, Newton AS, Thompson D, Klassen TP. A protocol for a systematic review of knowledge translation strategies in the allied health professions. *Implement Sci.* 2011;6:58. doi: 10.1186/1748-5908-6-58.
31. Kortteisto T, Kaila M, Komulainen J, Mäntyranta T, Rissanen P. Healthcare professionals' intentions to use clinical guidelines: a survey using the theory of planned behaviour. *Implement Sci.* 2010;5:51. doi: 10.1186/1748-5908-5-51.
32. Prior M, Guerin M, Grimmer-Somers K. The effectiveness of clinical guideline implementation strategies – a synthesis of systematic review findings. *J Eval Clin Pract.* 2008;14:888–97.
33. Boaz A, Baeza J, Fraser A and for the European Implementation Score Collaborative Group (EIS). Effective implementation of research into practice: an overview of systematic reviews of the health literature. *BMC Res Notes.* 2011;4:212. doi: 10.1186/1756-0500-4-212.
34. Francke AL, Smit MC, de Veer AJE, Mistiaen P. Factors influencing the implementation of clinical guidelines for health care professionals: a systematic meta-review. *BMC Med Inform Decis Mak.* 2008;8:38. doi: 10.1186/1472-6947-8-38.

35. Harrison MB, Légaré F, Graham ID, Fervers B. Adapting clinical practice guidelines to local context and assessing barriers to their use. *CMAJ.* 2010;182:E78–84.
36. Dodek P, Cahill NE, Heyland DK. The relationship between organizational culture and implementation of clinical practice guidelines: a narrative review. *J Parenter Enteral Nutr.* 2010;34:669–74.
37. Yagasaki K, Komatsu H. Preconditios for successful guideline implementation: perceptions of oncology nurses. *BMC Nurs.* 2011;10:23. doi: 10.1186/1472-6955-10-23.
38. Kirsh SR, Lawrence RH, Aron DC. Tailoring an intervention to the context and system redesign related to the intervention: a case study of implementing shared medical appointments for diabetes. *Implement Sci.* 2008;3:34. doi: 10.1186/1748-5908-3-34.
39. Baker R, Camosso-Stefinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S, Robertson N. Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2010;3:Art. No.: CD005470. doi: 10.1002/14651858.CD005470.pub2.
40. Simpson F, Doig GS. The relative effectiveness of practice change interventions in overcoming common barriers to change: a survey of 14 hospitals with experience implementing evidence-based guidelines. *J Eval Clin Pract.* 2007;13:709–15.
41. Ploeg J, Davies B, Edwards N, Gifford W, Miller PE. Factors influencing best-practice guideline implementation: lessons learned from administrators, nursing staff, and project leaders. *Worldviews Evid Based Nurs.* 2007;4:210–9.
42. Hoomans T, Ament AJHA, Evers SMAA, Severens JL. Implementing guidelines into clinical practice: what is the value? *J Eval Clin Pract.* 2010;17:606–14.
43. Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlane F, Peacock R. How to spread good ideas: a systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO). 2004. [http://www.netscc.ac.uk/hsdr/files/project/SDO_FR_08-1201-038_V01.pdf].
44. Waterman H, Tillen D, Dickson R, de Koning K. Action research: a systematic review and guidance for assessment. *Health Technol Assess.* 2001;5:23.
45. Carr W, Kemmis S. *Becoming critical. Education, knowledge and action research.* Reprint, Victoria: Deakin University Press; 1990.
46. Smith A. *An action research inquiry exploring the transfer of pain knowledge from a continuing education course into practice.* PhD thesis. University of Stirling, Department of Nursing and Midwifery; 2008. [https://dspace.stir.ac.uk/bitstream/1893/474/1/A%20Smith%20-%20An%20action%20research%20inquiry%20ecploring%20the%20transfer%20etc.pdf].
47. Dick B. A beginner's guide to action research. 2000. [http://158.132.155.107/posh97/private/research/methods-action-research/guide.pdf].
48. Kemmis S. Exploring the relevance of critical theory for action research: emancipatory action research in the footsteps of Jürgen Habermas. In: Reason P, Bradbury H, editors. *Handbook of Action Research.* 4th ed. London: Sage Publications; 2006. p. 94–105.
49. Ilott I, Gerrish K, Booth A, Field B. Testing the Consolidated Framework for Implementation Research on health care innovations from South Yorkshire. *J Eval Clin Pract.* 2013;19:915–24.
50. Cochrane Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist. 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].

51. Thorsen T, Mäkelä M. A framework for guidelines implementation studies. In: Thorsen T, Mäkelä M, editors. *Changing professional practice. Theory and practice of clinical guidelines implementation.* Copenhagen: Danish Institute for Health Services Research and Development; 1999. p. 23–53.
52. Mazza D, Bairstow P, Buchan H, Paubrey Chakraborty P, Van Hecke O, Grech C, Kunnamo I. Refining a taxonomy for guideline implementation: results of an exercise in abstract classification. *Implement Sci.* 2013;8:32. doi: 10.1186/1748-5908-8-32.
53. Elovainio M, Eccles M, Mäkelä M. Attitudes towards guidelines and a scale for measuring them. In: Thorsen T, Mäkelä M, editors. *Changing professional practice. Theory and practice of clinical guidelines implementation*. Copenhagen: Danish Institute for Health Services Research and Development; 1999. p. 153–67.
54. Alanen S, Kaila M, Välimäki M, for the ECCE Study Group: Attitudes towards guidelines in Finnish primary care nursing: a questionnaire survey. *Worldviews Evid Based Nurs.* 2009;6:229–36.
55. Dickinson A, Peacock K, Fair N, Thomas M, Nicol R, Mikkelsen J, Haslemore J, Chapman L, Garrett N, Johnstone L. The implementation and evaluation of an oral healthcare best practice guideline in a paediatric hospital. *Int J Evid Based Healthc.* 2009;7:34–42.
56. Lester S. Novice to expert: the Dreyfus model of skill acquisition. 2005. [http://www.sld.demon.co.uk/dreyfus.pdf].
57. Bettoni MC, Schneider S. Experience management: lessons learned from knowledge engineering. German Workshop on Experience Management (GWEM). 2002. p. 117–28. [http://subs.emis.de/LNI/Proceedings/Proceedings10/12_ExpManag-LessLear.pdf].
58. Abt-Zegelin A. Sprache und Pflegedokumentation. In: Abt-Zegelin A, Schnell M, editors. *Sprache und Pflege*. Bern: Huber-Verlag; 2005. p. 111–30.
59. White KA. Self-confidence: a concept analysis. *Nurs Forum*. 2009;44:103–14.
60. Medves J, Godfrey C, Turner C, Paterson M, Harrison M, MacKenzie L, Durando P. Systematic review of practice guideline dissemination and implementation strategies for healthcare teams and team-based practice. *Int J Evid Based Healthc.* 2010;8:79–89.
61. Hulscher M, Wensing M, Grol R. Multifaceted strategies for improvement. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: John Wiley & Sons, Ltd; 2013. p. 278–87.

ADDITIONAL FILES

Additional file 1: Scientific framework

To achieve and ensure sustainable implementation, a 'whole-systems' approach like participatory action research approach (PAR) [1, 2] is recommended. Such a comprehensive approach takes into account all facets of a healthcare setting [2]. PAR involves a period of inquiry which describes, interprets and explains social situations/practice. A change intervention is then simultaneously adopted that aims to improve a practice situation and involve all persons concerned in the research process as collaborating partners of the researcher ([3], p. 11; [4], p. 183; [5]). Action research itself is a cyclical process of continuous assessment, planning, action and evaluation. This provides the opportunity for the procedures to be adapted to the existing needs of a given situation [6]. Such a flexible approach also masters the challenge of changing practice as it allows for assimilation of the unforeseeable through continuous observation and reflection [4]. According to Kemmis, its empirical-analytic approach is "oriented essentially towards functional improvements in terms of its success in changing particular outcomes of practices" and "an interest in getting things done effectively" ([7], p. 95); or, as Smith expressed, it "is concerned with testing [the] effectiveness of an intervention" ([5], p. 85). A PAR approach focuses on essential features that until now have rarely been considered in the process of implementing guidelines or research results into healthcare settings.

The *Consolidated Framework for Implementation Research (CFIR)*, developed by Damschroder et al. [8], focuses on systems as a whole [9] and thus seemed to fit quite well into PAR. This comprehensive framework takes the user through five major domains (*intervention characteristics, outer setting, inner setting, characteristics of individuals* and *process*) with several underlying constructs. Thus, it increases researcher and participant awareness of critical topics like the adaptability of an innovation or the setting's implementation climate throughout an implementation project.

Several implementation strategies are available that aim to support and facilitate successful guideline use and to help overcome possible barriers during the implementation process. The Cochrane *Effective Practice and Organisation of Care (EPOC)* Review Group provided a framework that distinguishes four different types of interventions: professional, financial, organisational and

regulatory interventions. Each type of intervention comprises a list of several implementation strategies [10]. These lists provide a valuable overview of possible strategies for meeting the different requirements of an implementation process and furthermore include strategies which vary from bottom-up (through participation) to top-down approaches (through instructions). The *EPOC* framework has been suggested for use in guideline implementation studies, either for planning the implementation process itself and/or for designing a study [11]. Yet, the framework does not specify the effectiveness of the individual implementation strategies.

References

1. Leykum LK, Pugh JA, Lanham HJ, Harmon J, McDaniel Jr RR. Implementation research design: integrating participatory action research into randomized controlled trials. I*mplement Sci.* 2009;4:69. doi: 10.1186/1748-5908-4-69.
2. Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlane F, Peacock R. How to spread good ideas: a systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO). 2004. [http://www.netscc.ac.uk/hsdr/files/project/SDO_FR_08-1201-038_V01.pdf].
3. Waterman H, Tillen D, Dickson R, de Koning K. Action research: a systematic review and guidance for assessment. *Health Technol Assess*. 2001;5:23.
4. Carr W, Kemmis S. *Becoming critical. Education, knowledge and action research.* Reprint, Victoria: Deakin University Press; 1990.
5. Smith A. *An action research inquiry exploring the transfer of pain knowledge from a continuing education course into practice.* PhD thesis. University of Stirling, Department of Nursing and Midwifery; 2008. [https://dspace.stir.ac.uk/bitstream/1893/474/1/A%20Smith%20-%20An%20action%20research%20inquiry%20ecploring%20the%20transfer%20etc.pdf].
6. Dick B. A beginner's guide to action research. 2000. [http://158.132.155.107/posh97/private/research/methods-action-research/guide.pdf].
7. Kemmis S. Exploring the relevance of critical theory for action research: emancipatory action research in the footsteps of Jürgen Habermas. In: Reason P, Bradbury H, editors. *Handbook of action research.* 4th ed. London: Sage Publications; 2006. p. 94–105.
8. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50. doi: 10.1186/1748-5908-4-50.
9. Ilott I, Gerrish K, Booth A, Field B. Testing the consolidated framework for implementation research on health care innovations from South Yorkshire. *J Eval Clin Pract.* 2013;19:915–24.
10. Cochrane Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist. 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].
11. Mäkelä M, Thorsen T. A framework for guidelines implementation studies. In: Thorsen T, Mäkelä M, editors. *Changing professional practice. Theory and practice of clinical guidelines implementation.* Copenhagen: Danish Institute for Health Services Research and Development; 1999. p. 23–53.

Additional file 2: Nursing personnel involvement and applied implementation strategies

Nursing personnel involvement

A steering group comprising nursing personnel representatives was recruited from both departments: five representatives from the ASD and eight from the OD with HEB serving as moderator and advisor in each group. During six (ASD) / seven (OD) monthly meetings between January and June/July 2011, the implementation of the Falls CPG was planned, necessary measures initiated and their progress continually evaluated. The results of the baseline data collection informed the course of action for each steering group. All graduate and assistant nurses not members of a steering group were given the opportunity to present their ideas and/or critiques, either in person during a steering group meeting or indirectly through their representatives. The main purposes of the steering group meetings were to determine:

- the problem of falls from the perspective of nursing personnel
- gaps in preventive measures already carried out by nursing personnel
- nursing personnel's aims for guideline implementation and appropriate criteria for their measurement*
- successful implementation criteria from the participants' point of view (for example, availability of necessary means/equipment for fall prevention)

*Nursing personnel's aims included a reduction of falls and their effects; more knowledge regarding fall prevention, Falls CPG recommendations and on recording a patient fall; optimising patient care in fall prevention; consistent procedures in fall-preventive actions and documentation; having adequate means and staff to adhere to fall-prevention recommendations; environmental modification (barrier-free access to the shower for disabled and less mobile patients, doorframe ramp to the balcony); patient information for hospital stay including adequate slippers and personal walking aids; making fall-prevention efforts visible.

Furthermore, steering group meetings served to consecutively select and tailor adequate implementation strategies and to initiate appropriate measures, including:

- defining the content of an educational programme for each department

- compiling a reference book with unit-specific information including written materials specified to each unit; for instance core information to be given to patients regarding fall prevention or a list of commonly present drugs known to raise the risk of falls
- determining additionally necessary means/equipment to prevent falls and necessary environmental modifications
- determining the mode of audit and feedback with consideration of existing structures in both departments

All steering group members encouraged their team to use the evidence-based guideline recommendations in daily practice. Furthermore, they served as facilitators for their team by answering questions, and by collecting information, additional ideas and/or critiques that were consequently integrated into the ongoing process.

Applied implementation strategies

Six implementation strategies were tailored to the needs of each department, then applied and classified according to *EPOC* [1]:

1. Educational meetings: 3 identically-organised 90-minute lectures were held for OD nursing personnel. ASD nursing personnel attended short lectures (2 x 15 minutes) during two team meetings. Those who could not attend one of these meetings were informed individually by a steering group member.
2. Distribution of written materials: The reference books were made available to each unit and nursing personnel was obliged to act according to the compiled material as soon as the training was completed.
3. Local opinion leaders: Steering group members from both departments acted as motivators in their respective teams as soon as the steering groups were established.
4. Audit and feedback: Assessment of fall risks, nursing care planning and measures taken in daily practice were audited using the pre-existing structures of both departments. Within the ASD, audit and feedback were included into the weekly nursing ward rounds, and the nurse in charge of the respective patient received appropriate feedback from the ward manager. Within the OD, audit and feedback were included through regular audits of nursing records, and feedback was given to the team by the appointed nurse. After a fall, a report had to be written

which was audited by the head nurse, who in turn gave feedback to the responsible nurse.

5. Adaptation of nursing record systems: Only minor adaptations were necessary in both departments and installed/executed prior to the educational meetings, for example by adding phrases like 'patient information given' to allow documentation measures to be performed quickly.
6. Changes in physical structure, facilities and equipment: Necessary equipment was purchased and environmental modification was initiated. These were used immediately upon receipt.

The first four implementation strategies were part of the *professional interventions* category as they were directed towards the nursing personnel. The latter two were part of the *organisational interventions* category [1]. Financial incentives could not be offered as there was no extra budget available for this project.

References

1. Cochrane Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist. 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].

Chapter 6

The Consolidated Framework for Implementation Research (CFIR): a useful theoretical framework for guiding and evaluating a guideline implementation process in a hospital-based nursing practice

Breimaier HE, Heckemann B, Halfens RJG, Lohrmann C. The Consolidated Framework for Implementation Research (CFIR): a useful theoretical framework for guiding and evaluating a guideline implementation process in a hospital-based nursing practice.

Submitted to BMC Nursing 3 March 2014

ABSTRACT

Background: Implementing clinical practice guidelines (CPGs) in a healthcare setting is a complex intervention comprising various independent and interdependent components. Although never evaluated in a practical context, the *Consolidated Framework for Implementation Research (CFIR)* appeared to be a suitable theoretical framework for guiding an implementation process. The aim was an evaluation of the comprehensiveness, applicability and usefulness of the *CFIR* in implementing a fall-prevention CPG in nursing practice to improve patient care in an Austrian university teaching hospital setting.

Methods: The *CFIR* evaluation based on (1) team-meeting minutes, (2) the main investigator's research diary containing a record of a before-and-after, mixed-methods study design embedded in a participatory action research (PAR) approach for guideline implementation, and (3) qualitative and quantitative data collected from involved graduate and assistant nurses from two Austrian university teaching hospital departments with respective data analysis. The *CFIR* was used to organise the findings across all data sources per and across time point(s) and to assess their influence on the implementation process resulting in implementation and service outcomes.

Results: Overall, the *CFIR* emerged as a comprehensive framework for implementing a guideline into a hospital-based nursing practice. However, the *CFIR* did not take into account some factors that are crucial in the planning phase of an implementation process such as stakeholder aims and wishes/needs when implementing an innovation, pre-established measures related to the intended innovation and pre-established strategies for implementing an innovation. For *CFIR* constructs like *reflecting & evaluating* and *engaging*, a more specific definition is recommended. The framework and its supplements were easily applicable for researchers and their scope was appropriate for the complexity of a prospective CPG-implementation project. The *CFIR* facilitated qualitative data analysis and provided a structure of organising project results and viewing them in a broader content to explain the main findings.

Conclusion: The *CFIR* was a valuable and helpful framework (1) for assessing baseline, process and final state of and influencing factors on a CPG-implementation project, (2) for the content analysis of qualitative data collected throughout the implementation process and (3) for explaining the main findings.

Key words: Consolidated Framework for Implementation Research (CFIR), evaluation, guideline implementation, implementation outcomes, nursing

BACKGROUND

Nurses are expected to provide evidence-based care that is regularly updated with research findings in order to improve quality of care and promote positive patient outcomes [1 - 3]. Evidence based clinical practice guidelines (CPGs) are seen as one means of introducing research results into practice [4]. Yet, introducing CPGs into any health care setting is considered a complex intervention. Complex interventions are characterized by a number of components that may act independently and/or interdependently from one another. These components may consist of several hindering factors on an organisational, multidisciplinary, individual and/or guideline level [5]. One also has to consider that common influencing factors such as nurses' knowledge and cognitions, attitudes as well as social influence, organisation and resources are often specific to innovation, context and target groups [6]. All of these factors play a role in the implementation process, but it is difficult to determine which ones are crucial [7, 8]. Multifaceted strategies should therefore be employed which target existing barriers and other previously identified influencing factors [5, 6, 9 - 11]. Furthermore, implementation interventions should be tailored to the needs of the respective sites to maximize improvement in professional practice [12, 13]. Van Achterberg et al. point out that implementation strategies should also be linked with relevant theoretical insights if they are to be successful [6].

Several implementation theories mention influencing factors and guide implementers through the implementation process. These influencing factors often encompass the same meaning but are not identically labelled across these theories. Furthermore, implementation theories are often not exhaustive with regard to these factors. Therefore Damschroder et al. combined 19 published implementation theories into the *Consolidated Framework for Implementation Research (CFIR)*. It comprises five major domains (*intervention characteristics, outer setting, inner setting, characteristics of individuals* and *process*) with 39 underlying constructs and sub-constructs that are potential influences on efforts to change practice [11]. Each (sub-) construct is defined; for example, *tension for change* is defined as "the degree to which stakeholders perceive the current situation as intolerable or needing change" ([11], p. 8). The constructs can be used as implementation and evaluation criteria in three different ways: They may (1) raise awareness of potential influencing factors, (2) The constructs also (3) facilitate the analysis of pivotal processes and outcomes

and (3) help to organise all findings of an implementation process to explain the outcomes: in short, to understand what worked where and why [11]. To obtain a comprehensive overview of the implementation process, the influencing factors should be assessed at the beginning, throughout and at the end of any implementation process. Regarding outcomes, Proctor et al. point out that implementation, service and client outcomes can be distinguished [14]. Implementation outcomes are defined as "the effects of deliberate and purposive actions to implement new […] practices" ([14], p. 65). They are seen as necessary preconditions to attaining subsequent desired changes in clinical or service outcomes [14]. Service outcomes refer to the extent to which services are, among others, safe [14] as service providers have, for example, a better knowledge of the respective topic or because more devices are available.

It is relevant for potential users of the *CFIR* that it be a comprehensive, applicable and useful framework that meets the above mentioned expectations by Damschroder et al. [11]. Since its publication in 2009, the *CFIR* has been applied in a number of studies with the purpose of either explaining or describing research findings in order to identify matters of interest or evaluate the framework itself. Sorensen and Kosten [15] applied the framework to multiple articles in one journal issue and found that the model could be useful in systematically describing implementation research findings for a wide variety of clinical areas in the addictions field. Damschroder and Lowery applied the *CFIR* as an interview guide and for analysis purposes with the intention of describing factors that explain variations in implementation success of a programme implemented previously in Veteran's Affairs medical facilities, and to illustrate how the *CFIR* could be applied to identify influential contextual constructs on implementation [16]. This finally resulted in presenting specific examples to clarify distinctions between a few constructs identified during the *CFIR's* application as being closely related; for example *relative priority* versus *patient needs* and *resources; design quality and packaging* versus *access to knowledge and information* [16].

Damschroder and Hagedorn used the *CFIR* as an organising framework to evaluate implementation theories used in substance use disorder treatments. The authors concluded that the *CFIR* is a comprehensive practical taxonomy of constructs with influence on implementation effectiveness. None of the evaluated implementation theories captured all constructs provided in the *CFIR* [17]. Hartzler et al. used the *CFIR* as a guide to exploring publications

for the transportability of contingency management in substance abuse treatment. They were interested in identifying which of the *CFIR* domains were highlighted in the identified literature [18]. The domain highlighted most often was *intervention characteristics* (59%) followed by *characteristics of individuals* (34%) and *inner setting* (32%). The *process* was focussed on in 18% of the included literature and *outer setting* in 8%. Powel et al. used the *CFIR* to examine 'research (and real-world implementation efforts)' through its lenses as they expected that this would give "some indication of how comprehensively strategies address important aspects of implementation" ([19], pp. 194-95). The domains were addressed by implementation strategies between 45% and 100% of the included studies (*characteristics of individuals*: 100%, *inner setting*: 82%, *process*: 64%, *outer setting*: 55% and *characteristics of the intervention*: 45%). The authors appraised the *CFIR* as helpful for a greater understanding of the overall designs of studies included in their systematic review and the intended targets of the implementation strategies [19].

In a post-hoc, deductive analysis of narrative accounts of innovation in health care services, Ilott et al. evaluated the utility of the *CFIR*. They found the framework to be both useful and user-friendly as it captured the complexity of implementation in health care practice in context and across multiple sites. Additionally it was found to be easy to apply due to its conceptual clarity and the wide coverage of the five domains [20]. No study was found that applied and evaluated the *CFIR* for its comprehensiveness, applicability and usefulness in an ongoing implementation project.

For this reason, the purpose of this paper was to evaluate the comprehensiveness, applicability and usefulness of the *CFIR* itself. The evaluation of the *CFIR*'s comprehensiveness will focus on its constructs, while an evaluation of its usefulness and applicability will focus on its application as a theoretical framework during the implementation process. The *CFIR* was applied within a fall-prevention CPG implementation project. The basis on which to implement the evidence-based guideline "Fall prevention for older and elderly persons in hospitals and chronic care facilities" [21] (subsequently named the Falls CPG) was a hospital-wide incidence of patient falls which was considered to be high by the nursing management of the respective Austrian university teaching hospital. The implementation of the Falls CPG aimed at improving nursing practice in two of the hospital's departments. The project concentrated on implementation and service outcomes. The main focus of the study was inves-

tigating the effectiveness of the implementation strategies used. The resulting main findings (service outcomes and resource use) are reported in Breimaier et al. [22].

METHODS

Design

The *CFIR's* comprehensiveness, applicability and usefulness were assessed in a post-hoc evaluation of how useful the framework actually was for guiding the implementation of the Falls CPG during the course of implementation. The comprehensiveness review will focus on the (1) presence or absence of necessary constructs as well as (2) definitions of existing constructs. The applicability and usefulness review will focus on the CFIR (1) as a guide to developing assessment questions and as a framework for revealing influencing factors, (2) as a template for content-analysis and (3) as a guide to interpret the main findings. The *CFIR* was applied within a before-and-after, mixed methods study design embedded in a participatory action research (PAR) approach for guideline implementation. According to Grol et al. the *CFIR* can be considered an explanatory framework; to complement its use a 'process' or 'action theory', in this case the PAR approach, is needed [23]. *CFIR's* theory-based constructs and mechanisms help to explain whether an implementation may or may not succeed. Furthermore, it helps to identify potential barriers and facilitators if used pre- or during an implementation. This in turn helps to guide the selection of strategies to overcome or leverage these influencing factors [17]. The PAR approach, in turn, through its cyclical process, facilitated the identification of each relevant step in the Falls CPG implementation process. Before outlining the procedure for *CFIR's* evaluation, the study's PAR approach and procedure is subsequently described.

The study's participatory action research approach and procedure

Participatory action research (PAR)

Participatory action research is recommended as it is known to achieve and ensure sustainable implementation [24, 25]. The advantage of this approach was seen in its underlying key features: taking into account all facets of a healthcare setting, addressing issues of nursing praxis, bringing about change to improve practice, involving all stakeholders in the process, its cyclical pro-

cess and evaluation, and its educative nature [24, 26]. The flexibility of PAR allows for assimilation of unforeseeable events and occurrences and it provides the opportunity to adapt procedures to the existing needs of a given situation [27, 28]; therefore PAR was used as a general approach to implementing the Falls CPG.

Preparation phase

The nurse director, in agreement with all head nurses, selected two departments for participation: the Accident Surgery (ASD) and the Ophthalmic (OD) Department. Both departments were found to be appropriate for implementing the Falls CPG due to their patient clientele (age, restricted mobility, impaired eyesight) (Research diary (RD) 11/01/2010). During preparatory meetings between the nursing director, the two respective head nurses and HEB (main investigator), initial ideas for the general proceedings and mutual expectations, for example regarding aims to be achieved, were exchanged. The approximate time schedule was set for the subsequent steps of the implementation process (RD 25/02/2010, RD 07 & 15/06/2010). The roughly outlined steps included: baseline assessment to capture the intended outcomes and possible influencing factors, elaborating the concrete procedure within steering group meetings, mid-term assessment upon termination of the steering group meetings and final assessment half a year later. Planned sessions were scheduled on various days of the week to accommodate participant work schedules. It was also determined that all graduate and assistant nurses (subsequently referred to as nursing personnel) from ASD and OD would be included in the whole implementation process. Before the end of this preparation phase, the hospital had reorganised the head nurses' scope of responsibility resulting in one head nurse being responsible for both departments included in the project.

Steps of the implementation process and nursing personnel's involvement

Information meetings. In an initial information session, the project aims and scope were presented to nursing personnel. Participants received written information including informed consent forms for participation in the study. Ethical approval was obtained from the university's Research Ethics Committee (EK-No. 21-334 ex 09/10) prior to initiating the study. An overview of the implementation process steps is given in Figure 1.

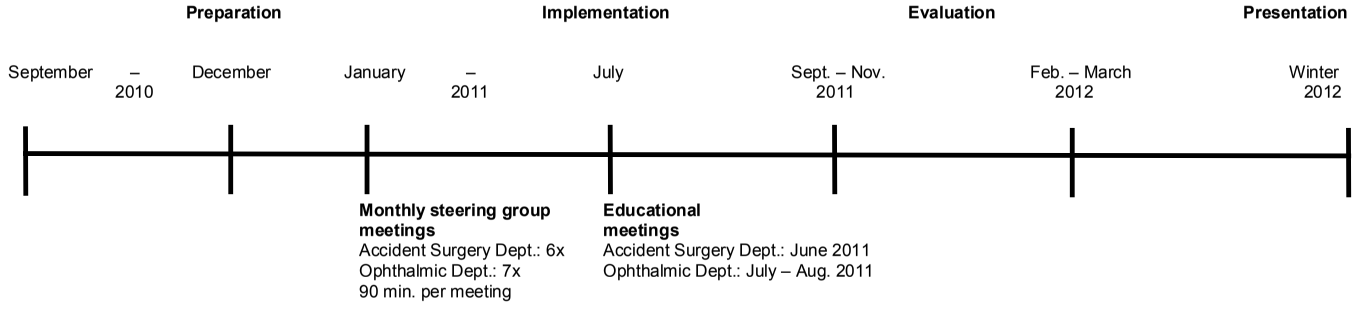


Figure 1 Course of the project

Data collection. Qualitative (interviews, group discussions) and quantitative (questionnaire) data were collected at the baseline (t1; *intervention characteristics, inner setting, characteristics of individuals* and additional relevant information), mid-term (t2; *intervention characteristics, inner setting, characteristics of individuals, process*) and at the end of the project (t3; *intervention characteristics, inner setting, characteristics of individuals, process*) from the ASD and OD nursing personnel regarding central outcomes and influencing factors (see Additional File 1). Baseline and final data collection assessed the effectiveness of the implementation strategies used (for further detail see Breimaier et al. [22]). Mid-term and final data collection assessed the implementation process from the perspective of the nursing personnel.

Steering groups. The core element of the whole implementation process was the two steering groups. They were recruited from both departments by the head nurse. The groups comprised 13 volunteers (5 from the ASD, 8 from the OD) including graduate and assistant nurses. They met on a monthly basis (ASD six times, OD seven times) to plan and continually evaluate the implementation process and its progress. HEB acted as the group's moderator and advisor. To make use of synergies and stimulate and enrich discussions, ideas were transferred by HEB between groups. At the beginning of the first meeting, the results of the baseline data collection were presented to each group, which informed the course of action within both groups. During the first two meetings, and based on the baseline findings, the problem of 'falls' was defined from nursing personnel's perspective, gaps in fall preventive measures already carried out were determined, nursing personnel's aims regarding guideline implementation and appropriate criteria for its measurement as well as criteria of a successful implementation from their point of view were defined (ASD & OD steering-group-meeting minutes (SGMM) 01 & 02/2011).

Evaluation and adaptation of the ongoing process. According to PAR cycles of continuous problem identification/situation analysis, planning, action and evaluation [26], each steering group meeting included topics regarding status quo, what was already underway, pending issues, what was needed or had to be done, when and by whom, and any open questions in order to evaluate the ongoing implementation process and allow necessary adaptations/ modification (ASD & OD SGMMs). To give an example: one early-defined aim of ASD nursing personnel was to level the doorframe ramp to the balcony, which had been identified as risk factor (ASD SGMM 02/2011). In the course

of the project it became clear that this was not possible for several reasons. A discussion during a steering group meeting brought up a suitable alternative solution: to install a nurse call on the balcony so that patients could ring for help to safely cross the doorframe ramp (ASD SGMM 03 & 04/2011). As no extra budget was available for the Falls CPG implementation project it was clear from the beginning that each steering group decision had to go through official channels. However, if based on good arguments regarding usefulness and feasibility, the head nurse helped to organise its realisation. This also applied for necessary devices/equipment for fall prevention. Nursing personnel from each working unit helped, for example, to identify available devices/equipment for fall prevention and what would be necessary to adhere to guideline recommendations. Based on this, a list was compiled in a steering group meeting and forwarded to the head nurse. A sensor mat, for example, was on the OD list to monitor, especially at night, high-risk patients such as those suffering from dementia. After a local presentation of a sensor mat to steering group members and ward managers on one of the wards, and weighing the pros and cons, purchase was not recommended (OD SGMM 04 & 06/2011). Within a later steering group meeting, an alternative solution was found in form of a baby monitor (OD SGMM 06/2011).

Selection of implementation strategies. In the course of the steering group meetings, adequate implementation strategies were consecutively selected and tailored. For this purpose the framework for implementation interventions/strategies provided by the Cochrane *Effective Practice and Organisation of Care (EPOC)* Review Group [29] was applied. The selection and tailoring of implementation strategies were based on the gaps, aims and necessities mutually defined in the first two rounds (for further details see Breimaier et al. [22]). All involved parties had the opportunity to present ideas and/or critique during a steering group meeting (either in person or through a representative) and they were kept formally and informally up to date. Further information detailing nursing personnel involvement is provided in Breimaier et al. [22]).

CFIR's evaluation

The evaluation of the *CFIR*'s comprehensivness, applicability and usefullness was based on several sources of data recorded during the implementation process. The main investigator's research diary with consecutively entered notes documented the course of the project. This included: decisions made;

perceived facilitators, barriers and their solutions; topics and results of ad hoc meetings held on demand between HEB and head nurse or HEB, head nurse and ASD/OD ward managers from the two participating departments; observations and experiences made by HEB with regard to *CFIR's* comprehensivness and its application. Minutes of steering group meetings (SGMMs 01-07/2011) also captured the course of the project. To assess the influencing factors of the intended Falls CPG implementation project, as suggested by the *CFIR* [11], quantitative (questionnaire) and qualitative data (interviews, group discussions) were collected (t1 - t3). Details about the corresponding data collection tools and the respective data analysis methods are outlined in Additional File 1. Relevant findings are used to illustrate the main influencing factors with respect to each *CFIR* domain.

Prior to the start of the implementation process, the *CFIR* was used to develop a list of questions. This development of questions considered each *CFIR* domain with its respective (sub-) constructs that were thought to be necessary and helpful to assess the baseline of the project, to reveal influencing factors in the course of the project and finally to evaluate the implementation process itself. This list of questions provided the basis for the applied questionnaires, respective semi-structured interview guides and reflective questions asked during the steering group meetings. When analysing the qualitative data the *CFIR* was used as a template for content analysis. Finally, the *CFIR* also was used as a guide to interpret the main findings. To do so, all findings obtained across all data sources per time point (interview, group discussions and questionnaire data, SGMMs, relevant RD entries) and across the three time points were organised under *CFIR's* respective domains, (sub-) constructs and its supplements (see Breimaier et al. [22]). The intention was (1) to reveal whether the qualitative and quantitative data with regard to the same *CFIR* domain and (sub-) construct supported each other or not, (2) to find out how and which factors/elements influenced the implementation process and the main outcomes of the implementation project as anticipated by the *CFIR* [11], and (3) to discover changes over the course of the project. The strength and direction of the influence of the identified factors were assessed using the aggregated findings from all respective sources and marked with '+' / '++' (positive/very positive influence), '-' / '--' (negative/very negative influence) or '+/-' (mixed influence). The main investigator's thorough post-hoc reflections helped to combine relevant data for this assessment.

RESULTS

Detailed information about participating nursing personnel (response rates and *characteristics of individuals*) and the setting (*inner setting - structural characteristics*) is outlined in Additional File 2.

CFIR's comprehensiveness

Presence or absence of necessary constructs

The *CFIR* successfully covered a wide range of influential factors relevant for an implementation project, such as available resources, nursing personnel's perception of the underlying problem (patient falls) and the intervention (Falls CPG) itself, communication and its channels, culture of the organisation, co-operation within and between teams and leaders and the degree of receptiveness shown by the organisation regarding implementation. However, in the preparation phase of the project, four constructs were added to the framework based on HEB's reflection regarding implementation processes and her experience as a nurse (RD 23/07/2010): (1) Stakeholders' aims: it was anticipated that the nursing personnel had their own ideas about what they wanted to achieve with regard to the Falls CPG implementation, (2) stakeholders' wishes/needs when implementing the Falls CPG: to learn what should be considered in the ongoing implementation process, (3) pre-established strategies for implementing an innovation: to learn what was known and common and what may fit or not, and (4) pre-established (fall preventive) measures related to the intended innovation: fall prevention is within nursing personnel's scope of responsibility for which existing measures were anticipated. Results of these four added constructs are presented in Additional File 3.

Definition of existing constructs

The underlying *reflecting & evaluating* construct (*process* domain) was defined very broadly as "quantitative and qualitative feedback about the progress and quality of implementation…" [11]. In the ongoing process during steering group meetings, the outcomes of the baseline assessment built the basis for further action, which in turn was continually evaluated in each steering group meeting as already described in the methods section. To evaluate the proceedings from nursing personnel's perspective during the mid-term and final data collection (RD 21 & 24/05/2010, RD 20/07/2011, RD 23/02/2012), the definition of this construct was specified with: stakeholders' conclusions

about their satisfaction and contentedness with the project; its progress and achievements; the invested time and effort on behalf of stakeholders; the perceived change and impact; stakeholders' learning effect, as well as perceived barriers and facilitators. Additionally, stakeholders recommendations for further CPG implementation projects and their estimation of the sustainability of the implemented Fall CPG were requested.

The underlying *engaging* construct (*process* domain) only considered persons involved in the design and realisation of the implementation process (for example, opinion leaders or external change agents) but not the staff applying the CPGs after implementation, i.e. the "frontline" stakeholders. However, since a group's degree of engagement is crucial for a project's success, it was determined that they should also be included as an additional sub-construct (RD 24/05/2010, RD 20/07/2011).

CFIR applicability and usefulness

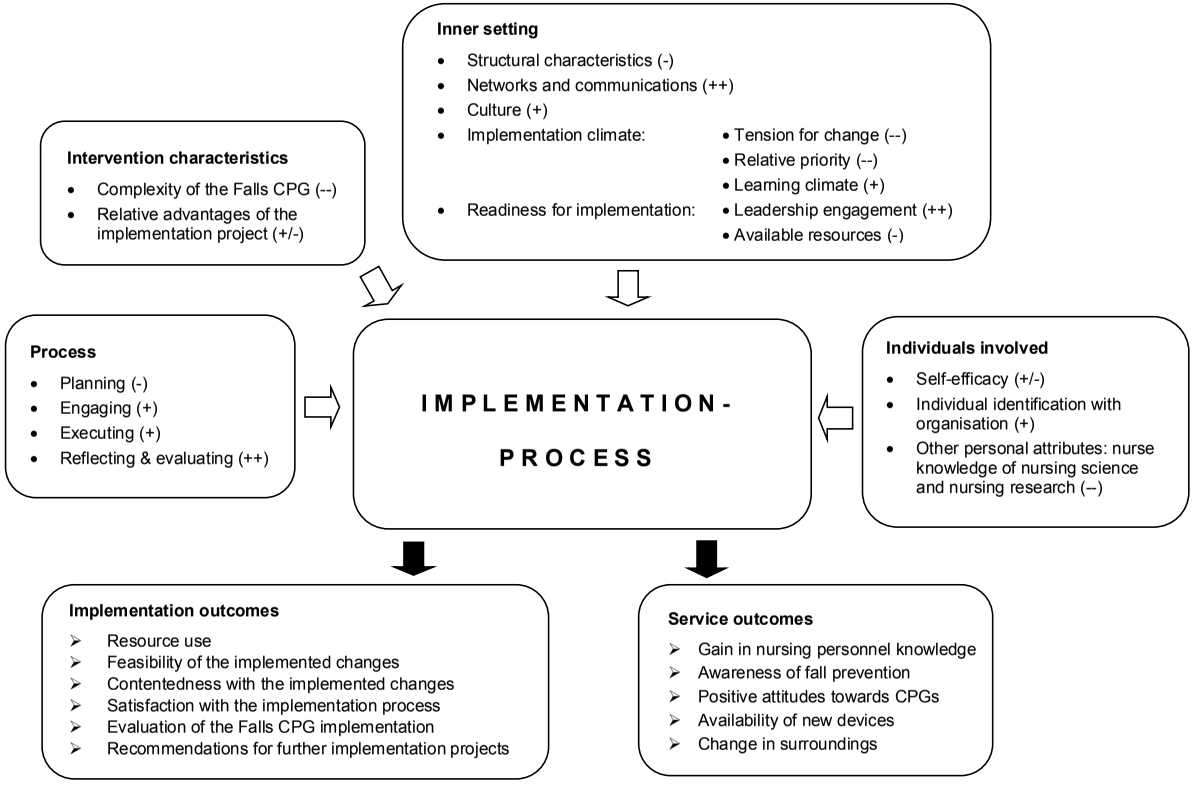
The *CFIR* was used as a guide (1) to develop questions to assess context and process, (2) to create a framework for content-analysis of qualitative data, (3) to reveal influencing factors on and changes during the implementation process, and (4) to interpret the main findings.

The CFIR as a guide to developing assessment questions

The *CFIR* was easily applicable and supportive. It helped to develop assessment questions for the Falls CPG implementation project. Moreover, questions for reflecting and evaluating the progress within the steering group meetings were able to be included as an integral part of each meeting (ASD & OD SGMMs).

The CFIR as a framework for revealing influencing factors on the implementation process with its outcomes and changes in the course of the project

Several factors influencing the Falls CPG implementation project were revealed – both barriers as well as facilitators. Factors that mainly influenced the Falls CPG implementation came from four out of the five *CFIR* domains: *characteristics of the intervention, inner setting, characteristics of the individuals* and *process*. The respective (sub-) constructs that mainly influenced the implementation process are illustrated in Figure 2 together with a description of outcomes achieved. For each domain, the respective (sub-) constructs fa-



+ positive / ++ very positive influence; - negative / -- very negative influence; +/- mixed influence

Figure 2 Overview of main influencing factors on implementation process ordered by CFIR domain and (sub-) constructs, and achieved implementation and service outcomes

cilitating the implementation process are described first, followed by barriers and constructs which had a mixed influence. Constructs of the *outer setting* were not so influential in this implementation project and therefore not included in the description.

Characteristics of the intervention. Especially at the start, the implementation process was negatively influenced by the perceived *complexity* of the Falls CPG. Nursing personnel found the document too lengthy, difficult to apply, and complicated. They did not feel they had enough time to read it during their day or night shift. This concern was considered when designing the educational programme in the steering group meetings (ADS & OD SGMMs). The influence of the supposed *relative advantage* of the implementation project was mixed. While quite a few interviewees (t1) saw no need to implement the Falls CPG others saw potential for improvement, for example in nursing practice or availability of fall preventive means. Further details together with quotes are provided in Additional File 3.

Inner setting - facilitators. All in all, eight constructs with main influencing qualities were identified – four facilitating ones and four barriers. Two constructs turned out to be very supportive: *networks & communications* and *leadership engagement* (*readiness for implementation construct*). (1) Networking and communication within teams as well as between teams, ward managers and the head nurse were generally considered to be positive (interview data, t1; RD notes). This supported the transparency of the ongoing project between all parties and initiated a continuous in-depth discussion of the topic within both departments (interview data, t2 & t3). (2) *Leadership engagement* was the second construct. The head nurse, for example, advocated the project within meetings with ward managers of both departments and facilitated the acquisition of necessary devices even though no extra budget was available for this project. Two further positive influencing factors were the *culture* and *learning climate* (sub-) constructs: (3) The *organisational culture* was predominantly felt to be a group and a hierarchical culture (questionnaire data, t1 - t3). It seemed to be of minor concern that a decision be made by a leader if, for example, no agreement could be achieved within a team and decisions were seen as a leader's responsibility (interview data, t1). For this reason a steering influence from the management (head nurse and OD ward managers) regarding the design and content of the intended educational programme was included by the OD steering group without rising concern (RD 03/03 & 15/06/2011).

(4) The *learning climate* (*implementation climate* construct) appeared favourable, especially regarding *leadership, experimentation* and *rewards* (questionnaire data, t1 - t3). This facilitated, for example, the selection and tailoring of implementation strategies like the educational programme (RD 17 & 31/01/2011).

Inner setting – barriers. At the same time, four constructs from the *inner setting* domain proved to negatively influence the implementation process, especially at the beginning: (1) a need for change (*tension for change, implementation climate* construct) was not seen. Nursing personnel were convinced that they already adhere to the Falls CPG and could not envision further fall preventive measures being implemented in their daily work (interview data, t1). Explicitly illustrating recommended pre-established fall preventive measures already in place and a focus on recommended ones not in place helped to overcome this barrier when planning the Falls CPG implementation in the steering group meetings (ASD & OD SGMM 01 to 03/2011). (2) Other issues like pain management had also been considered even more important than implementing the Falls CPG and captured nursing personnel's attention (interview data, t1) (*relative priority, implementation climate* construct). Nonetheless, the head nurse and ward managers supported the project and during the steering group meetings we concentrated on topics regarding fall prevention relevant for each department (ASD & OD SGMMs; see Additional File 3). (3) An extra budget was not available for implementing the Falls CPG. For this reason, not all ideas in the implementation process could be realised, such as, for example, creating a prize for a cross word puzzle on fall prevention as a form of incentive (RD 07/07/ & 23/08/2011. (4) A structural reorganisation in the hospital (*structural characteristics* construct) caught OD nursing personnel's attention: As the head nurse had resumed responsibility for the OD prior to the start of the project, additional meetings with OD ward managers, the head nurse and HEB were included in the course of the project (RD 21/10/2010, 10/02, 03/03, 14/04 & 19/05_2011). Moreover, the OD itself was undergoing major restructuring at the time. Further information regarding the influencing factors of the *inner setting* is provided in Additional File 3.

Characteristics of individuals. Within this domain, we identified a strong influence from the following three constructs: (1) *Individuals' identification with the organisation* seemed to be good considering the many years of work experience in the same place and the low staff turnover especially in OD (inter-

view and questionnaire data, t1). (2) Participants had little to moderate knowledge of nursing science and research (*other personal attributes* construct) (questionnaire data, t1 - t3). Resulting initial linguistic differences between researcher and participants were reported shortly after the first information meeting by the head nurse and respective explanations included for the following ones (RD 12/09/2010). Upcoming questions regarding the research part and the project proceedings were answered within an ad hoc meeting between the head nurse, OD ward managers and HEB (RD 21/10/2010). (3) Nursing personnel's self-efficacy was generally good. However, due to the open approach with no detailed plan for the proceedings and the position/role of the participants, they felt an intangible insecurity about this change process at the project start (interview data, t1 & t2). This was solved within the steering group meetings when it became clear that the proceedings should match nursing personnel and department needs (ASD & OD SGMMs). Further information regarding these (sub-) constructs is provided in Additional File 2.

Process. Within this domain four constructs were relevant influencing factors: *planning, engaging, executing* and *reflecting & evaluating*. (1) The planning construct contained two influencing factors. Firstly, the project was meant to commence in the spring of 2010, but had to be postponed to autumn 2010 for organisational reasons within the OD (RD 26/04/2010). Therefore the mid-term assessment (t2), originally scheduled for summer 2011, was actually conducted in autumn 2011, i.e. three month later as intended and with only three instead of six months left to the final data collection (t3). Secondly, a last-minute decision by the hospital's nursing management to include the OD's outpatient clinic and the operation theatre in the project (RD 02/08/2010) further complicated matters. The implementation of the Falls CPG had to be adapted to the three different working units within the OD and one additional steering group meeting was necessary. The planning process within the steering group meetings was done stepwise and adaptations were included when required as described in the methods section.

(2) In general, the *engaging* construct was assessed to have had a positive influence on the implementation process. This includes the selection of suitable members for the two steering groups agreed upon by both the researchers' (inclusion of graduate as well as assistant nurses and nursing personnel from all working units) and head nurse (being constructive, interested in the topic but also taking up a critical stance). Several opinion leaders were among the

group members. The teamwork was constructive and open-minded, the group members supported the Falls CPG implementation in their respective teams and finally all set aims were successfully reached (ASD SGMM 06/2011, OD SGMM 07/2011; RD 17/01/2011). The head nurse was formally appointed to be the internal implementation leader. She advocated for the project within meetings with ward managers, forced project transparency for staff, facilitated the acquisition of necessary devices, developed a template to report fall incidences, and mandated the preparation of a supplementary information folder including the material that had been elaborated on during the steering group meetings (RD 06/2010 - 07/07/2011). The main investigator was involved as an external change agent. After initial scepticism, HEB was perceived by steering group members as an adviser whose ideas served as a basis for discussion – the steering groups themselves decided what was suitable and what not. (ASD & OD SGMMs 06 & 07/2011).

(3) *Executing* was mainly considered to be a positive influence on the implementation project. A clearly defined time schedule regarding what had to be achieved and by when was not set in detail at the beginning. However, the set time frame for steering group meetings was kept for organisational reasons (RD 15/06/2011). Steering groups, the main investigator, the head nurse and ward managers all strived to achieve this with timely and coordinated action undertaken by the respective parties. When, for example, in the third ASD steering group meeting the decision was made to install a nurse call on the ASD balcony, the ASD ward manager immediately requested an assessment of its practicability by an electrician. After his positive confirmation and having been the given okay for installation from the head nurse, the nurse call was in effect at the beginning of July 2011 (RD07/07/2011). At the end of the steering group meetings, all set targets were either achieved or in their final phase, as ADS' educational programme was not yet completed and the OD unit's reference books not fully prepared (ASD & OD SGMMs 06 & 07/2011). At the beginning of the steering group meetings, however, its members struggled to define appropriate measurement criteria to assess the achievement of nursing personnel's aims. Discussions with head nurse and ward managers (RD 03/03/2011) and within the first ASD and OD steering group meetings (SGMMs 01 & 02/2011) helped to overcome this problem. Steering group members expressed that they became aware of what had to be done and commenced concrete planning at the time of the third meeting (interview data, t2).

Continuous *reflecting and evaluating* helped to bring forward the project. In each steering group meeting the progress of the Falls CPG implementation was regularly discussed as already described in the methods part. Pending items were followed persistently until a solution or an alternative was found (ASD & OD SGMMs). The earlier referenced nurse call for the ASD balcony is one example of this. Steering group members reported project progress during team meetings within their work unit or during shift changes to get feedback from their colleagues. In the OD several meetings to report progress and clarify any emerging problems or questions were scheduled between the head nurse, OD ward managers and HEB (RD 10/02, 03/03, 14/04 & 19/05/2011) or else between the head nurse and HEB (RD 15/03, 10/05 & 15/06/2011). This additionally ensured transparency and ward manager support for the project within their units.

Implementation and *service outcomes.* The summary of the chosen approach, procedures and influencing factors finally resulted in *implementation* and *service outcomes*. *Implementation outcomes* revealed that the implemented measures were feasible and the nursing personnel were content with what was implemented and satisfied with the process. Nursing personnel evaluated the Falls CPG implementation for characteristics of change and several change process variables. Moreover, they provided recommendations for further implementation projects. Detailed information as to *implementation outcomes* is provided in Additional File 3. *Service outcomes* included increases in nursing personnel knowledge, their awareness of fall prevention, positive attitudes towards CPGs, the availability of new devices as well as changes in the surroundings. Detailed information on this and resource use (*implementation outcome*), which were the study's central outcomes, is provided in Breimaier et al. [22].

The CFIR as a template for content-analysis

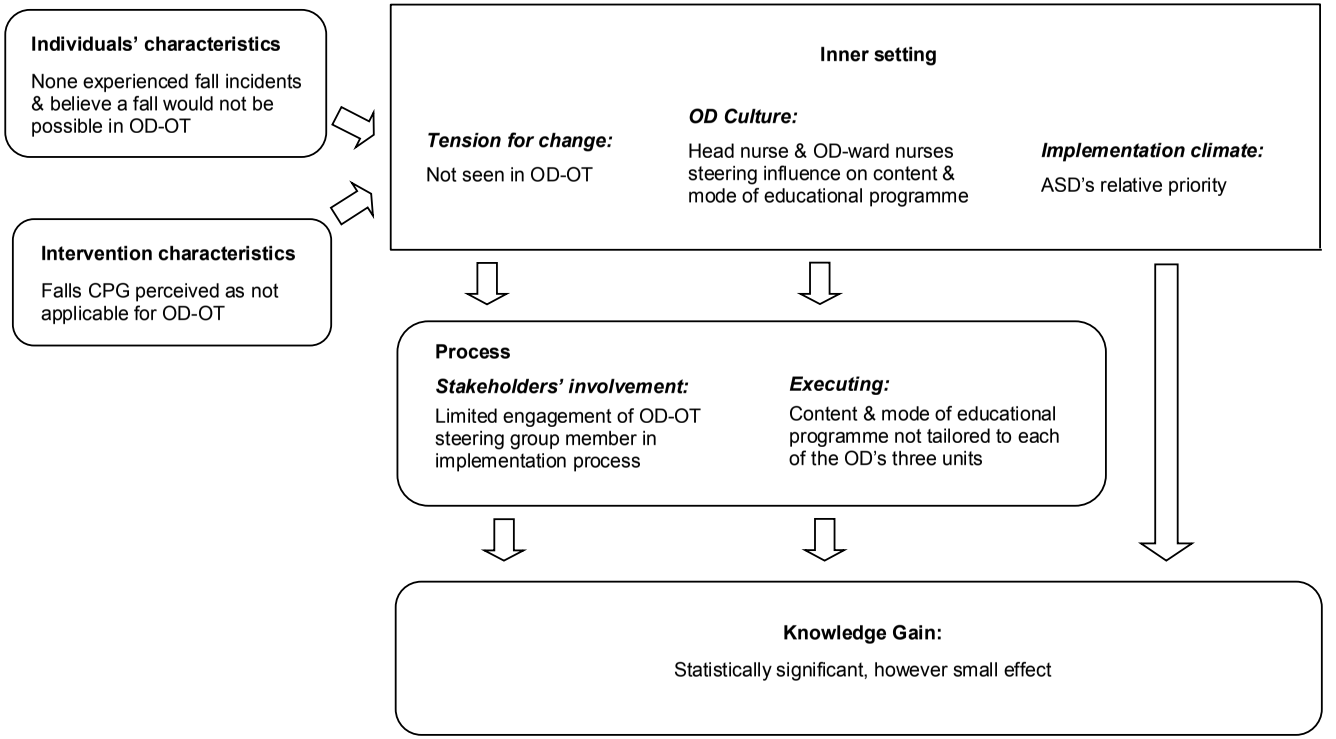
In general, the task of assigning text passages from the interviews and group discussions to their respective *CFIR* construct or sub-construct was unproblematic. The analysis of the first interviews (t1) however, revealed that the difference between *tension for change* and *relative priority* (domain *inner setting*, construct *implementation climate*) was not clear. Based on a closer look at the respective definition given by Damschroder et al. [11], the decision was made that *tension for change* would refer to the perspective of an individual person and *relative priority* to the perspective of the organisation (RD

15/12/2010, 05/01/2011). Furthermore, a close examination of the respective definition solved the initial problem of distinguishing between *adaptability* (domain *intervention characteristics*) and *compatibility* (domain *inner setting*) (RD 10/01/2011). Engagement or non-engagement expressed by interviewees (t2 & t3) could not clearly be assigned to either the *engaging* or to the *executing* construct (both constructs belong to the *process* domain). Based on a discussion between HEB and BH, a new sub-construct was created, *stakeholder involvement*. This sub-construct was finally assigned to the code *reflecting & evaluating* (domain *process*) as it reflected stakeholders' own perspective about their engagement in this project (RD 13, 22, 24 & 27/01/2012). *Stakeholder involvement* was subsequently defined as the way in which stakeholders were incorporated into the project. During the analysis of the final interviews (t3), no further problems arose regarding content categorisation.

The CFIR as a guide to interpret the main findings

When reflecting on why certain things worked (or did not), one has to consider that the intention behind implementing the Falls CPG was initially more of a top-down approach (RD 11/01/2010). However, the actual process, as initiated by HEB, was in fact a bottom-up approach that included management steering elements by the head nurse.

Overall, and bearing in mind the information pooled under the *CFIR's* domains and (sub-) constructs, this Falls CPG implementation project with its achieved outcomes can be considered successful and the applied multifaceted and tailored implementation strategies were effective. The gain in knowledge, which was one main outcome of the study, improved significantly ($p = .001$) between baseline and final assessment [22]. However, the increase totalled 4.1% and was therefore considered to be small. A closer look at those factors that were presumed to limit the gain of knowledge in nursing personnel provided an explanation for this phenomenon. Constructs of *intervention* and *individuals characteristics* had an influence on the *tension for change* construct. This construct together with OD *culture* (*inner setting* domain), influenced the two *process* constructs *stakeholders' involvement* and *executing*, respectively. These two *process* constructs together with *implementation climate* (*inner setting* domain) were presumed to negatively influence nursing personnel's gain in knowledge. An overview is given in Figure 3 and the factors are subsequently described.



ASD = Accident Surgery Department, CPG = clinical practice guideline, OD = Ophthalmic Department, OT = operation theatre

Figure 3 Limiting factors on nursing personnel's knowledge gain on fall prevention

A factor that should not be underestimated was the reservations about the project from within OD's operation theatre. OD nursing personnel hadn't experienced any patient falls in their working unit, and they believed that this would not happen due to the precautions they were taking (*characteristics of individuals* domain). Furthermore, they did not consider the Falls CPG to be applicable for their setting (*intervention characteristics* domain). For this reason a *tension for change* (*inner setting* domain) was not seen (interview data, t1). This contributed to the fact that, in general, the operation theatre remained a work unit with fewer activities regarding the implementation of the Falls CPG which was finally accepted by the head nurse (RD 10/05/2011). Furthermore, the representative could not always participate in the steering committee meetings (OD SGMMs) (*participants' involvement* construct, *process* domain).

A further limiting factor was seen in the steering influence of the head nurse and OD ward managers (culture construct, *inner setting* domain) on the mode and content of the OD's educational programme regarding the Falls CPG (executing construct, *process* domain) as described in Breimaier et al. [22]. ASD's *relative priority* (implementation climate domain) was the third presumed factor that limited gain of knowledge about fall prevention in nursing personnel: two other projects captured nursing personnel's attention and resources (RD 31/01/2011).

DISCUSSION

The present study was the first to apply and subsequently evaluate the *CFIR* for its comprehensiveness, applicability and usefulness within a large-scale CPG-implementation project in acute nursing care. Herein, the framework guided the assessment of context and process as well as the content-analysis of qualitative data. Moreover, it facilitated the organisation of influencing factors and outcomes and helped to explain the main findings. According to Powell et al. the *CFIR* provides one of the most comprehensive overviews of the key theories and conceptual models that inform implementation research and practice [19].

CFIR comprehensiveness

Presence or absence of necessary constructs

Applying the framework and its five domains and 39 underlying (sub-) constructs in the Falls CPG implementation helped all involved parties to get a comprehensive picture of the two participating departments' context and the implementation process. Ilott et al. concluded from their examination of the terminology's coherence that the framework offered a comprehensive structure and consistent terminology for scrutinising implementation in situ [20]. Yet, when applying the *CFIR* in this Fall CPG implementation project, it became apparent that the framework lacked important aspects for baseline assessment. Firstly, the framework did not consider that stakeholders, depending on their role within the organization, will have disparate ideas, aims, wishes and requirements regarding an innovation. These need to be taken into account and transparently discussed when designing a change process in order to win stakeholder acceptance and increase their involvement, but also to facilitate the identification and management of barriers and facilitators. The constructs *stakeholders' aims* and *stakeholders wishes/needs when implementing an innovation*, which were identified as being important in the present project, were lacking in the *CFIR*. The new constructs would enhance the *characteristics of individuals'* domain. According to its definition, individuals are, among other things, carriers of interests [11]

Secondly, the framework did not consider the fact that an innovation in healthcare is never introduced in a neutral environment devoid of pre-existing work practices or change strategies. To make the right choice regarding implementation strategies it is therefore essential to capture the starting point of an innovation, i.e. pre-existing structures and measures. It would make little sense to introduce pre-existing aspects that are already in line with recommendations of the guideline to be implemented. These may be strengthened if necessary, but to implement them again would not only be a waste of energy and resources in these days of constraints in the healthcare system, and it would probably also create opposition among those involved. Those impacted by change must be met wherever they happen to be at that particular point in time ([30], p. 219). To augment the baseline assessment, an additional construct, labelled *pre-established measures related to the intended innovation*, could be included as part of the *implementation climate* construct of the *inner setting* domain.

Since the nursing work environment is characterized by constant change, it was assumed that nursing personnel had previous experience with change processes and strategies. Including a setting's pre-established strategies for implementing an innovation could also increase the practical value of the framework, as this informs the implementers what might or might not be utilised in the implementation process and can provide tips for applicable implementation strategies. This additional construct could be included as a seventh construct to the *inner setting* domain. In this sense, the *CFIR* is in line with the recommendations of Ilott et al. [20]. The authors, however, suggest adding a sixth domain pertaining to practical strategies for the *CFIR*. From their point of view, these strategies could then be linked to the other five domains. They argue that specific knowledge translation strategies, like audits, for example, were implicit in some constructs – in this case within *goals & feedback* [20]. Powell et al. also argue that the *CFIR* suggests implicitly that "successful implementation may necessitate the use of an array of strategies that exert their effects at multiple levels of the implementation concept" ([19], p. 194). However, it is questionable whether possible implementation strategies should be added as a sixth domain to the *CFIR*. Existing lists, such as for example the framework for implementation interventions/strategies provided by the Cochrane *Effective Practice and Organisation of Care (EPOC)* Review Group [29] could be used and its strategies mapped to the *CFIR* constructs.

Definition of existing constructs

The *CFIR's* constructs have been criticized for being wide-ranging and multifaceted with some requiring more detailed descriptions [20]. This was particularly true for the *reflecting & evaluating* construct (*process* domain) which was defined as: "quantitative and qualitative feedback about the progress and quality of implementation accompanied with regular personal and team debriefing about progress and experience" [11]. This could be understood twofold: to continuously reflect and evaluate the ongoing process but also to assess the process at the end of the implementation project from the perspective of all involved parties. This idea is in line with implementation researchers, affiliated with Veterans Affairs (VA) Diabetes Quality Enhancement Research Initiative [31]. In the Falls CPG implementation project in question, both perspectives were used. Assessing the implementation process from participants' perspective may capture relevant aspects for further implementation endeavours in the same setting; for example, participant learning, perceived barriers and

facilitators, and views/recommendations on how to ensure sustainable implementation. Ilott et al. also regarded this *reflecting & evaluating* construct as premature, especially in view of its importance for achieving longer-term change [20]. Sustainability was regarded as a further important aspect lacking in the framework. However, any innovation that is not implemented sustainably would be “a waste of time, financial resources and leadership effort at a time of economic austerity” ([20], p. 8).

The underlying *engaging* construct (*process* domain) should not only include those persons with formal or informal power, but also all other stakeholders, as their support or opposition though often seemingly insignificant, nearly invisible contributions, can significantly influence the implementation process. As a group, they have the power to make or break the innovation process. This large, but often overlooked group of people must therefore be considered in the implementation process. According to Damschroder this will be included in the second version of the *CFIR* [31].

Including additional underlying constructs inevitably adds to the complexity of the framework [20]. One of its potential drawbacks is the *CFIR’s* complexity [15]. However, if it were used for various implementation projects in one setting, not every domain and underlying construct would need to be evaluated with each new implementation project. Once an in-depth assessment has been carried out within an organisation, the still valid knowledge can be used to inform new projects. Not assessing each *CFIR* construct every time is in line with existing literature: Damschroder and Hagedorn meanwhile suggest evaluating the list of *CFIR* constructs to determine those ones with highest applicability in the intended study. The assessment of the study could then focus on those relevant constructs [17]. Damschroder and Lowery concluded in a later paper that they would only include those twelve constructs for guiding future implementation if they differentiated between high and low implementation effectiveness [16].

CFIR applicability and usefulness

The CFIR as a guide to developing assessment questions and as a framework for revealing influencing factors on the implementation process

For the implementation project presented in this paper, the provided and added (sub-) constructs could be easily utilised for developing and compiling baseline, mid-term and final assessments. The majority of the constructs were clearly defined which facilitated the development of relevant questions with respect to the search for pre-existing instruments. This confirms Illot et al. who valued the *CFIR* as a "high-level conceptual framework that encompasses a range of concepts that are applicable to a wide variety of situations" ([20], p. 915).

The *CFIR* was chosen for the purpose of obtaining a comprehensive assessment of the initial situation and capturing barriers and facilitators at the beginning of and during the Falls CPG implementation process. The five domains and added constructs helped to grasp the complexity of implementing an innovation aimed at improving nursing practice in a teaching hospital setting. The *CFIR* also allowed one to capture the degree to which a change is directed from the top or emerges from the bottom of a hierarchy [15]. At the beginning of the project, nursing personnel expected a top-down approach for the implementation of the Falls CPG. Contrary to the general expectation, and in agreement with the head nurse, the Falls CPG was implemented using a participatory, i.e. bottom up, approach. Apart from a few steering elements introduced by the head nurse, for example the arrangement of the OD educational programme, a bottom-up approach was maintained throughout the course of the project. Furthermore, the *CFIR* increased researcher and participant awareness of critical topics like guideline *complexity* and *adaptability*, as well as the setting's *implementation climate* throughout the project. The final evaluation of the implementation process revealed that nursing personnel were satisfied with the proceeding and the achievements despite the difficulties and insecurity they experienced at the beginning of the project.

Applying the *CFIR* as a guide for assessing the implementation context not only helped to focus on interesting central results during the three data collection phases (t1 - t3) but also to focus on several factors presumed to be influential. Consequently, implementation outcomes could be obtained that might also be of interest for other potential implementers. Proctor et al. point

out that attention should be given to implementation outcomes in all studies of implementation to finally advance an evidence base around successful implementation [14].

The CFIR as a template for content-analysis and as a guide to interpret the main findings

The *CFIR*, with its added (sub-) constructs, could be easily utilised for guiding the qualitative data analysis within a prospective CPG implementation project. Furthermore, applying the *CFIR* taught researchers whether the employed implementation strategies were effective and why they worked or failed. Bringing together all data collected in the course of the project - i.e. qualitative and quantitative data, the main investigator's research diary records and steering group team meeting minutes - under the *CFIR* frame, interrelations between the *CFIR* domains and constructs became visible. This helped the researchers to explain the main findings.

Limitations

The principle limitation of this evaluation was that the assessment of how useful the *CFIR* actually was for guiding the implementation of a CPG during the course of implementation, that is the CFIR's comprehensiveness, applicability and usefulness, was performed retrospectively. It based on the main investigator's diary, steering group meeting minutes, qualitative and quantitative data to inform the main focus of the study as well as main investigator's post-hoc reflections instead of a thoroughly and prospectively planned research study with validated instruments/procedures.

CONCLUSIONS

The *CFIR* proved to be a valuable and helpful, although not exhaustive framework to assess the baseline, process and final state of a CPG implementation project. This framework should be supplemented with other important factors and local features to achieve a sound basis for the planning and realisation of an ongoing project. Furthermore, a clear definition of underlying constructs, for example *reflecting & evaluating*, facilitate using the *CFIR* to implement an innovation. The *CFIR* also proved to be both applicable and useful - for developing relevant interview and group discussion questions, compiling several data collection tools, analysing qualitative data, and organising the obtained

results into the *CFIR's* domains and underlying constructs which helps to explain and interpret outcomes of an implementation project.

Relevance to clinical practice and further research

The *CFIR* and the authors' proposed supplements can help nurse managers, other responsible staff and/or researchers to obtain a comprehensive overview of factors influencing an implementation project. It may also facilitate the contextualisation of findings, explanation of crucial elements in the process and assessment of final outcomes of an implementation project.

This evaluation provides valuable insights for further improvement of the general applicability and comprehensiveness of the *CFIR*, for example a clear definition of constructs. The *CFIR's* constructs themselves exceeded the scope of this evaluation. The validity of the *CFIR* constructs requires evaluation in further research projects. The results of the retrospective *CFIR* evaluation in question should be confirmed and refined through thoroughly planned prospective research.

ADDITIONAL FILES

Additional file 1: Data collection tools and data analysis. Description of questionnaires and semi-structured interview guides as well as mode of data analysis.

Additional file 2: Participants and setting. Description of nursing personnel's individual characteristics (demographics and other personal attributes, self-efficacy, individual identification with the organisation) including the response rates (t1 - t3) and of the setting (structural characteristics).

Additional file 3: Additional results regarding influencing factors of the Falls CPG implementation process and implementation outcomes. Further information based on interview and questionnaire data is provided regarding nursing personnel's aims, their wishes/needs regarding the Falls CPG implementation, pre-established measures to implement an innovation and fall preventive measures currently in place, as well as regarding *intervention characteristics (complexity, relative advantage), inner setting (networks & communications, readiness for implementation, culture, implementation climate)* and on *implementation outcomes*.

ABBREVIATIONS

ASD: Accident Surgery Department; CFIR: Consolidated Framework for Implementation Research; CPG: Clinical practice guideline; i.e: that is to say; OD: Ophthalmic Department; PAR: Participatory action research; RD: Research diary; SGMM: Steering-group-meeting minutes; t1: Baseline data collection; t2: Mid-term data collection; t3: Final data collection.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS CONTRIBUTIONS

HEB was responsible for the study conception and design, preparation of the questionnaires, implementation strategies, data collection, data analysis and manuscript drafting. BH contributed to developing the interview guide, to data interpretation and to revising the first draft for important intellectual content. RJGH and CL were responsible for the study conception and design and critical revisions of the manuscript for important intellectual content. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

We wish to thank all participating graduate and assistant nurses and the management of the two departments from the University Hospital Graz for their collaboration in preparing the project and during the implementation process as well as for spending their precious time in sharing their unique experiences with us.

FUNDING

The Austrian Federal Province of Styria: Land Steiermark, Abteilung 3 – Wissenschaft und Forschung (Project no.: A3-16.M-94/2010-15) financially supported this study.

REFERENCES

1. Stetler CB, Ritchie JA, Rycroft-Malone J, Schultz AA, Charns MP. Institutionalizing evidence-based practice: an organizational case study using a model of strategic change. *Implement Sci.* 2009;4:78. doi: 10.1186/1748-5908-4-78.
2. Hart P, Eaton LA, Buckner M, Morrow BN, Barrett DT, Fraser DD, Hooks D, Sharrer RL. Effectiveness of a computer-based educational program on nurses' knowledge, attitude, and skill level related to evidence-based practice. *Worldviews Evid Based Nurs.* 2008;5:75–84.
3. Kirshbaum M. Translation to practice: a randomised, controlled study of an evidence-based booklet for breast-care nurses in the United Kingdom. *Worldviews Evid Based Nurs.* 2008;5:60–74.
4. Ploeg J, Davies B, Edwards N, Gifford W, Miller PE. Factors influencing best-practice guideline implementation: lessons learned from administrators, nursing staff, and project leaders. *Worldviews Evid Based Nurs*. 2007;4:210–9.
5. Yagasaki K, Komatsu H. Preconditions for successful guideline implementation: perceptions of oncology nurses. *BMC Nurs.* 2011;10:23. doi: 10.1186/1472-6955-10-23.
6. van Achterberg T, Schoonhoven L, Grol R. Nursing implementation science: how evidence-based nursing requires evidence-based implementation. *J Nurs Scholarsh*. 2008;40:302–10.
7. Campbell M, Fitzpatrick R, Haines A, Kinmonth AL, Sandercock P, Spiegelhalter D, Tyrer P. Framework for design and evaluation of complex interventions to improve health. *BMJ.* 2000;321:694–6.
8. MRC, prepared on behalf of the medical Research Council (MRC) by Craig P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: new guidance. 2006. [www.mrc.ac.uk/complexinterventionsguidance].
9. Prior M, Guerin M, Grimmer-Somers K. The effectiveness of clinical guideline implementation strategies – a synthesis of systematic review findings. *J Eval Clin Pract.* 2008;14:88–97.
10. Boaz A, Baeza J, Fraser A and for the European Implementation Score Collaborative Group (EIS). Effective implementation of research into practice: an overview of systematic reviews of the health literature. *BMC Res Notes*. 2011;4:212. doi: 10.1186/1756-0500-4-212.
11. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50. doi: 10.1186/1748-5908-4-50.
12. Kirsh SR, Lawrence RH, Aron DC. Tailoring an intervention to the context and system redesign related to the intervention: a case study of implementing shared medical appointments for diabetes. *Implement Sci.* 2008;3:34. doi: 10.1186/1748-5908-3-34.
13. Baker R, Camosso-Stefinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S, Robertson N. Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2010;3. doi: 10.1002/14651858.CD005470.pub2.
14. Proctor E, Silmere H, Raghavan R, Hvmand P, Aarons G, Bunger A, Griffey R, Hensley M. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health*. 2011;38:65–76.
15. Sorensen JL, Kosten T. Developing the tools of implementation science in substance use disorders treatment: application of the Consolidated Framework for Implementation Research. *Psychol Addict Behav.* 2011;25:262–8.
16. Damschroder LJ, Lowery JC. Evaluation of a large-scale weight management progam using the Consolidated Framework for Implementation Research (CFIR). *Implement Sci.* 2012;8:51. doi: 10.1186/1748-5908-8-51.
17. Damschroder LJ, Hagedorn HJ. A guiding framework and approach for implementation research in substance use disorders treatment. *Psychol Addict Behav.* 2011;25:194–205.

18. Hartzler B, Lash SJ, Roll JM. Contingency management in substance abuse treatment: a structured review of the evidence for its transportability. *Drug Alcohol Depend.* 2012;122:1–10.
19. Powell BJ, Proctor EK, Glass JE. A systematic review of strategies for implementing empirically supported mental health interventions. *Res Soc Work Pract.* 2014;24:192–212.
20. Ilott I, Gerrish K, Booth A, Field B. Testing the Consolidated Framework for Implementation Research on health care innovations from South Yorkshire. *J Eval Clin Pract.* 2013;19:915–24.
21. Bachner D, Haas W, Semlitsch B, Schaffer S, Uhl C, Weiß R. *Evidence-based Leitlinie "Sturzprophylaxe für ältere und alte Menschen in Krankenhäusern und Langzeitpflegeeinrichtungen".* Graz: Steiermärkische Krankenanstaltengesellschaft mbH; 2009.
22. Breimaier HE, Halfens RJG, Lohrmann C. Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nurs.* 2015;14:18. doi: 10.1186/s12912-015-0064-z.
23. Grol RPTM, Bosch MC, Hulscher MEJL, Eccles MP, Wensing M. Planning and studying improvement in patient care: the use of theoretical perspectives. *Milbank Q.* 2007;85:93–138.
24. Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlane F, Peacock R. How to spread good ideas: a systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO). 2004. [http://www.netscc.ac.uk/hsdr/files/project/SDO_FR_08-1201-038_V01.pdf].
25. Leykum LK, Pugh JA, Lanham HJ, Harmon J, McDaniel Jr RR. Implementation research design: integrating participatory action research into randomized controlled trials. *Implement Sci.* 2009;4:69. doi: 10.1186/1748-5908-4-69.
26. Waterman H, Tillen D, Dickson R, de Koning K. Action research: a systematic review and guidance for assessment. *Health Technol Assess.* 2001;5:23.
27. Carr W, Kemmis S. *Becoming critical. Education, knowledge and action research.* Reprint, Victoria: Deakin University Press; 1990.
28. Dick B. *A beginner's guide to action research.* 2000. [http://www.uq.net.au/action_research/arp/guide.html].
29. Cochrane Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist. 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].
30. Gomez P, Probst G. *Die Praxis des ganzheitlichen Problemlösens. Vernetzt denken. Unternehmerisch handeln. Persönlich überzeugen.* Bern: Haupt Verlag; 1999.
31. Damschroder LJ: CFIR Taxonomy. CFIR Wiki (last modified on 29 August 2014). [http://cfirwiki.net/wiki/index.php?title=CFIR_Taxonomy].

ADDITIONAL FILES

Additional file 1: Data collection tools and data analysis.

Data collection tools

The *Consolidated Framework for Implementation Research (CFIR)* [1] determined the focus for each data collection point. At the baseline (t1), the aim was to assess influencing factors for the intervention (guideline implementation), with emphasis on intervention characteristics (e.g. familiarity with the falls CPG), inner and outer settings (e.g. culture of the organisation, peer pressure) as well as characteristics of the individuals (e.g. demographics). The *process* domain with the focus on the evaluation of the implementation process from participants' perspective was introduced at mid-term (t2) and was the main focus for the final data collection (t3). Data were collected via questionnaire, group discussion and semi-structured interview. The questionnaires (t1 & t2) included 13 closed-ended questions regarding personal attributes, two closed-ended questions regarding the Falls CPG and five instruments on participant attitudes towards guidelines, fall preventive knowledge, organisational culture and organisational learning capability. Internal reliability as reflected by Cronbach alpha measures is presented with the tables of the results gained from the respective instruments. The questionnaire for the final data collection additionally included an aggregation of six instruments focussing on several aspects of the implementation process and its consequences. More details are presented in Table 1 where these quantitative measures were also mapped to the *CFIR*.

Interview guides for the semi-structured interviews and discussions were based on the *CFIR* framework and featured open-ended questions pertaining to each respective implementation stage. Table 2 presents the *CFIR* domains focussed on at each data collection time point with respective examples. In order to have a second opinion from a nurse expert familiar with qualitative research, BH reviewed and discussed the content of the interview guides (t2 and t3) with HEB regarding relevance. The final questions were determined by consensus. All discussions and interviews were audio taped and verbally transcribed either by the primary investigator or a research assistant. All transcripts were reviewed for accuracy and proofread by HEB.

Table 1 Quantitative measures mapped to the *Consolidated Framework for Implementation Research (CFIR)* domains

***CFIR* domains**	**Quantitative measures used for assessing influencing factors within the Falls CPG implementation process**
Characteristics of the individuals*	*Closed-ended demographics questions:* age, gender, profession, department *Other personal attributes:* experienced fall incidence in nursing career; work experience in current position; part-time employment; year of diploma; participation in further training (nursing science, nursing research, evidence-based nursing); inclusion of research relevant aspects in nursing education; frequency of reading research articles; and participation at baseline and/or mid-term data collection *General Self-Efficacy Scale:* measuring participants' self-efficacy. The scale features 10 items on a 4-point Likert scale from 1 = *not at all true* to 4 = *exactly true* [2]. The individual response scores were totalled and divided by ten. The final composite score ranged from 1.0 to 4.0. A higher score reflected a person's more optimistic persuasion. The scale was accessible for free in German [3]. *Nursing personnel's knowledge:* 13 items (7 single- and 6 multiple-choice items, 81 answer options), developed for this study, measured nursing personnel knowledge about the guideline in terms of risk of falls, fall prevention and recommended measures. Further information is provided in Breimaier et al. [4]. *Attitudes Towards Guidelines Scale:* to measure nursing personnel's attitudes towards guidelines. The scale consists of seven subscales: *general attitude, usefulness, reliability, lack of individual or team competence, lack of organisational competence, impracticality* and *availability*. Each subscale consists of two Likert-scaled items from 1 = *strongly disagree* to 4 = *strongly agree* [5]. The translation process is described in Breimaier et al. [4].
Inner setting*	*Competing Values Framework (CVF):* The organisational culture of the two participating departments was measured on this 20-item instrument [6] with a 4-point Likert scale (1 = *does not apply*; 4 = *applies*). Four different but equivalent organisational cultures were able to be distinguished [6, 7]: 1. *group culture:* the values and norms emphasised are associated with affiliation, teamwork and participation 2. *developmental culture*: characterised by the promotion of risk taking in conjunction with innovation and change 3. *hierarchical culture*: emphasis on stability, rules, policies and regulations; it reflects the norms and values associated with bureaucracy 4. *rational culture*: emphasis on efficiency and achievement Each culture is composed of five statements regarding *group character, leadership style, cohesion, strategic emphasis* and *rewards of a group* [8]. Permission to use this instrument was obtained from the developer. The translation proceeded according to the five steps described by Beaton et al. [9], but only used one native English translator.

	Organisational Learning Survey (OLS) Instrument: The organisational learning capability of the two departments was measured using 21 items on a 5-point Likert scale (from 1 = *strongly disagree* to 5 = *strongly agree*) [10]. The five key conditions measured are defined according to Goh and Richards as following ([10], p. 578): 1. *Clarity of purpose and mission* (4 items): The degree to which nursing personnel have a clear vision/mission of the organisation and understand how they can contribute to its success and achievement. 2. *Leadership commitment and empowerment* (5 items): The role of the nursing director, head and ward managers in the organisation with respect to helping nursing personnel learn and elicit behaviours that are consistent with an experimenting and changing culture. 3. *Experimentation and rewards* (5 items): The degree of freedom nursing personnel enjoy in the pursuit of new ways of getting the job done and freedom to take risks. 4. *Transfer of knowledge* (4 items): The systems that enable nursing personnel to learn from others, from past failures and from other organisations. 5. *Teamwork and group problem solving* (3 items): The degree of interdisciplinary teamwork in the organisation to solve problems and generate new and innovative ideas. The developers gave their permission to use this instrument and the translation followed the same procedure described above.
Process evaluation**	The guideline implementation process was evaluated with an instrument developed by Caldwell et al [11]. Its six parts are: *characteristics of the change process* (10 items); e*xtent of work unit change* (3 items); *consequence of guideline implementation* (4 items); *individual job impact* (6 items); *demands-abilities (person-job) fit* and *values-congruence (person-organisation) fit* (each 2 items) [11]. The Likert scale ranged from 1 = *strongly disagree* to 5 = *strongly agree*. Caldwell gave permission to use and adapt the instrument to the nursing context. The translation process followed the above-described procedure. A further question asked whether the educational meetings had been supportive in implementing the Falls CPG. The Likert scale ranged from 1 = *strongly disagree* to 5 = *strongly agree.*

* Asked at all three data collection time points (t1 - t3)
** Asked at the final data collection time point (t3)

At baseline (t1), general information regarding features of the setting (*inner setting* domain, *structural characteristics* construct) were obtained from the head nurse, including number of beds, employed nursing personnel, staff turnover, patient length of stay and the patients' condition. To evaluate the ongoing implementation process within the steering group meetings, the discussions were recorded digitally and summarized in the respective protocol.

Table 2 Topics of interview guidelines mapped to the Consolidated Framework for Implementation Research (CFIR) domains

Data collection point	Foci of semi-structured interview guides with examples
Baseline (t1)	*Characteristics of intervention* Participant's perception of the issue, familiarity with the Falls CPG content, anticipated benefits *Inner setting* Local workflow and communication channels, workload, teamwork, tension for change *Characteristics of the individuals* Participants' expectations of the implementation of the Falls CPG *Additional relevant information* - Stakeholders' aims for implementing the Falls CPG - Stakeholders' wishes/needs for the implementation of the Falls CPG - Pre-established measures for preventing falls - Pre-established strategies for implementing an innovation
Mid-term (t2)	*Characteristics of the intervention* Applicability and fit of the content/measures introduced, perceived time investment into the implementation process *Inner setting* Transparency of the process; participant satisfaction with goals already achieved, opportunity to bring in own ideas and/or critique *Characteristics of individuals* Knowledge related to and attitude towards the Falls CPG, change in own mode of work P*rocess* Interviewee satisfaction with the progress of the implementation; its impact on daily work; emerging difficulties; perceived benefits; perceived changes; recommendations for further implementation projects
Final data collection (t3)	*Characteristics of intervention* Nursing personnel's perception about source and quality of the Falls CPG; to what degree the Falls CPG is adapted, applicable and useful; familiarity with the Falls CPG; perceived time investment into the implementation process *Inner setting* Access to the Falls CPG and materials compiled during steering group meetings *Characteristics of individuals* Knowledge related to and attitude towards the Falls CPG *Process* Participant's thoughts on the implementation process; perceived difficulties and changes; meeting of expectations; satisfaction with the implementation strategies, perceived changes

Data analysis

Quantitative data were analysed descriptively (mean, standard deviation, percentages, frequency count) and managed with PASW Statistics for Windows, Version 18 (t1) / IBM SPSS Statistics for Windows, Version 20 (t3).

Qualitative data were content-analysed as described below and managed with MAXQDA 10. The *CFIR*, supplemented with the four constructs *stakeholders aims, stakeholders wishes/needs when implementing an innovation, pre-established fall prevention measures* and *pre-established strategies for implementing an innovation,* provided a template for the analysis. The unit of analysis was made up of the two participating departments and the meaning units were sentences containing related aspects regarding content and context [12]. As a first step, the manifest content [12] of each transcript was categorised using the *CFIR* and the four supplemental (sub-) constructs and their content were summarised as a memo. If additional interview data were found by the researchers to be relevant for the implementation process but did not fit into the already existing (sub-) constructs, additional (sub-) constructs were added in the course of the analysis process, like, for example, *participants' involvement*. Secondly, the memos from all interviews and all discussions at the data collection time point were scrutinised for commonalities and were subsequently labelled and summarized. The content categorised into the *learning effect* construct (*process* domain) revealed, for example, that participants perceived learning effects regarding the comprehensibility of the Falls CPG; further devices to prevent falls; the change process, and insights into nursing science and research. To strengthen the credibility of data categorisation, member checks were done after baseline data were analysed. Participants confirmed that their views were reflected in the proposed constructs. Mid-term and final data categorisation (step 1 and step 2) were counterchecked by BH. Discrepancies were discussed between HEB and BH until agreement was reached [11].

References

1. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50. doi: 10.1186/1748-5908-4-50.
2. Jerusalem M, Schwarzer R. Allgemeine Selbstwirksamkeitserwartung SWE [userpage.fu-berlin.de/health/germscal.htm].

3. Schwarzer R, Jerusalem M. The General Self-Efficacy Scale (GSE). [userpage.fu-berlin.de/health/germscal.htm].
4. Breimaier HE, Halfens RJG, Lohrmann C. Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nurs.* 2015;14:18. doi: 10.1186/s12912-015-0064-z.
5. Elovainio M, Eccles M, Mäkelä M. Attitudes towards guidelines and a scale for measuring them. In: Thorsen T, Mäkelä M, editors. *Changing professional practice. Theory and practice of clinical guidelines implementation.* Copenhagen: Danish Institute for Health Services Research and Development; 1999. p. 153–67.
6. Shortell SM, Zazzali JL, Burns LR, Alexander JA, Gillies R, Budetti PP, Waters TM, Zuckerman HS. Implementing evidence-based medicine. The role of market pressures, compensation incentives, and culture in physician organizations. *Med Care.* 2001;39:I-62–78.
7. Shortell SM. Quality improvement implementation survey II. Berkeley: University of California; 1992. [http://shortellresearch.berkeley.edu/CABG_THR/QUALIMP9_1queALL_ssc.doc].
8. Shortell SM, Marsteller JA, Lin M, Pearson ML, Wu S-Y, Mendel P, Cretin S, Rosen M. The role of perceived team effectiveness in improving chronic illness care. *Med Care.* 2004;42:1040–8.
9. Beaton DE, Bombardier C, Guillemin F, Bosi Ferraz M. Guidelines for the process of cross-cultural adaptation of self-report measures. *SPINE*. 2000;25:3186–91.
10. Goh S, Richards G. Benchmarking the learning capability of organizations. *Eur Manag J.* 1997;15:575–83.
11. Caldwell SD, Herold DM, Fedor DB. Toward an understanding of the relationships among organizational change, individual differences, and changes in person-environment fit: a cross-level study. J Appl Psychol. 2004;89:868–82.
12. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today.* 2004;24:105–12.

Additional file 2: Participants and setting.

Participating nursing personnel

Response rates

Response rates at all three data collection time points (t1 = baseline, t2 = mid-term, t3 = final) were high (Table 1).

Table 1 Response rates at baseline, mid-term and final data collection

Time of data collection	Nursing personnel available	Participating nursing personnel	Response rate
t1	128	106	82.8%
t2	117	111	94.9%
t3	116	110	94.8%

Characteristics of individuals

Individual characteristics include demographics and *other personal attributes* (Table 2), *knowledge and beliefs about the intervention* (see Breimaier et al. [1]), *self-efficacy* and *individual identification with the organisation*.

Demographics and other personal attributes: Participants were on average 38 years old, female and had little to moderate knowledge of nursing science and research. The majority of graduate nurses had graduated before the introduction of nursing science into the nursing curricula and thus had little awareness of or further training in nursing science, nursing research and evidence based nursing. Furthermore, they seldom read research articles (see Table 2).

Self-efficacy: Participants' self-efficacy rating barely changed throughout the data collection period (t1 - t3). The means and standard deviations were: t1 (n = 98): 3.08 / 0.363; t2 (n = 103): 3.01 / 0.461 and t3 (n = 100): 3.03 / 0.359. This perception was confirmed by interviewees (t1) who were confident in mastering the change. One interviewee reported:

Table 2 Demographics and other personal attributes of participants at t1 - t3

Demographics and personal attributes	**t1 (n)**	**t2 (n)**	**t3 (n)**
Age (years):	(102)	(100)	(99)
mean	38.97	38.33	38.27
standard deviation	10.57	11.21	10.42
< 20 - < 30	23.5%	28.0%	25.3%
30 - < 40	22.6%	20.0%	26.3%
40 - < 50	34.3%	31.0%	31.3%
50 - 65	19.6%	21.0%	17.2%
Gender:	(105)	(109)	(104)
female	93.3%	92.7%	94.2%
Profession:	(104)	(110)	(105)
graduate nurse	66.3%	63.6%	74.3%
assistant nurse	33.7%	36.4%	25.7%
Department:	(106)	(111)	(110)
Ophthalmic	65.1%	73.0%	68.2%
Accident Surgery	34.9%	27.0%	31.8%
Experienced fall incidence in nursing career:	(105)	(111)	(110)
yes	73.3%	70.3%	80.0%
Work experience in current position:	(101)	(108)	(104)
< 2 years	18.8%	25.0%	21.2%
2 - < 5 years	10.9%	12.0%	13.5%
5- < 10 years	14.9%	15.7%	21.2%
≥ 10 years	55.4%	47.2%	44.2%
Part-time employment:	(104)	(108)	(103)
yes	32.7%	39.8%	40.8%
Year of diploma:	(69)	(68)	(77)
<2001	66.7%	58.8%	54.5%
≥2001	33.3%	41.2%	45.5%
Further training in:	(68)	(68)	(75)
nursing science	23.5%	17.6%	25.3%
nursing research	20.6%	19.1%	24.0%
evidence-based nursing	26.5%	32.3%	28.0%
no further training	58.8%	60.3%	56.0%
Inclusion of research relevant aspects in nursing education: yes	(67) 62.2%	(68) 69.1%	(74) 74.3%
Extent of inclusion:	(41)	(46)	(55)
high	0.0%	10.9 %	14.5%
moderate	41.5%	43.5%	41.8%
low	58.5%	45.7%	43.6%

Frequency of reading research articles:	(68)	(69)	(77)
never	5.9%	7.2%	5.2%
once or twice a year	51.5%	27.5%	29.9%
every 2 to 3 months	18.8%	41.4%	29.9%
once a month	14.5%	10.1%	16.9%
twice a month	4.3%	4.3%	14.3%
once a week	4.3%	5.8%	2.6%
several times a week	0.0%	2.9%	1.3%
Participation:		(109)	(94)
at baseline (t1)		79.8%	72.3%
at mid-term (t2)		--	76.6%
neither		--	10.6%

I'd say on the whole I am able to gauge my colleagues very well. I do believe everybody brings their own personality, their own, I use the word resources again, their knowledge. I do believe that with each and everyone's own personality, it is perfectly feasible to put something like this project into practice (t1_8_281).

Initially, however, the open approach to implementing the Falls CPG caused substantial uncertainty among nursing personnel. As the intention was to develop the implementation process together with all stakeholders, the implementation steps and the position/role to be taken by participants could not be predefined from the outset - however, nursing personnel expected a more or less top-down approach. For this reason, at the beginning, participants perceived the project as lacking clear organisational direction. Participants felt an intangible insecurity about this change process:

I honestly have to say this. And somehow, my own powerlessness in this context, which I feel somewhat, actually bothers me (t1_4_395).

Individual identification with the organisation: The majority of participants had more than 10 years of experience working in the same place (Table 2) and some even more than 20 up to over 30 years (t1_1_1; t3_7_465). Yearly staff turnover in the Ophthalmic Department (OD) was less than 10% whereas in the Accident Surgery Department (ASD) it was approximately 22% (see Table 3).

Description of the setting

Structural characteristics

Features of the setting are outlined in Table 3. Both departments were led by one head nurse who assumed responsibility for the OD four months prior to the start of the project. The OD itself was undergoing major restructuring at the time: two wards had been amalgamated into one and a further ward was in transition from an inpatient to a day-surgery ward (t3_12_112).

Table 3 Features of the setting (t1)

Features	Ophthalmologic Department	Accident Surgery Department
Size	Three wards; outpatient clinic; operation theatre	One ward
Number of beds	58 beds one- and two-bed rooms	56 beds one-, two-, three- and six-bed rooms
Building	A spacious, light-flooded building in an art-nouveau style	A closely spaced, functional, multi-story concrete building from the 1970s
Employed nursing personnel	62 graduate nurses 36 assistant nurses	29 graduate nurses 15 assistant nurses
Staff turnover	Normally less than 10%. After a long period of staff consistency, there were several changes shortly before and at the beginning of the implementation project. Several nurses, including two ward managers and the responsible head nurse retired from the OD with a short interim solution.	Staff turnover was normally about 10 people a year (approximately 22%).
Patient length of stay	In general about 2 days to one week; occasionally a few hours in the case of day-surgery	In general about 3 days up to one month
Patients	A great variety of eye diseases including blindness	All kinds of (poly-)traumas, fractures, head injuries, ligament lesions, joint replacements or arthroscopy

References

1. Breimaier HE, Halfens RJG, Lohrmann C. Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nurs.* 2015;14:18. doi: 10.1186/s12912-015-0064-z.

Additional file 3: Additional results regarding influencing factors of the Falls CPG implementation process and implementation outcomes.

Results of nursing personnel's aims, wishes and needs as well as pre-established implementation strategies and fall preventive measures in place

The results are based on baseline (t1) interview data.

Nursing personnel's aims, wishes and needs

Nursing personnel's aims with regard to the Falls CPG implementation covered, among others, a reduction of falls and their consequences; more knowledge regarding fall prevention and how to record a patient fall as well as having adequate means/devices and staff to adhere to fall-prevention recommendations. For more details see Breimaier et al. [1]. Participant wishes/needs for the implementation of the Falls CPG comprised particularly education - for example, receiving information about risk factors or legal aspects of restrains. With regard to the innovation itself they firstly requested clarification regarding the need to implement the Falls CPG and its purpose, and secondly, to receive a guideline in the end that would be practical, self-explanatory and easy to work with.

Pre-established strategies for implementing an innovation and fall preventive measures

Strategies to implement an innovation that were already established in both departments included discussions during team meetings; written information; establishing a steering group for the planning and implementation of more elaborate innovations; assessing the innovation for its suitability for the intended purpose during a test phase; and, based on this assessment, making a decision whether to further pursue or discontinue the innovation. Furthermore, the ASD ward manager, for example, observed during the weekly ward rounds whether new information was adhered to in the planning of patient care. This provided an indication to use audit and feedback as an implementation strategy tailored to organisational structures in place. Regarding existing fall preventing measures, participants emphasised that they had already undertaken many measures to prevent falls. They asked about previous falls, escorted patients with walking difficulties and ensured that no unnecessary items were left in a patient's room or in the corridor.

Additional results of main influencing factors in the Falls CPG implementation process

Additional results from questionnaire and interview data regarding main influencing factors in the two *CFIR* domains *characteristics of the intervention* and *inner setting* are provided below.

Intervention characteristics

Although it deals with a routine subject of daily nursing practice, the Falls CPG was criticized for its *complexity*: Nursing personnel found the document to be too lengthy, difficult to apply and too complicated. Staff hat to re-read parts of the document several times to fully grasp their meaning (interview data, t1). One interviewee remarked:

There are certain parts that I recall having had to read two to three times (t1_16_101).

Another one stated:

Y*ou really had to read carefully.* [...] *You can't be focussed enough during the night shift and during the day you really don't have time* [to read]. *All that's left pretty much is reading it at home and not everyone would do that. You really have to intensify your understanding in this area. Either way you have to deal with it and read it more than once* [in order to understand it] (t1_11_137).

Opinions on the *relative advantage* of the implementation project were diverse (interview data, t1). Quite a few interviewees saw no need to implement the Falls CPG. They felt that they were already working carefully and had not recently witnessed falls in their working unit (Ophthalmic Department (OD) operation theatre). Others saw potential in the areas of

(1) reducing falls, variations in patient information, nursing practice, and documentation of fall prevention:

[It helps] *that we can look things up, that we have something concrete* [to refer to], *and that everybody can thus do the same. This is important to me, because patients are constantly becoming more critical, also towards care personnel, and if everybody does something different, that's not good. If five or six* [staff] *come to a patient and everybody does the same thing, it is surely*

better. And that is the good thing about having something to read up on for each particular [care] *activity* (t1_17_236).

Another participant commented in the same vein:

I see an advantage in that we work in a more standardised way. If we have something like a framework, and the resources to put this into practice, it [the care] *becomes more standardised. And this surely leads to fewer falls* (t1_1_303).

(2) Interviewees also expected to have more devices to prevent falls: *Then of course* [..] *that I also have any necessary aids at my disposal* (t1_2_226).

(3) Further potential for improvement was identified in enhancing one's own knowledge and making the work done in connection with fall prevention visible:

There is obviously a different kind of awareness that has come back. Also, paying more attention to things to make sure that falls can be prevented. But, perhaps, also just to better respond to the patient's individual needs. This is of course assessed in the patient history. But I believe that the awareness just being there, that all of that is important. That this becomes automatic [laughter] *for people and that then maybe it will become the norm. I believe that we already do so much, but the problem is that we are just not aware of it* (t1_6_118).

Inner setting

Further information regarding the four constructs *networks & communication, readiness for implementation, culture* and *implementation climate* is provided.

(1) *Networks & communications* (interview data, t1). Networking and communication were generally considered to be good/very good and supportive in both departments with effective co-operation and the exchange of information within and between teams and their ward managers, as well as between ward managers and the head nurse. Overall, team members felt well informed. Team spirit and teamwork were strong. One participant remarked: [we] *all act in concert with one another* (t1_2_290).

(2) *Readiness for implementation* with regard to two sub-constructs (interview data, t1). *Leadership engagement*: From the staff's point of view the ward managers and the head nurse were seen as very supportive people with an open ear for their staff and interested in the well-being of patients. One interviewee said:

I do believe that the leadership is very interested in us implementing this. They communicate that not as in 'you have to do this now'; instead they explain how important it is (t1_12_200).

The head nurse was perceived as being completely involved in the department's processes and as able to take necessary action. The head nurse herself believed in and was enthusiastic about the Falls CPG implementation. She saw herself as a key person who could offer support for the steering groups and who could forward what had been compiled in these groups to the nursing director. Prior to the official project start she organised a meeting with ward managers and another with steering group members to discuss expectations and possible benefits of the project. Steering group members were included based on mutual agreement between head nurse, the respective ward manager and staff members. The head nurse had already introduced a fall protocol in the Accident Surgery Department (ASD) and wanted to reactivate and elaborate on this to include it in the OD within the implementation of the Falls CPG.

Available resources: No extra budget was available for the Falls CPG implementation project. However in spite of a high workload in both departments, the time-resources were allocated for implementing the Falls CPG, as every staff member was assumed to be making all possible efforts to advance improvements for patients. A limited number of fall-preventive devices were available. Space to keep walkways free of furniture or patient property, like wheelchairs - was limited especially in the ASD.

(3) *Culture* (questionnaire and interview data, t1 - t3). The majority of participants perceived the type of organisational culture to be a group culture, but almost as many identified the culture as hierarchical (Table 1). This result remained the same across all data collection points (t1 - t3). Predominantly those interviewees (t1) employed in the OD expressed that the team felt "like a family". One interviewee emphasised that although she was only a small wheel in the system, she was aware that the whole system only could func-

tion when all wheels worked properly (t2_6_465). ASD nursing personnel took a slightly different view (t1) due to workload, size of the ward and staff fluctuation. Nevertheless, the ASD nursing personnel also emphasized that the workload was only manageable thanks to their team spirit:

All in all, I reckon, good to very good. Of course, there are always colleagues who cause a bit of [hesitates] *trouble, but on the whole, because it is such a big ward, we know that we can only work if we stick together* (t1_1_536).

The internal consistency for the four subscales of the organisational culture instrument resulted in 0.81 (*group culture*), 0.53 (*developmental culture*), 0.47 (*hierarchical culture*) and 0.37 (*rational culture*), respectively (t1).

(4) *Implementation climate* (questionnaire and interview data, t1 - t3). All in all, the climate for implementing the Falls CPG seemed to be positive, yet there were some barriers. The main influencing factors have been allocated to three sub-constructs: *tension for change, relative priority* and *learning climate*.

Table 1 Organisational culture at t1 - t3

	t1			t2			t3		
Type of culture	**N**	**Mean**	**SD***	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**
Group	95	3.10	0.629	99	2.97	0.705	103	2.84	0.729
Developmental	94	2.39	0.458	95	2.38	0.525	101	2.31	0.439
Hierarchical	93	2.74	0.437	98	2.71	0.458	105	2.79	0.483
Rational	90	2.60	0.426	96	2.55	0.394	102	2.58	0.410

*SD = standard deviation

The *tension for change* (interview data, t1) in daily practice appeared to be a low priority for the nursing personnel:

It is, as I have mentioned before, still a topic for us that is not really being addressed. It exists, and it is self-evident for us, but maybe it is not really such an important topic (t1_7_230).

The nursing personnel felt they had already employed a satisfactory number of measures to prevent patient falls:

We actually see it this way. We already take most of the measures that are presumably now being written down or elaborated upon in this guideline. It's

just that we don't work with guidelines. We work on the basis of our experience and those measures that we have always employed anyway. Because we know when we have to be vigilant; I believe that (t1_3_124).

Moreover, participants believed they already adhered to the Falls CPG:

I don't know. Perhaps it is a bit different in other departments. In our department, I think it [the Falls CPG] *is being put into practice* (t1_7_19).

Another one stated:

[..] *this is actually difficult, because we basically already work according to* [a guideline]. *Not actually according to this particular guideline, but we always assess the patient as to the risk of a fall, whether one can anticipate this happening or not. I think that you can already see this when they come in; they come with a cane, on crutches, or with relatives* (t1_12_17).

On this basis, participants could not envision further measures:

Well, I think we already do a lot anyway. At the moment I wouldn't know what else to suggest for us to do in addition [to what we already do] (t1_12_42).

Although 50% (n = 106) of all participants had witnessed a fall incident within the 12 months prior to t1 (questionnaire data), the frequency of falls was perceived to be low (interview data, t1). However, no official detailed statistics on fall incidents were available within the departments. Participants from the OD's outpatient clinic perceived the Falls CPG as less applicable to their working unit. OD theatre nursing personnel felt that the risk of a fall was not an issue and thus saw no need for change:

There is nothing for us to implement in this respect, because patients never set foot on the ground (t2_16_6).

The *relative priority* - the participants' shared perception of the importance of the Falls CPG implementation - was modest (interview data, t1). The Falls CPG were initially disseminated across the hospital in 2009 with the request that nursing personnel read it:

People should know that the Falls CPG exists and have read it. [We] *never talked about it again* [...] *though, because we had enough other issues to deal with* (t1_18_267).

When the Falls CPG project commenced, nursing personnel had been feeling slightly tired of change due to other projects running parallel to this one: ASD nursing personnel were working on two additional projects (pain management and patient mobilisation); OD nursing personnel had just finished a comprehensive quality assessment. They did not expect novelty from the Falls CPG implementation and thus prioritized other topics:

There are other issues that are also very important or even more important than this implementation (t1_16_111).

Across all time points, the *learning climate*, assessed through the Organisational Learning Survey instrument (questionnaire data, t1 - t3), appeared favourable, especially regarding *leadership, experimentation and rewards*, and *transfer of knowledge*, yet it was less positive pertaining to *clarity of purpose and mission*, and (interdisciplinary) *teamwork and group problem solving* (Table 2). Participants felt that they were always given the opportunity to express their views and ideas prior to the introduction of new work practices (interview data, t2).

It has always been this way, so it happens automatically. We always communicate with each other. And if someone has an idea, it is always taken into consideration (t2_4_87).

Table 2 Organisational learning capability at t1 - t3

Organisation characteristics	t1			t2			t3		
	N	Mean	SD*	N	Mean	SD	N	Mean	SD
Purpose & mission	92	3.60	0.602	100	3.58	0.549	101	3.64	0.648
Leadership	94	4.02	0.781	102	4.07	0.994	105	3.83	0.857
Experimentation	98	3.97	0.700	105	3.91	0.789	101	3.74	0.913
Knowledge transfer	101	3.95	0.631	107	3.89	0.725	102	3.76	0.752
Teamwork	89	3.35	0.829	94	3.30	0.842	94	3.22	0.849

*SD = standard deviation

The internal consistency for the five subscales of the organisational learning capability instrument resulted in 0.31 (*purpose & mission*), 0.75 (*leadership*), 0.74 (*experimentation*), 0.59 (*knowledge transfer*) and 0.55 (*teamwork*), respectively (t1).

Implementation outcomes

Feasibility of the implemented

Interview data (t2 & t3) revealed that the implemented changes were appropriate for the respective working unit and easily applicable in daily nursing practice. One interviewee remarked: *Yes, they were all practice-related things, and that worked really well* (t3_2_16). Another one commented: *One can actually really use it* (t3_1_131). Especially the nursing assistants appreciated the additional acquired devices as *beforehand it had been really a big struggle* (t2_12_128). One assistant nurse stated: *actually I am getting by with it really well. There's no additional work* (t3_15_130), and her colleague added: *it's a relief* (t3_16_132).

Contentedness with the implemented

Participants (interview data t2 & t3) were highly satisfied with the results, and at the end of the implementation project interviewees regarded the Falls CPG as having been successfully implemented and firmly established in their daily work. One participant commented: *You live and breathe this* [the Falls CPG] *if you work with it every step of the way* (t2_5_334). Nursing personnel was especially satisfied with the purchase of devices to facilitate patient care. Furthermore, they found that their awareness of fall prevention had increased, that they had realised the Falls CPG's usefulness and advantage, and that they had learned from the project. They appreciated the simplicity of the changes and the user-friendliness of the new devices. They particularly valued management who became aware of their previous performance and engagement in fall prevention through the project. Although the Falls CPG was not regarded as equally relevant for all work units, at the end of the project, nursing personnel in the outpatient clinic rated it as more relevant than they did at its beginning. In conclusion, participants found that all their requirements and wishes had been met and that the output had actually exceeded their expectations (interview data, t2 & t3). One participant pointed out:

Well, I can only say once more that I am surprised that this has happened the way it has. As a matter of fact I had, I had actually expected less (t2_12_302).

From the perspective of the operation theatre nursing personnel, however, the Falls CPG bore no relevance to their daily work (interview data, t3).

Gaining insight into a nursing research project was seen as a positive side-effect, as these two statements illustrate:

(1) *I have to say that I don't know if I would participate again because there are so many young colleagues who have a much longer future ahead of them in this job than I do. I would surely also wish for them to have this experience, it is interesting. You gain a lot that you can possibly use later; it doesn't matter how, in working groups or other places. One just gains certain experience through the conversations and through all the activities that happen in this context;* [through] *participation and passing things on to colleagues and so on.* [As well as through] *conversations with colleagues directly on the same ward and those on* [other] *wards. This exchange is very interesting. And I believe that a number of* [staff] *should have this experience* (t3_6_195).

(2) *Roughly the process, how it works, to implement nursing science. It was actually interesting to get a glimpse into how this works. Because otherwise you don't see much of nursing science, if you are working clinically and* […]. *You cannot really catch up on these things. It was pretty interesting to get to learn about this* (t3_4_304).

Satisfaction with the implementation process

Interview data at t2 and t3 revealed participants satisfaction with the proceedings, the project's usefulness was obvious. Interviewees assessed the implementation progress as good/very good, despite their early doubts and reservations (interview data, ASD steering group meeting minutes (SGMM) 06/2011, OD SGMM 07/2011). They appreciated the target-oriented action in implementing the Falls CPG. Several times during the course of the project, the head nurse expressed her satisfaction with the progress of the implementation project (research diary (RD) 03/03, 10/05 & 15/06/2011). Additionally, interviewees were content/very content with the co-operation between all parties involved in the implementation. Steering group members appreciated the co-operation within their group as well as their achievements. This was particularly true for the OD steering group as co-operation across all three working units provided valuable, novel ideas (OD SGMM 07/2011). Interviewees valued the opportunity to get involved and participate in the design of the process but also the transparency of the process:

But [staff] *from the second floor have surely all been involved. They, I believe, also felt this way. All information was passed on relatively swiftly, about what had been implemented and what their other ideas were. There have also been critical voices every now and then. But at the end of the day, I believe that there is nobody who was unaware that this was* [going on]. *And who did not feel taken seriously when making a suggestion. I don't know how the others feel about this, but I have not heard anything different* (t2_8_36).

One participant pointed out that the researcher had succeeded in bringing together the two perspectives of practice and research and that the ward's perspective was well represented (t2_7_422).

Education was considered (t3) to be helpful (mean = 3.72; SD = 1.044, n = 107) by most of the participants (68.2%). Interviewees (t2) appreciated having received information about fall incidents, reasons and time of occurrence. Interview data from t2 and t3 revealed that participants from the ASD were highly satisfied with the educational arrangements organized by their colleagues. Feedback from OD participants was mixed. While some felt that no new information had been presented, others emphasised that the content on restraint and the internal fall statistics were very interesting. The fact that all meetings (information meetings, data collection …) were scheduled after the morning shift was regarded negatively (interview data, t2).

Evaluation of the Falls CPG implementation

The Falls CPG implementation process was evaluated regarding *characteristics of the change process, extent of work unit change, consequence of guideline implementation, individual job impact,* as well as *demands-abilities (person-job) fit* and *values-congruence (person-organisation) fit*. Table 3 provides details.

The ten items of the *characteristics of the change process* construct were grouped into *management support* (items 3 - 10) and *gateway to participation* (items 1 - 2). The results showed that participants were satisfied with both the *management support* (mean = 3.09, SD = .756, n = 99) and the available *gateway to participation* (mean = 3.79, SD = 1.057, n = 109) during the implementation project. They highlighted that all levels of management were committed to change (mean = 4.31, SD = .868, n = 109). The head nurse was also seen as supportive (mean = 4.20, SD = .984, n = 108).

Time and effort, including *extent of work unit change*: From a participant perspective, the implementation of the Falls CPG neither increased nor lowered the extent of their work (mean = 3.14, SD = 1.162, n = 106). Interview data (t2 & t3) confirmed that the implementation of the Falls CPG did not fundamentally impact either their work practices or their daily routine. Workload was seen as having increased only minimally after the Falls CPG was introduced, despite more extensive patient assessment and documentation, including a new fall report in case of an incident. One participant commented: *No, it is not additional work for me. Well, I do not consider it additional work; it is just part of my job* (t3_8_260). Another remarked:

t3_13_34: *Well, we discussed this among one another. I quite liked that. And we took some time to actually delve into the topic. At the beginning everybody regards this as additional work which actually it isn't, in reality.*

Interviewer: *So actually no additional work in terms of everyday routine?*

t3_13_34: *No.*

Interviewees felt that the gains had outweighed the effort expended. The head nurse commented: *Although a lot of time was invested it paid off* (t2_2_227). She also pointed out that half a year of intensive work was adequate. The same was reported from members of the steering group:

Yes, I mean, this is surely illustrative, because in comparison, the input was actually lower [than the yield]. *I don't actually know how many hours were spent on the group sessions. But it was not that many. I actually think that the end result is pretty good.* (t2_6_519).

Nursing personnel who were not involved in the steering group estimated the perceived expenditure for the implementation to be low.

Consequence of guideline implementation, individual job impact, person-job and *person-organisation fit*: In general, respondents disagreed with the statement (mean = 1.85, SD = 0.778, n = 105) that the implementation of the Falls CPG had brought on negative consequences. Furthermore, the implementation had hardly any negative impact on participants' jobs (mean = 2.45, SD = 1.102, n = 101). Nursing personnel's *demands-abilities (person-job) fit* ap-

Table 3 Evaluation of the Falls CPG implementation (t3)

Criteria for process evaluation	N	Mean	SD*
Characteristics of the Change Process			
Sufficient advanced notice was given.	109	3.80	1.25
Ample opportunities for input or critique were given.	109	3.78	1.16
The steering group members kept everyone fully informed.	109	4.06	1.02
Sufficient resources were available to support this change.	108	3.64	1.10
All levels of management were committed to this change.	109	4.31	0.87
People affected negatively by this change were treated fairly.	101	3.61	1.01
Management dealt quickly and effectively with 'surprises' during the change.	103	3.71	1.01
An adequate explanation for necessity of change was provided.	109	3.74	1.20
There was sufficient support from ward managers for this change.	109	3.92	1.09
The head nurse supported the Falls CPG implementation.	108	4.20	0.98
Extent of Work Unit Change			
The implementation of the Falls CPG involved ...			
... changes in the work unit's processes and procedures.	107	3.30	1.28
... changes in the way people do their jobs.	106	3.19	1.24
... changes in daily routines in this work unit.	107	2.95	1.30
Consequence of Change			
The implementation of the Falls CPG ...			
... has made my unit less effective.	105	2.03	1.00
... created problems for my work unit.	106	1.92	0.99
... has disrupted the way my unit normally functions.	106	1.97	0.99
... has harmed my work unit.	106	1.47	0.78

Individual Job Impact			
I am expected to do more work than I used to.	103	2.40	1.42
The nature of my work has changed.	103	2.44	1.33
My job responsibilities have changed.	104	2.37	1.39
I find greater demands placed on me at work because of the implementation of the Falls CPG.	104	2.58	1.36
I am experiencing more pressure at work because of the implementation of the Falls CPG.	103	2.27	1.26
The work processes and procedures I use have changed.	102	2.66	1.23
Demands-Abilities (Person-Job) Fit			
As a result of the implementation of the Falls CPG ...			
... my abilities and training better 'fit' what my job requires.	103	3.04	1.11
... I am more qualified to do my job than before.	103	2.74	1.22
Values-Congruence (Person-Organisation) Fit			
As a result of the implementation of the Falls CPG ...			
... my personal values better match my department's values.	100	2.70	1.12
... my personal values and those of the department have become more similar.	102	2.64	1.05

*SD = standard deviation

peared unchanged (mean = 2.89, SD = 1.021, n = 103) as did *values-congruence (person-organisation) fit* (mean = 2.65, SD = 1.016, n = 99).

The internal consistency for each of the six included instruments amounted to 0.88 (*characteristics of the change process*), 0.90 (*extent of work unit change*), 0.84 (*consequence of change*), 0.90 (*individual job impact*), 0.70 (*person-job fit*) and 0.87 (*person-organisation fit*), respectively.

Recommendations for further implementation projects

At the end of this guideline implementation project the following recommendations could be extracted for further implementation projects in nursing practice. A profound baseline analysis indicates several influencing factors - hindering ones but also facilitating ones. It helps to illuminate pre-established good nursing practice. Therefore gaps and deficits in the ongoing process can be focussed on. The participatory approach that involves all parties not only helps to identify the aims of those involved and criteria to measure them but also to choose multifaceted implementation strategies that fit the local setting by including available resources and structures. A continual evaluation of the implementation process allows the procedure to be adapted when something unforeseen arises. Openness to the unusual and acceptance of ideas and critique from all involved is important for finding solutions that can be accepted by all parties.

References

1. Breimaier HE, Halfens RJG, Lohrmann C. Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nurs*. 2015;14:18. doi: 10.1186/s12912-015-0064-z.

Chapter 7

Generel reflections

GENERAL REFLECTIONS

Research findings have an impact on patients and professionals only if they change, among others, nursing practice in a positive way [1]. The main goal of this doctoral thesis was to obtain in-depth information about factors influencing implementation processes and strategies used to implement evidence-based clinical practice guidelines (CPGs), the effectiveness of multifaceted and tailored implementation strategies applied in a guideline implementation project and the theoretical framework applied therefor.

SUMMARY OF THE FINDINGS

Study I focussed on assessing graduate nurses' wishes, knowledge, attitudes and perception of barriers associated with the implementation of research findings into nursing practice in Austria, where nursing science is still in its infancy. The analysis of the open- and closed-ended questions revealed that nurses' wishes are for *adequate information* (e.g., good introduction to the innovation or to the value and significance to nursing science), *structural availability* (e.g., to have time for implementation or provision of necessary means/material), and *professional support* (e.g., with regard to the implementation of research results). The results indicated also that the following should be offered as part of continuing education and training: the contribution of nursing research for the professional life, the implementation of research findings in professional life and fundamentals of nursing research. Topics of particular interest were research-based information about *nursing phenomena*, such as pressure ulcer or patient falls, and *interventions*, such as wound management. Nurses mentioned their willingness to participate in further training with regard to nursing research and nursing science, and felt that further training should be offered by the employer. The nurses' knowledge about queried topics concerning research-relevant aspects and evidence-based practice was generally limited. Nevertheless, nurses indicated that their education on nursing science/research and its implementations was predominantly of an introductory nature. Overall, the nurses' attitudes towards nursing research and research utilisation were slightly negative. The three most highly ranked barriers to research utilisation that were mentioned were lack of time (69.9%), lack of information/knowledge (45.4%) and lack of interest (25.9%).

Study II put an emphasis on implementation interventions (i.e., strategies), which had been used in the nursing homes and hospitals in three countries to implement guidelines on changing clinical nursing practice. Provision of written materials was the most frequently used implementation strategy (85%), which falls into the group of professional strategies. Changes in the patient record system ranked foremost in the group of organisational strategies (78%). Financial incentives for nurses as well as regulatory strategies were rarely used. More implementation strategies were used in Austria and Germany than in The Netherlands, but in The Netherlands, the five most commonly used implementation strategies were used in a broader application setting. For example, implementation strategies used in Dutch settings fall into three out of four categories from the Cochrane *Effective Practice and Organization of Care (EPOC)* list whereas in Austrian and German settings, they fall into two out of four categories.

Study III, part 1, concentrated on the effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice using a PAR approach. The main outcomes at the level of nursing personnel, namely, the graduate and assistant nurses, indicated a significant gain in knowledge on fall prevention, how to access the Falls CPG and the guideline itself between the baseline and final assessment. The qualitative data also revealed an increase in participant awareness about fall prevention. The participants' attitude towards the guidelines improved significantly towards the end of the project. Furthermore, the project raised the participants' awareness of fall prevention and strengthened their self-confidence. Main outcomes at the organisational level were the availability of required fall prevention equipment such as baby monitors or one-way glide sheets and environmental adaptations (e.g., a handrail in the corridor). Hospital nursing personnel (approximately 150) invested a total of 1,192 hours of working time over the course of the project, which is valued at about 14,600 €.

Study III, part 2, focussed on the comprehensiveness, applicability and usefulness of the *Consolidated Framework for Implementation Research (CFIR)*, the theoretical framework that was applied to guide the implementation process. The analysis of the comprehensiveness revealed that the *CFIR*, overall, is a comprehensive framework for implementing a guideline into a hospital-based nursing practice. However, the CFIR did not take into account some crucial factors during the planning phase of an implementation process.

These factors included stakeholder aims and wishes/needs when implementing an innovation, pre-established measures related to the intended innovation and pre-established strategies for implementing an innovation. For the *CFIR* constructs *reflecting & evaluating* and *engaging*, a more specific definition is recommended. The analysis of the *CFIR's* applicability and usefulness disclosed that the framework and its supplements could be easily applied by researchers. Their scope was appropriate for the complexity of a prospective CPG-implementation project. Furthermore, the analysis of qualitative data was facilitated by the application of the *CFIR*, and with the help of the *CFIR* the main findings could be explained. A spectrum of relevant implementation outcomes were additionally obtained due to *CFIR's* guidance, particularly with respect to the organisational culture, organisational learning capability and recommendations for further implementation projects from the participants' perspectives.

GENERAL DISCUSSION OF THE FINDINGS

Nurses' wishes, knowledge, attitudes and perception of barriers upon implementing research findings into practice

Until this study nurses' wishes, needs and requirements have rarely been focused on. Participating nurses expressed great interest in research-based information with regard to a variety of nursing phenomena and interventions that would allow them to offer the best care. Among the most frequently expressed wishes with regard to research implementation were *adequate information* (e.g., a good introduction to the innovation or to the value/significance to nursing science), and a *supportive surrounding*, specifically *structural availability* (e.g., time for implementation or provision of necessary means/material). These seem to be important features when implementing research-based knowledge during daily nursing practice, because these are, according to Gerrish [2], major obstacles met when implementing evidence-based practice. A recently published study supported the necessity of identifying the training needs of specific staff and their organisational characteristics when implementing evidence-based practices [3]. Furthermore, nurses not only expressed their willingness to learn more about research and research utilisation, but also their willingness to participate in further training about nursing research and science. Both findings are in line with those reported in the literature [4 - 7]. This interest and willingness may be explained by the circum-

stance that nurses realise the necessity for a change towards evidence-based practice, and this should be noted and encouraged.

The participating nurses' knowledge with regard to nursing research and research utilisation can be regarded as insufficient, irrespective of when they received their diploma. Although nursing research has been included in their basic education, the time allocated in the curricula to this topic seems to have been too limited for nurses to receive sufficient insight into the topic and influence their practice. However, the published literature supports these findings [5, 6]. Additionally, Johnson et al. found that more nurses reported having gaps in research knowledge as compared to members of other health professions [6]. This suggests that lack of knowledge about research and research utilisation may be an overarching problem in nursing that should be dealt with. The participants' slightly negative attitudes can be explained by their insufficient knowledge with regard to research. According to Kajermo et al., the ability to analyse scientific reports/articles and research use are significant determinants of attitudes towards research and development in nursing [7].

In order to accelerate change by means of translating research results into nursing practice, it is indispensable to understand the related barriers. *Lack of time* and *lack of knowledge* were the barriers most frequently perceived by participants. For more than two decades both aspects have been reported most frequently as barriers for implementing nursing research into daily practice [6, 8 - 11] and it seems that no fundamentally changes have been effected during this period. Our results with regard to the *lack of interest* as a primary perceived barrier are supported by the research results of Thorsteinsson [12].

Implementation interventions used in nursing homes and hospitals in Austria, Germany and The Netherlands

The findings in this study indicated that the implementation strategies most frequently applied were directed towards professionals and organisations, which is in line with other findings [13, 14]. The most frequently used strategy reported in this study and in the literature [13 - 15] was the use of written or educational materials. An explanation may be that the distribution of such material is easily and quickly accomplished at a relative little cost as compared to more active and time consuming implementation strategies such as audit and feedback. Furthermore, these materials may be used as reference materials at a later time. In general, financial and regulatory interventions were rarely

used - which is also in line with the findings of Yost et al. [14] and Gagliardi et al. [15]. Offering financial incentives to nurses does not seem to be an option, due to financial restraints in healthcare budgets, in contrast to the situation in industry. However, other, non-monetary incentives could be given (e.g., participation in further education).

The most striking difference observed among the three countries was the configuration of the five most frequently used categories of implementation strategies. Whereas in Dutch settings, the professional, organisational and regulatory strategies were used most frequently, the organisational and professional strategies were used most frequently in Austrian and German settings. In particular, *inspecting authorities*, a regulatory strategy, was significantly more frequently applied in Dutch settings. An explanation for this difference might be that, in The Netherlands, the Health Care Inspectorate regularly controls whether healthcare institutions meet their standards. Dutch healthcare settings have been obliged to collect data about the so-called “norms of safe care”, for example, in the form of an annual prevalence survey, since 1998 [16]. Austrian and German settings seem to rely more heavily on strategies that passively and indirectly influence the nurses’ work and that are under higher levels of internal management control, such as *changes in patient record systems* or *efforts to improve nurses’ work satisfaction*. The latter was applied with significantly less frequency in The Netherlands. These differences with regard to the top-five implementation strategies might be due to a higher awareness of the relevance of the process and steps of implementation in Dutch than in German and Austrian settings, because of the longer history of nursing science in The Netherlands. Scrutinizing the Dutch example, it seems that regulatory strategies could play a more important role in the implementation of research-based knowledge.

Effectiveness of multifaceted and tailored strategies for the implementation of an evidence-based fall-prevention guideline into acute care nursing practice

Findings of this study show the effectiveness of multifaceted and tailored strategies for the implementation of an evidence-based Falls CPG into an acute care hospital nursing practice. Similar findings can be found in Dogherty et al. [17]. However, findings from an overview of systematic reviews offered no convincing evidence that multifaceted implementation strategies are more effective than single-component ones, and increasing the number

of intervention components did not significantly improve the effect size [18]. These findings indicate that a focus should be placed not only on the number of applied implementation strategies, but on their effects when combined, their appropriateness in the respective setting in which they are applied, and the characteristics of the persons involved in the change process. According to Wensing et al., the effectiveness of tailored interventions is not clear. The reason for this is revealed through the wide variety of methods used to tailor implementation strategies across studies. It is, therefore, necessary to first choose the objective of the implementation process, then identify the barriers to the intended change and finally link strategies to these barriers [19]. The procedures undertaken in our study support this mode.

The time invested when implementing the Falls CPG was relatively low (i.e., about eight hours of investment per person during the whole course of the project). Bjørk et al., however, point out that knowledge translation is a time-consuming endeavour [20] without presenting more detailed information.

Evaluation of the CFIR after its application in a fall-prevention guideline implementation

Through the application of the *CFIR* in the Falls CPG implementation project, a very detailed picture of the setting and process could be obtained. Nonetheless, the comprehensiveness was somewhat limited because (1) four important aspects for baseline assessment were missing and (2) one construct of the framework was too broadly defined, whereas another one was not broad enough. In a recent publication, Martinez et al. critique the framework as not including implementation outcomes and not hypothesizing interrelations among constructs that could be tested [21]. On the other hand, Nilsen pointed out that the *CFIR* belongs to a group of determinant frameworks which have the overarching aim to predict, understand and/or explain outcomes [22]. Yet, it is advisable to modify the *CFIR* to become a comprehensive framework that can point out all relevant aspects of an implementation process.

On the other hand, the *CFIR* proved to be easily applicable and highly useful for its intended application as a guide for developing assessment questions and as a framework for revealing influencing factors on the implementation process, as a template for content analysis and as a guide to explaining the main findings - as Nilsen previously proposed [22]. All in all, applying the *CFIR* can be recommended as a way to obtain knowledge about the implementa-

tion of research-based knowledge into nursing practice because it can reveal, for example, essential processes that can be used to facilitate the application of guidelines in nursing practice [23]. This, in turn, can result in a more structured approach with reduced resource expenditures when applied from the beginning of an implementation initiative [20], or make the dissemination of evidence-based interventions more likely to occur [24].

METHODOLOGICAL REFLECTION

Methodological aspects of the studies included in this doctoral thesis (i.e., their strengths and limitations) are discussed in the respective chapters. In order to facilitate the understanding of the results of this doctoral thesis, a number of strengths and limitations should be considered and are subsequently summarised.

Strengths of the studies conducted

An overall strength of this doctoral thesis is its focus on several important aspects that must be considered when implementing research-based knowledge into nursing practice. The main strengths of the singular studies are given below.

Study I:

1. Open-ended questions were included in the questionnaire, which allowed participants to document their point of view.
2. A large sample number was recruited (n = 1023) within one hospital despite a relatively low response rate of 56%.
3. The instrument used was based on an existing instrument, which had been psychometrically tested to various extents and modified in the Austrian context.

Study II:

1. The questionnaire used was based on the typology of implementation interventions of the Cochrane *Effective Practice and Organisation of Care (EPOC)* Review Group [25], which facilitates comparisons, and allowed the inclusion of a broad spectrum of possible implementation strategies.
2. The study had a strong international character.

Study III (part 1 & 2):

1. The applied PAR approach was crucial. Implementing a CPG into nursing practice is considered a challenging enterprise [26] carried out in a complex setting [27, 28]. In such a context, the use of PAR, as a whole systems approach, is recommended to achieve and ensure sustainable implementation [27, 28]. Therefore, the PAR approach was deemed to be appropriate. Furthermore, all requirements of PAR ([28], p. 31, [29], p. 11, [30, 31]) were fulfilled.
2. The use of a mixed-method design within a PAR approach was also critical. A mixed-method design was deemed appropriate, because neither qualitative nor quantitative data alone were considered adequate to capture the complexity of a guideline implementation process. Furthermore, the findings from one approach were enhanced by findings from the second source applied.
3. The high response rate, which was above 80% both before and after the investigation, was a further strength. This high response rate might have been due to the fact that working time was allocated to nursing personnel for participation in the respective activities.
4. The evaluation of the applied theoretical framework was considered appropriate, because evaluation research assesses, for example, how well a programme - in this case the *CFIR* - is working ([32], p. 727).

Limitations of the studies conducted

Nonetheless, some limitations must also be considered for all three studies conducted. The main limitations were:

Study I:

1. Only one hospital of a major Austrian city was included in the data collection and, thus, the findings may not apply to hospital settings elsewhere.
2. Missing data points, especially in open-ended questions regarding wishes/needs/requirements (65.2%) and possible facilitators to using/implementing research results (59.6%), exist. Thus, the findings may only show the perspective of the most engaged or interested participants with regard to topics and not the whole breadth of possible themes.

Study II:

1. The low response rates, which varied from 8.7% to 47.1% in the three countries and type of settings, after excluding incompletely filled in questionnaires, may influence the interpretation of the results. Two reminders were sent to all managers and nursing directors, and the deadline was extended twice, in an effort to improve the response rate.
2. The use of a web-based questionnaire may have influenced responses or response rates. This was not a commonly used form of data collection in nursing at the time data was collected.

Study III (part 1 & 2):

1. The use of a one-group before-after design, a type of quasi-experimental design, to examine the effectiveness of the applied implementation strategies, may have had effects. The drawback of this type of design is its weak support for causal inference, because it is vulnerable to many internal validity threats ([32], p. 218).
2. The majority of instruments used to measure outcomes and possible influential factors [21, 33], were not tested for its uses in nursing.
3. An assessment of how useful the *CFIR* actually was as a guidance tool for a CPG during the course of the implementation was retrospectively made. One problem with this type of design is that recollected data is often less accurate than data directly taken, with respect to assessments made of the *CFIR*, at the time of its application ([32], p. 224).

RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the results and limitations reported in this doctoral thesis, several recommendations for future research are made. First, instruments that can be used to assess factors that influence and affect the outcome of an implementation endeavour in nursing practice should be developed, existing ones should be tested further for their applicability in this professional field and, finally, both should be psychometrically tested. Second, further research should focus not only on the effectiveness of strategies applied to the implementation of research-based knowledge into nursing practice, but also on the combination and appropriate nature of these strategies. Implementation strategies are a means to introduce evidence into healthcare and nursing practice and should, therefore, be identified, developed and tested [34]. This would allow manag-

ers and other persons responsible for implementation purposes into nursing practice to select appropriate strategies. Third, because these persons are also required to calculate probable costs of an implementation endeavour in their planning phase, the cost- and resource-related aspects should be included in future implementation-related research and subsequently reported [35], which has until now rarely been the case.

RECOMMENDATIONS FOR PRACTICE

Findings reported in this doctoral thesis allow the formulation of the following recommendations for practice. Nurses must have appropriate knowledge that allows them to understand the basics of nursing research and its implementation in the daily routine in order to alter their attitudes regarding these topics. Therefore, a multifaceted approach, focussing on basic as well as continuing education is essential. With regard to basic nursing education in Austria, it is strongly recommended to reconsider the current nursing curricula that prepares nurses-to-be to meet role expectations delineated in two Austrian legal regulations [36, 37]. Nursing educators should expose nurses to basic nursing research methods as well as models/theories of knowledge dissemination and transfer in basic training. Nurse managers and employers are required to offer in-service education and skills development support with regard to nursing research and critical thinking, because ongoing capacity building is required to help nurses develop, maintain and utilise their research skills [6]. The promotion of positive attitudes towards research and its utilisation is also required with respect to both basic and continuing education, because evidence exists that nurses' attitudes are important in the use of research findings in practice [7]. Obtaining sufficient research-based knowledge is one step toward the achievement of more positive attitudes. Pointing out the advantages of research-based practice and creating an evidence-based practice culture is a necessary additional step. Furthermore, employers should reconsider the job descriptions for nurses and include research and its application into daily nursing practice.

Applying a PAR approach together with the *CFIR* in a slightly modified form is strongly recommended as a general approach when implementing research-based knowledge into daily nursing practice. Two aspects, in particular, should be considered during an implementation process: (1) the wishes, needs and

requirements of all nurses affected by the process from the very beginning, and (2), in accordance with Wensing et al. [19], the process for selecting adequate implementation strategies. With respect to the latter consideration the context and factors influencing it must be assessed in order to decide what must be achieved during the first step. Based on this consideration, appropriate implementation strategies that fit the problem(s), setting and persons affected by the change can be selected. This should be done by working together with those being affected by the change.

REFERENCES

1. McKenna HP. Research assessment: the impact of impact. *Int J Nurs Stud.* 2015;52:1–3.
2. Gerrish K. Evidence-based practice. In: Gerrish K, Lathlean J, editors. *The research process in nursing.* 7th ed. Chichester: Wiley Blackwell; 2015. p. 541–53.
3. D'Ippolito M, Lundgren L, Amodeo M, Beltrame C, Lim L, Chassler D. Addiction treatment staff perceptions of training as a facilitator or barrier to implementing evidence-based practices: a national qualitative research study. *Substance Abuse.* 2015;36:42–50.
4. Staffileno BA, Carlson E. Providing direct care nurses research and evidence-based practice information: an essential component of nursing leadership. *J Nurs Manag*. 2010;18:84–9.
5. Akerjordet K, Lode K, Severinsson E. Clinical nurses' attitudes towards research, management and organisational resources in a university hospital: part 1. *J Nurs Manag*. 2012;20:814–23.
6. Johnson C, Lizama C, Harrison M, Bayly E, Bowyer J. Cancer health professionals need funding, time research knowledge and skills to be involved in health services research. *J Canc Educ.* 2014;29:389–94.
7. Kajermo KN, Alinaghizadeh H, Falk U, Wändell P, Törnkvist L. Psychometric evaluation of a questionnaire and primary healthcare nurses' attitudes towards research and use of research findings. *Scand J Caring Sci.* 2014;28:173–85.
8. Funk SG, Champagne MT, Wiese RA, Tornquist EM. Barriers to using research findings in practice: the clinician's perspective. *Appl Nurs Res.* 1991;4:90-5.
9. Funk SG, Champagne MT, Tornquist EM, Wiese RA. Administrators' views on barriers to research utilisation. *Appl Nurs Res.* 1995;8:44-9.
10. Ellen ME, Léon G, Bouchard G, Ouimet M, Grimshaw JM, Lavis JN. Barriers, facilitators and views about next steps to implementing supports for evidence-informed decision-making in health systems: a qualitative study. *Implement Sci.* 2014;9:179. doi: 10.1186/s13012-014-0179-8.
11. Ugolini D, Casanova G, Ceppi M, Mattei F, Neri M. Familiarity of physicians, translational researchers, nurses, and other health professionals with evidence-based medicine terms and resources. *J Canc Educ.* 2014;29:514–21.
12. Thorsteinsson HS. Icelandic nurses' beliefs, skills, and resources associated with evidence-based practice and related factors: a national survey. *Worldviews Evid Based Nurs.* 2013;10:116–26.
13. Medves J, Godfrey C, Turner C, Paterson M, Harrison M, MacKenzie L, Durando P. Systematic review of practice guideline dissemination and implementation strategies for healthcare teams and team-based practice. *Int J Evid Based Healthc.* 2010;8:79–89.
14. Yost J, Thompson D, Ganann R, Aloweni F, Newman K, McKibbon A, Dobbins M, Ciliska D. Knowledge translation strategies for enhancing nurses' evidence-informed decision making: a scoping review. *Worldviews Evid Based Nurs.* 2014;11:156–67.
15. Gagliardi AR, Alhabib S, and the members of the Guidelines International Network Implementation Working Group. Trends in guideline implementation: a scoping systematic review. *Implement Sci.* 2015;10:54. doi: 10.1186/s13012-015-0247-8.
16. LPZ—Résumé. Maastricht University, CAPHRI School for Public Health and Primary Care; 2014. [http://www.lpz-um.eu/eng/home].
17. Dogherty EJ, Harrison MB, Graham ID, Digel Vandyk A, Keeping-Burke L. Turning knowledge into action at the point-of-care: the collective experience of nurses facilitating the implementation of evidence-based practice. *Worldviews Evid Based Nurs.* 2013;10:129–39.

18. Squires JE, Sullivan K, Eccles MP, Worswick J, Grimshaw JM. Are multifaceted interventions more effective than single-component interventions in changing health-care professionals' behaviours? An overview of systematic reviews. *Implement Sci.* 2014;9:152. doi: 10.1186/s13012-014-0152-6.
19. Wensing M, Bosch M, Grol R. Developing and selecting interventions for translating knowledge to action. *CMAJ.* 2010;182:E85-8.
20. Bjørk IT, Lomborg K, Nielsen CM, Brynildsen G, Frederiksen A-MS, Larsen K, Reierson IÅ, Sommer I, Stenholt B. From theoretical model to practical use: an example of knowledge translation. *JAN.* 2013;69:2336–47.
21. Martinez RG, Lewis CC, Weiner BJ. Instrumentation issues in implementation science. *Implement Sci.* 2014;9:118. doi: 10.1186/s13012-014-0118-8.
22. Nilsen P. Making sense of implementation theories, models and frameworks. *Implement Sci.* 2015;10:53. doi: 10.1186/s13012-015-0242-0.
23. Matthew-Maich N, Ploeg J, Dobbins M, Jack S. Supporting the uptake of nursing guidelines: what you really need to know to move nursing guidelines into practice. *Worldviews Evid Based Nurs.* 2013;10:104–15.
24. Tabak RG, Khoong EC, Chambers DA, Brownson RC. Bridging research and practice. Models for dissemination and implementation research. *Am J Prev Med.* 2012;43:337–50.
25. Cochrane *Effective Practice and Organisation of Care Review Group (EPOC) data collection checklist.* 2002. [http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/datacollectionchecklist.pdf].
26. Grol R, Wensing M. Characteristics of successful innovations. In: Grol R, Wensing M, Eccles M, Davis D, editors. *Improving patient care. The implementation of change in health care.* 2nd ed. Chichester: Wiley Blackwell BMJ|Books; 2013. p. 79–90.
27. Leykum LK, Pugh JA, Lanham HJ, Harmon J, McDaniel Jr RR. Implementation research design: integrating participatory action research into randomized controlled trials. *Implement Sci.* 2009;4:69. doi: 10.1186/1748-5908-4-69.
28. Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlane F, Peacock R. How to spread good ideas: a systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. Report for the National Coordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO). 2004. [http://www.netscc.ac.uk/hsdr/files/project/SDO_FR_08-1201-038_V01.pdf].
29. Waterman H, Tillen D, Dickson R, de Koning K. Action research: a systematic review and guidance for assessment. *Health Technol Assess.* 2001;5:23.
30. Carr W, Kemmis S. Becoming critical. Education, knowledge and action research. Reprint. Victoria: Deakin University Press; 1990.
31. Dick B.: A beginner's guide to action research. 2000. [http://www.uq.net.au/action_research/arp/guide.html].
32. Polit DF, Tatano Beck C. *Nursing research: generating and assessing evidence for nursing practice.* 9th ed. Philadelphia: Wolters Kluwer Health | Lippincott Williams & Wilkins; 2012.
33. Lewis CC, Stanicks CF, Martinez RG, Weiner BJ, Kim M, Barwick M, Comtois KA. The Society for Implementation Research Collaboration Instrument Review Project: a methodology to promote rigorous evaluation. *Implement Sci.* 2015;10:2. doi: 10.1186/s13012-014-0193-x.
34. Powell BJ, Waltz TJ, Chinman MJ, Damschroder LJ, Smith JL, Matthieu MM, Proctor EK, Kirchner JAE. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci.* 2015;10:21. doi: 10.1186/s13012-015-0209-1.

35. Neta G, Glasgow RE, Carpenter CR, Grimshaw JM, Rabin BA, Fernandez ME, Brownson RC. A framework for enhancing the value of research for dissemination and implementation. *Am J Public Health.* 2015;105:49–57.
36. Federal Act on the Quality of Health Services (Health-Care Quality Act - Gesundheitsqualitätsgesetz - GQG). Excerpt from the 2005 Health Reform Act, Fed. Law Gaz. I no. 179/2004. [http://www.bmg.gv.at/cms/home/attachments/3/4/1/CH1063/CMS1043931577060/health_care_quality_act.pdf].
37. Flemmich G, Nöstlinger W, editors. *Gesundheits- und Krankenpflegegesetz. Gesetze und Kommentare NR 180.* Wien: Verlag des Österreichischen Gewerkschaftsbundes GmbH; 2004.

Chapter 8

Summary

SUMMARY

In order to achieve the best patient care, an application of research-based knowledge to clinical practice is seen as a requirement, and nurses are expected to take this evidence into account during their daily practice. Although research-based knowledge is continually produced and made available to nurses, only a small proportion of it is used in the daily nursing practice. This poses the possibility of harm to nursing care recipients when being cared for in a healthcare setting. Increasingly, evidence is being summarised in evidence-based clinical practice guidelines (CPGs) to promote the translation of research-based knowledge into clinical practice. Nevertheless, incorporating these evidence-based CPGs effectively and sustainably into nursing practice remains a challenge.

The aim of this doctoral thesis was to obtain in-depth information about the process of implementing research-based knowledge into nursing care. A focus was especially placed on influencing factors, strategies used to implement evidence-based CPGs in nursing practice, the effectiveness of multifaceted and tailored implementation strategies and the theoretical framework applied when implementing an evidence-based CPG into acute care nursing practice.

The **first chapter** provides background information on the four components of this doctoral thesis: guideline implementation, influential factors, implementation strategies and the *Consolidated Framework for Implementation Research (CFIR)* and its combination with participatory action research (PAR). Furthermore, the aims, the research questions posed and the outline of this doctoral thesis are presented.

Chapter two provides a brief overview of the methods in terms of design, setting, sample, data collection and analysis of the studies conducted.

In **chapter three,** the results of a descriptive and exploratory cross-sectional survey that focussed on nurses' wishes, knowledge, attitudes and perception of barriers and facilitators with respect to implementation of research findings into practice are described. The modified version of the Questionnaire on Utilisation of Nursing Research by Parahoo (1998) with open- and closed-ended questions was used to collect data in a large Austrian university hospital in May 2007. The qualitative and quantitative data obtained from 1023 graduate nurses were analysed descriptively and for content. The findings revealed

nurses' insufficient knowledge about, as well as negative attitudes towards, nursing research and research implementation. Nonetheless, nurses mentioned their willingness to participate in further training with regard to nursing research, and indicated that it should be offered by the employer. Topics of particular interest were research-based information about nursing phenomena and interventions. When implementing research-based knowledge into nursing practice, nurses mentioned their need for adequate information, the availability of certain structural requirements such as sufficient time and means/material as well as professional support to overcome barriers. The three primary barriers mentioned were lack of time, of information/knowledge and of interest.

Chapter four focused on the implementation interventions used in Austrian, German and Dutch nursing homes and hospitals. All in all, 215 nursing homes and 118 hospitals participated in a cross-sectional online-survey during June/July 2008. The questionnaire was based on the modified typology of implementation interventions of the Cochrane *Effective Practice and Organisation of Care (EPOC)* Review Group. According to this typology the implementation strategies are grouped into four categories: professional, financial, organisational and regulatory strategies. Data were analysed descriptively and by means of one-way ANOVA. The results revealed that *providing written materials* is the most frequently used implementation strategy (85%), a strategy which is directed towards professionals. This is followed by *changes in patient record system* (78%), an organisational implementation strategy. Financial incentives or regulatory strategies were rarely used. Although Austrian and German settings used on average more implementation strategies than Dutch ones, the focus on the five most frequently used implementation strategies in the three countries shows that their configuration in Dutch settings is broader. The top five implementation strategies in the Dutch settings fall into three *EPOC* categories (professional, organisational, regulatory strategies), whereas in Austrian and German settings, they fall into two categories (professional and organisational strategies).

Chapter five emphasises the effectiveness of multifaceted and tailored strategies to implement an evidence-based fall-prevention guideline into acute care nursing practice. Two departments of an Austrian university teaching hospital provided the setting for the guideline implementation and the before and after, mixed-methods study was carried out using a participatory action research

approach. The *CFIR* was applied as a theoretical framework. Graduate and assistant nurses were included in the implementation process. All instruments for data collection (semi-structured interview and group discussion guidelines, questionnaires) were based on the *CFIR*. The questionnaire captured demographic data, knowledge, attitudes, several influencing factors and, for the final data collection, a process evaluation was conducted. Additionally, the total staff time invested was recorded in hours. Qualitative data were analysed for content, based on the *CFIR* and its supplements, which had been added at the beginning of the project. Quantitative data were analysed descriptively and inferentially. Eighteen graduate and assistant nurses participated in the semi-structured interviews initially, at the mid-term and at the end of the project. For the quantitative data collection and group discussion, the numbers of participants were n = 106, n = 111 and n = 110 respectively. The main outcomes at the level of graduate and assistant nurses indicated a significant gain in knowledge on fall prevention, how to access the Falls CPG and the guideline itself, as well as an improvement in participants' attitudes. Qualitative data highlighted an increase in the participants' awareness of fall prevention and it was clear that the project strengthened their self-confidence. The main outcomes at the organisational level were the availability of required fall prevention equipment and required environmental adaptations made. A total of 1,192 hours of working time was invested to implement the Falls CPG by participating graduate and assistant nurses during the course of the project, which can be valued at about 14,600 €.

In **chapter six,** the evaluation of the *CFIR* is presented. The *CFIR* provided the theoretical framework in the study which has been described in chapter five and was focussed on in a post-hoc appraisal with regard to its comprehensiveness, applicability and usefulness in implementing a fall-prevention CPG into nursing practice. Data sources for this critical appraisal were team-meeting minutes, the main investigator's research diary, semi-structured interview and questionnaire data, which were collected over the course of the implementation project. The *CFIR's* comprehensiveness, applicability and usefulness for actually guiding the implementation of a CPG during the course of implementation was analysed through a critical reflection of the included data sources. The analysis generally confirmed that the *CFIR* is a comprehensive framework that can be used to implement a guideline into a hospital-based nursing practice. However, some crucial factors of the planning phase had to be added: stakeholder aims and wishes/needs when implementing an inno-

vation, pre-established measures related to the intended innovation and pre-established strategies for implementing an innovation. Furthermore, two *CFIR* constructs (*reflecting & evaluating* and *engaging*) need a more specific definition. With regard to *CFIR's* applicability and usefulness, the analysis disclosed that the framework, together with its supplements, was easily applicable for researchers, and it facilitated qualitative data analysis and the explanation of the central findings. Furthermore, a spectrum of relevant implementation outcomes could be obtained due to the *CFIR's* guidance in the case of, for example, organisational culture or recommendations for further implementation projects from the participants' perspectives.

Chapter seven provides a brief overview as well as a general discussion of the main findings of this doctoral thesis. Methodological aspects are addressed. Based on the results and limitations of this doctoral thesis further research is recommended in the field of implementing research-based knowledge into nursing practice. This includes the investigation (and development) of instruments for the assessment of influential factors and outcomes of an implementation effort in nursing practice, the effectiveness of strategies applied to implement research-based knowledge into nursing practice as well as cost- and resource-related aspects of an implementation project. To improve nursing practice through the implementation of research-based knowledge a revision of Austrian nursing curricula, the inclusion of nursing research methods in basic as well as further training and applying a participatory action research approach in combination with the *CFIR* as a theoretical framework when implementing current knowledge is recommended.

Chapter 9

Zusammenfassung

ZUSAMMENFASSUNG

Von Pflegekräften wird gemäß Berufskodizes wie auch gesetzlichen Regelungen erwartet, forschungsbasiertes Wissen in ihrer täglichen Arbeit anzuwenden. Solches Wissen wird kontinuierlich für die Pflegepraxis zur Verfügung gestellt, es kommt jedoch nur ein kleiner Teil dieses Wissens in der täglichen pflegerischen Arbeit an. Dies birgt für Patientinnen und Patienten die Gefahr, während ihres Aufenthaltes in einer Einrichtung des Gesundheitswesens nicht adäquat und nach aktuellem Kenntnisstand gepflegt und versorgt zu werden oder gar zu Schaden zu kommen. Um die Aufnahme und Anwendung von aktuellem forschungsbasiertem Wissen im klinischen Alltag zu unterstützen, wird dieses Wissen zunehmend in Form von Evidenz-basierten Leitlinien für die klinische Praxis zusammengefasst und Pflegepersonen beispielsweise im Intranet einer Einrichtung zur Verfügung gestellt. Die effektive und nachhaltige Implementierung solcher Evidenz-basierten Leitlinien in die Pflegepraxis stellt aber nach wie vor eine Herausforderung dar.

Ziel dieser Doktorarbeit war es, detaillierte Informationen über den Prozess der Implementierung von forschungsbasiertem Wissen in die Pflegepraxis zu erhalten. Diese Doktorarbeit fokussierte (1) Einflussfaktoren auf einen Wissenstransfer in die Pflegepraxis, (2) die zur Implementierung von Evidenz-basierten klinischen Leitlinien in die Pflegepraxis eingesetzten Strategien, (3) die Effektivität von vielfältigen, an die jeweilige Einrichtung angepassten Implementierungsstrategien sowie (4) den zur Implementierung einer Evidenz-basierten Leitlinie in die Pflegepraxis in einem Akutkrankenhaus eingesetzten theoretischen Rahmen.

Das **erste Kapitel** bietet theoretische Hintergrundinformationen zu diesen vier Themenfelder der Doktorarbeit, insbesondere zur Implementierung von Leitlinien, zu Einflussfaktoren, zu Implementierungsstrategien sowie zum *Consolidated Framework for Implementation Research (CFIR)* und dessen Kombination mit partizipatorischer Aktionsforschung. Im Weiteren werden die Ziele, die Forschungsfragen und der Aufbau der Doktorarbeit dargelegt.

Kapitel zwei gibt einen kurzen Überblick über die methodologischen Aspekte der im Rahmen der Doktorarbeit durchgeführten Studien hinsichtlich Studiendesign, Setting, Population, Datensammlung und -analyse.

Kapitel drei beschreibt die Ergebnisse einer deskriptiven und explorativen Querschnittsstudie zu Wünschen, Kenntnisstand und Einstellungen von Pflegenden im Zusammenhang mit der Implementierung von Forschungsergebnissen in die Pflegepraxis sowie den damit verbundenen und von den Pflegepersonen wahrgenommenen Hindernissen und förderlichen Faktoren. Die Datensammlung erfolgte in einem österreichischen Universitätskrankenhaus im Mai 2007. Hierzu wurde die modifizierte Version des Fragebogens von Parahoo (1998) über die Anwendung von Pflegeforschung verwendet. Die mittels strukturiertem Fragebogen schriftlich gewonnenen qualitativen und quantitativen Daten von 1023 diplomierten Pflegekräften wurden deskriptiv und inhaltsanalytisch ausgewertet. Die Ergebnisse zeigten einen unzureichenden Kenntnisstand wie auch negative Einstellungen gegenüber Pflegeforschung und Forschungsimplementierung auf. Dennoch äußerten Pflegekräfte ihre Bereitschaft, an Weiterbildungen zu Pflegeforschung teilzunehmen, und den Wunsch, dass diese Weiterbildungen vom Arbeitgeber / von der Arbeitgeberin angeboten werden sollten. Themen von besonderem Interesse waren forschungsbasierte Informationen zu Pflegephänomenen und -interventionen. Hinsichtlich der Implementierung von forschungsbasiertem Wissen in die Pflegepraxis äußerten die Pflegepersonen ihren Bedarf an adäquaten Informationen, an das Vorhandensein bestimmter struktureller Bedingungen (ausreichend Zeit, Mittel/Material), aber auch an professioneller Unterstützung, um Hindernisse zu überwinden. Die drei am häufigsten genannten Hindernisse waren Mangel an Zeit, fehlende Information/Kenntnisse sowie mangelndes Interesse zu Pflegeforschung und der Umsetzung von forschungsbasiertem Wissen.

Schwerpunkt von **Kapitel vier** sind die Interventionen - auch Strategien genannt -, die in österreichischen, deutschen und niederländischen Pflegeheimen und Krankenhäusern zur Implementierung von Leitlinien eingesetzt werden. Dafür wurde eine online-basierte Querschnittsstudie durchgeführt, an der sich insgesamt 215 Pflegeheime und 118 Krankenhäuser beteiligten. Die Datenerhebung erfolgte zwischen Juni und Juli 2008. Der hierzu genutzte Fragebogen basierte auf der modifizierten Typologie von Implementierungsinterventionen der *Effective Practice and Organisation of Care (EPOC)* Review Group von Cochrane. Danach werden die Implementierungsstrategien in vier Gruppen eingeteilt: professionelle, organisatorische, finanzielle und gesetzlich-regulative Strategien. Die Datenauswertung erfolgte deskriptiv und mittels einfacher Varianzanalyse. Die Ergebnisse dieser Studie zeigten auf,

dass zur Verfügung gestelltes *schriftliches Material*, eine Strategie aus der Gruppe der professionellen Implementierungsstrategien, die in allen teilnehmenden Einrichtungen insgesamt am häufigsten eingesetzte Strategie zur Implementierung von Leitlinien war (85 %). *Veränderungen im Patientinnen- und Patientendokumentationssystem* war die am zweithäufigsten eingesetzte Implementierungsstrategie (78 %). Sie gehört zu den organisatorischen Strategien. Finanzielle Anreize und gesetzlich-regulative Strategien wurden selten genutzt. Obwohl österreichische und deutsche Einrichtungen im Schnitt mehr Implementierungsstrategien einsetzten als niederländische Einrichtungen, zeigte sich, dass die Gruppenzusammensetzung der fünf am häufigsten eingesetzten Strategien in niederländischen Einrichtungen breiter war. Die fünf in den Niederlanden am häufigsten eingesetzten Implementierungsstrategien gehören zu drei *EPOC*-Gruppen (professionelle, organisatorische und gesetzlich-regulative Strategien), während die in österreichischen und deutschen Einrichtungen genutzten Strategien zu zwei Gruppen (professionelle und organisatorische Strategien) gehören.

Kapitel fünf fokussiert die Effektivität von vielfachen und an die jeweilige Einrichtung angepassten Strategien, die zur Implementierung einer Evidenz-basierten Leitlinie zur Sturzprophylaxe in die Pflegepraxis einer Einrichtung der Akutversorgung eingesetzt wurden. Das Setting der Leitlinienimplementierung sowie der im Rahmen von partizipativer Aktionsforschung durchgeführten Vorher-nachher-, Mixed Methods-Studie waren zwei Abteilungen eines österreichischen Universitätskrankenhauses. Das *CFIR* bildete den theoretischen Rahmen dazu. Diplomierte Pflegepersonen sowie Pflegehelferinnen und -helfer (Pflegepersonal) waren in den Implementierungsprozess eingebunden. Die Instrumente zur Datenerhebung (Leitfäden für halbstrukturierte Interviews und Gruppendiskussionen, Fragebögen) basierten auf dem *CFIR*. Jeder Fragebogen umfasste demographische Daten, den Kenntnisstand zu Pflegeforschung, Sturzprophylaxe und Leitlinien, die Einstellungen zu Leitlinien, verschiedene Einflussfaktoren und - ergänzend in der Enderhebung - eine Evaluation des Implementierungsprozesses. Zusätzlich wurde die vom beteiligten Pflegepersonal aufgewandte Zeit in Stunden erfasst. Qualitative Daten wurden inhaltsanalytisch unter Einbezug des *CFIR* ausgewertet. Quantitative Daten wurden deskriptiv und induktiv ausgewertet. Insgesamt beteiligten sich jeweils 18 Personen zu drei Erhebungszeitpunkten (Beginn, Zwischen- und Enderhebung) an halbstrukturierten Interviews sowie 106, 111 beziehungsweise 110 Personen an der jeweiligen Fragebogenerhebung. Die Haupter-

gebnisse auf Ebene des teilnehmenden Pflegepersonals zeigten einen signifikanten Kenntniszuwachs zu Sturzprophylaxe, zum Auffinden der Leitlinie zur Sturzprophylaxe im Hause und zur Leitlinie selbst. Auch nahmen zu Beginn vorhandene positive Einstellungen zu Leitlinien weiter signifikant zu. Die qualitativen Daten heben eine Zunahme des Bewusstseins der Teilnehmenden gegenüber Sturzprophylaxe hervor sowie der Stärkung ihres Selbstbewusstseins durch das Projekt. Die Hauptergebnisse auf Organisationsebene umfassten das Vorhandensein von erforderlichem Material zur Sturzprophylaxe sowie durchgeführte Anpassungen der klinischen Umgebung. Insgesamt wurden im Verlauf des Projektes 1192 Arbeitsstunden vom Pflegepersonal investiert, um die Leitlinie zur Sturzprophylaxe zu implementieren, was in etwa einem Kostenaufwand von 14.600 € entspricht.

Kapitel sechs präsentiert die Evaluierung des *CFIR*, das als theoretischer Rahmen in der in Kapitel fünf beschriebenen Studie eingesetzt wurde. Eine Post-hoc-Einschätzung fokussierte die Vollständigkeit, Anwendbarkeit und Nützlichkeit dieses theoretischen Rahmens. Als Datenquellen wurden hierzu die Protokolle der Teamsitzungen, das Forschungstagebuch sowie die im Verlauf des Implementierungsprojektes mittels halbstrukturierten Interviews und Fragebögen gesammelten Daten herangezogen. In der Analyse konnte die Eignung des *CFIR* als theoretischer Rahmen zur Implementierung einer Leitlinie in die Pflegepraxis eines Akutkrankenhauses grundsätzlich bestätigt werden. Es war jedoch erforderlich, einige relevante Faktoren in der Planungsphase des Projektes zu ergänzen: die Ziele, Wünsche und Bedarfe der Akteurinnen und Akteure (Stakeholder) im Zusammenhang mit der Implementierung einer Innovation, bestehende Maßnahmen in Bezug auf die vorgesehene Innovation (hier zum Beispiel bereits durchgeführte sturzpräventive Maßnahmen) sowie die bisher eingesetzten Implementierungsstrategien. Im Weiteren wurde ersichtlich, dass zwei *CFIR*-Konstrukte (*Reflexion & Evaluierung* sowie *Einsatz (engaging)*) eine präzisere Definition erforderten. In Bezug auf die Anwendbarkeit und Nützlichkeit des *CFIRs* ergab die Analyse, dass dieser Rahmen mit seinen genannten Ergänzungen durch die Gruppe der Forscherinnen und Forscher einfach zu handhaben war und sowohl die qualitative Datenanalyse wie auch die Erklärung der erreichten Hauptergebnisse erleichterte. Darüber hinaus konnte durch die orientierende Unterstützung durch das *CFIR* auch ein Spektrum an relevanten Implementierungsoutcomes gewonnen werden, wie zum Beispiel zur Organisationskultur der Ein-

richtung oder Empfehlungen für weitere Implementierungsprojekte aus der Perspektive der Teilnehmenden.

In **Kapitel sieben** werden die Hauptergebnisse dieser Doktorarbeit zusammengefasst und abschließend diskutiert. Methodologische Aspekte zu den durchgeführten Studien werden beleuchtet. Basierend auf den Ergebnissen und den Limitationen dieser Doktorarbeit zeigt sich, dass im Themenfeld Implementierung von forschungsbasiertem Wissen in die Pflege weitere Forschung erforderlich ist. Diese sollte pflegerelevante Instrumente zur Einschätzung von Einflussfaktoren und Outcomes aus Implementierungsprozessen, zur Effektivität von in der Pflege genutzten Implementierungsstrategien wie auch zu aufgewandten Kosten und Ressourcenverbrauch in einem Implementierungsprojekt näher untersuchen. Zur Verbesserung der Pflegepraxis wird eine Revision der österreichischen Curricula, die Aufnahme von Methoden der Pflegeforschung in die Grund- und Weiterbildung sowie die Anwendung partizipatorischer Aktionsforschung in Kombination mit dem *CFIR* als theoretischer Rahmen zur Implementierung von aktuellem Wissen empfohlen.

Chapter 10

Acknowledgements

ACKNOWLEDGEMENTS

This doctoral thesis, which was carried out at the Institute of Nursing Science at the Medical University of Graz, represents the efforts of many individuals, invested both during its preparation and the processes that led to its completion. I would like to extend my deepest gratitude to those individuals who have helped me achieve this goal.

In particular, I would like to express my sincere gratitude to my supervisors Prof. Dr. Christa Lohrmann, Medical University of Graz, and Associate Prof. Dr. Ruud JG Halfens, Maastricht University, for their continued support and encouragement throughout all stages of my doctoral thesis. Thank you, Christa, for your excellent support, valuable advice, constructive criticism and for giving me the opportunity to become part of the scientific community by helping me participate in (inter)national conferences and summer schools. Thank you, Ruud, for your encouraging and rapid feedback in response to all my questions as well as for your constructive and motivational comments and suggestions during our meetings. You, too, encouraged me to critically reflect on my topic during the progress of my thesis.

Many thanks go to my peers at the 'Joint PhD-College of Nursing Science' at the Maastricht University (The Netherlands), the Charité-Universitätsmedizin Berlin (Germany) and the Medical University of Graz (Austria) for all their constructive feedback and inspiring discussions, but also for pleasant times spent together during the doctoral programme. A special thanks also goes to Birgit Heckemann, co-investigator and co-author of paper 4. Without your valuable and thought-provoking comments, this work would have been less complete. Elisabeth Fink and Tatjana Seiser, two student research assistants with whom I worked during different periods over the course of my research, provided substantial support while entering and analysing data as well as transcribing the qualitative data. I always could rely on your work. Thank you so much.

I want also offer my sincere gratitude to all my colleagues at the Institute of Nursing Science at the Medical University of Graz for their guidance and constant support during the many steps taken during my doctorate studies. Special thanks are given to Manuela Schatz for revising all my English manuscripts during the past years, and to Sandra Klein for designing the layout of the present doctoral thesis.

I would also like to thank the nursing directors of all the hospitals (studies 1 - 3) and nursing homes (study 2) mentioned for opening their doors to me and making it possible for me to conduct the respective study. My sincere thanks goes to all study participants who contributed to this work through their participation. In particular, I would like to express my sincere gratitude to Elke Granitz, head nurse, and the steering committee members of the University Hospital Graz for giving me a deeper insight into nursing in Austria and for their support and fruitful discussions during the implementation project.

In closing, I would like to acknowledge the team of the Institute for Medical Informatics, Statistics and Documentation at the Medical University of Graz for the support in answering statistical questions.

Studies one and three in this thesis have been financially supported by the Austrian Federal Province of Styria: Land Steiermark, Abteilung 3 - Wissenschaft und Forschung.

Chapter 11

Curriculum vitae

CURRICULUM VITAE

Helga Elisabeth Breimaier completed her professional training in paediatric nursing care at the nursing school of the Krankenanstalten des Landkreises Ludwigsburg, Germany, in 1978. As a registered nurse, she subsequently worked in a surgical ward and a paediatric ward in Switzerland for 6.5 years. She continued her education and received a diploma as a foreign language business correspondent (English and Spanish) in 1989. Then, she again worked as a paediatric nurse on a gynaecological and obstetric ward in Germany, before she moved to Yemen to work with the German Development Service, working in a rural area as part of the mother-and-child programme over three years.

In 1996, Ms. Breimaier received her diploma as a teacher of nursing from the Katholische Akademie für Pflegeberufe in Bayern e. V., Regensburg, Germany. In 1995, she became an assistant at the nursing school of the Inselspital, Bern University Hospital, Switzerland, and held a teaching position from 1996 to 1997.

Between 1997 and 2004, Ms. Breimaier studied Nursing Science at the University of Witten/Herdecke, Germany, from which she received her Bachelor's Degree (BScN), as well as a qualification in quality development and management in 2000 and her Master's Degree (MScN) in 2004. During this time, she also worked part time as a paediatric nurse at the paediatric department of the Gemeinschaftskrankenhaus Herdecke, Germany, and as a student assistant at the university's Department of Nursing Science.

From 2005 to 2007, Ms. Breimaier worked as a nursing scientist and a teacher for nursing, first at the nursing school, the Berufsschule für Pflege - Neumünster, Zollikerberg, then at the Höhere Fachschule Pflege, Careum Bildungszentrum, in Zurich, Switzerland. In 2007, she also received her Certificate of Advanced Studies ETH in Development and Cooperation from the Swiss Federal Institute of Technology in Zurich, Switzerland.

Since 2007, Ms. Breimaier has been a member of the Institute of Nursing Science at the Medical University of Graz, Austria. Here, she works as a researcher and lecturer in the Bachelor's and Master's degree programmes. Her particular teaching focus is on research methodology and knowledge transfer. Her research focus is on knowledge transfer.

Since 2007, Ms. Breimaier has participated in the 'Joint PhD-College of Nursing Science' of the Charité-Universitätsmedizin Berlin in Germany; the Universiteit Maastricht in The Netherlands, and the Medical University of Graz in Austria. Furthermore, she has participated in the 3-year Summer School for Doctoral Studies of the European Academy of Nursing Science (EANS). She is also the author and reviewer of articles published in, and guest editor of, several national and international nursing journals, and she has been involved in the organisation of several national and international nursing conferences and symposia. In 2013, she was awarded the *Congress Award Graz* for organising the 13th European Doctoral Conference of Nursing Science, held in 2012 in Graz, Austria.

From 2009 to 2013, as well as since Nov. 2014, Ms. Breimaier has held a position as First Deputy Chair of the Institute of Nursing Science at the Medical University of Graz, Austria. In 2013, for her research project *Implementation of an evidence-based guideline to prevent falls into nursing practice in an acute hospital setting*, which addressed knowledge and knowledge transfer in patient care and evidence-based medicine, she was awarded the first prize of the *Berliner Gesundheitspreis* in Germany, which was endowed with 20,000 €.

Chapter 12

List of publications

NATIONAL AND INTERNATIONAL JOURNALS

Breimaier HE, Halfens RJG, Lohrmann C. Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nurs*. 2015;14:18. doi: 10.1186/s12912-015-0064-z.

Breimaier HE, Halfens RJG, Wilborn D, Meesterberends E, Haase Nielsen G, Lohrmann C. Implementation interventions used in nursing homes and hospitals: a descriptive, comparative study between Austria, Germany, and The Netherlands. *ISRN Nursing*. 2013;2013:Art. ID 706054. doi: 10.1155/2013/706054.

Breimaier HE, Lohrmann C. Umsetzung einer evidenzbasierten Leitlinie zur Sturzprophylaxe: Erfahrungen aus einem Aktionsforschungsprojekt. *Österreichische Pflegezeitschrift*. 2012;12:23–26.

Breimaier HE, Eichhorn-Kissel J, Kottner J, Meesterberends E, Meijers J, van Nie-Visser N. Editorial: The meaning of being a guest editor – a real challenge! *J Clin Nurs*. 2011;20:2383–4.

Breimaier HE, Halfens RJG, Lohrmann C. Nurses' wishes, knowledge, attitudes and perceived barriers on implementing research findings into practice among graduate nurses in Austria, *J Clin Nurs*. 2011;20:1744–56.

Breimaier HE, Lohrmann C. Pflegeforschung und Pflegepraxis: Kenntnisse, Einstellungen und Wünsche Pflegender zur Pflegeforschung – eine Erhebung am LKH-Univ. Klinikum Graz. *KlinOptikum*. 2008;9:20.

BOOK CHAPTERS AND REPORTS

Breimaier HE. Strategien zur Beeinflussung und Steuerung von Implementierungsprozessen. In: Hoben M, Bär M, Wahl H-W. *Implementierungswissenschaft für Pflege und Gerontologie. Grundlagen, Forschung und Anwendung – Ein Handbuch.* Stuttgart: W. Kohlhammer GmH [in print].

Breimaier HE, Lohrmann C. *Research report: Forschungs- und Wissenstransfer in die pflegerische Praxis. Implementierung Leitlinie Sturzprophylaxe.* Graz: Institute of Nursing Science, Medical University of Graz; 2014. [http://pflegewissenschaft.medunigraz.at/fileadmin/institute-oes/pflegewissenschaft/dokumente_forschung/Bericht_Sturzleitlinie-Implementierung_20150427.pdf].

Wilborn D, Meesterberends E, **Breimaier HE**, Lohrmann C, Halfens R, Haase Nielsen G. Wissensbedürfnisse von Pflegenden zum Thema „Systematische Übersichtsarbeiten": Eine Untersuchung aus Österreich und Deutschland. In: Schwendemann W, Puch H-J, editors. *Evangelische Hochschulperspektiven Theorie – Praxis – Partizipation. 9/2013*. Freiburg i. Brsg.: Verlag Forschung – Entwicklung – Lehre; 2013. p. 117–28.

Breimaier HE, Lohrmann C. *Research report: Forschungs- und Wissenstransfer in der pflegerischen Praxis.* Graz: Institute of Nursing Science, Medical University of Graz; 2011. [http://www.medunigraz.at/pflegewissenschaft/images/content/file/Forschung/Forschungsbericht_20110511.pdf].

PUBLISHED ABSTRACTS

Breimaier HE, Lohrmann C. *Measuring organizational culture: How appropriate is the Competing Values Framework (CVF)?* Book of abstracts of the 15th International Conference on Knowledge, Culture, and Change in Organizations, FEB 19–20, 2015; Berkeley, CA, USA.

Breimaier HE, Lohrmann C. *Von der Forschung in die Praxis – Wege einer erfolgreichen, forschungsbasierten Implementierung einer Evidenz basierten Leitlinie in die Pflegepraxis.* Book of abstracts of the Pflegekongress14, NOV 27–28, 2014; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *An evaluation of the process of implementing an evidence-based guideline into hospital-based nursing care.* Book of abstracts of the 18th International Nursing Research Conference, NOV 11–14, 2014; Vitoria-Gasteiz, SPAIN.

Breimaier HE, Lohrmann C. *The Consolidated Framework for Implementation Research (CFIR): A useful theoretical framework for assessing influencing factors and evaluating a guideline implementation process.* Poster proceedings of the 2nd Biennial Global Implementation Conference, AUG 19–21, 2013; Washington, D.C., USA.

Breimaier HE, Lohrmann C. *Participatory action research (PAR): A promising approach for implementing a clinical practice guideline in an acute care hospital setting.* Poster proceedings of the 2nd Biennial Global Implementation Conference, AUG 19–21, 2013; Washington, D.C., USA.

Breimaier HE, Lohrmann C. *Aktionsforschung – der Weg für eine effektive Implementierung einer Leitlinie in die Pflegepraxis.* Book of abstracts of the 20th Österreichische Gesundheits- und Krankenpflegekongress, JULY 3–5, 2013; Bregenz, AUSTRIA.

Breimaier HE, Lohrmann C. *Effectiveness of a multifaceted approach to implement a fall prevention guideline into nursing practice in a hospital setting. A before and in-between-assessment.* Book of abstracts of the Sigma Theta Tau International's 23rd International Nursing Research Congress, JULY 30 – AUG 3, 2012; Brisbane, AUSTRALIA.

Breimaier HE, Lohrmann C. *The Consolidated Framework for Implementation Research (CFIR) – a useful baseline audit for guideline implementation?* Book of abstracts of the 15th International Nursing Research Conference, NOV 16–18, 2011; Madrid, SPAIN.

Breimaier HE, Lohrmann C. *Effectiveness of interventions used most frequently to implement clinical practice guidelines (CPGs) into acute nursing practice.* Book of abstracts of the 12th European Doctoral Conference in Nursing Science (EDCNS), SEPT 15–17, 2011; Maastricht, THE NETHERLANDS.

Breimaier HE, Lohrmann C. *Action research – an appropriate approach to implement a clinical practice guideline into an acute care setting?* Book of abstracts of the 11th European Doctoral Conference in Nursing Science (EDCNS), SEPT 17–18, 2010; Berlin, GERMANY.

Breimaier HE, Lohrmann C. *Implementierung von Leitlinien und Standards: eingesetzte Strategien in österreichischen Krankenhäusern und Pflegeheimen.* Book of abstracts of the Pflegekongress10, OCT 28–29, 2010; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *Eingesetzte Strategien zur Implementierung von Leitlinien und Standards am Beispiel österreichischer Krankenhäuser und Pflegeheimen.* Book of abstracts of the Fachtagung für Gesundheitsberufe: Evidence-based Practice – was bringt die Zukunft? MARCH, 5–6, 2010; Bern, SWITZERLAND.

Breimaier HE, Lohrmann C. *Nurses' wishes and perceived obstacles regarding nursing research and utilization – comparison of different educational curricula.* Books of abstracts of the 6th Biennial Joanna Briggs Colloquium in association with 12th International Nursing Research Conference, NOV. 12–15, 2008; Córdoba, SPAIN.

Breimaier HE, Lohrmann C. *Missing values. The necessity to critically discuss the survey-questionnaire.* Books of abstracts of the 9th European Doctoral Conference in Nursing Science (EDCNS), SEPT 12–13, 2008; Maastricht, THE NETHERLANDS.

Breimaier HE, Lohrmann C. *Nursing science and nursing practice. What are nurses' attitudes, knowledge and wishes as to nursing research and research utilization?* Books of abstracts of the 13th Research Conference of the Workgroup of European Nurse Researchers (WENR), SEPT 2–5, 2008; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *Nursing science and nursing practice. Nurses' attitudes, knowledge, wishes and perceived obstacles regarding nursing research and research utilization.* Books of abstracts of the Royal College of Nursing of the United Kingdom Research Society (RCN) 2008 International Nursing Research Conference, APRIL 8–11, 2008; Liverpool, UK.

Breimaier HE, Lohrmann C. *Nursing science and nursing practice. Nurses' knowledge, attitudes and wishes about nursing research.* Book of abstracts of the 8th European Doctoral Conference in Nursing Science (EDCNS), SEPT 7–8, 2007; Vienna, AUSTRIA.

PUBLISHED POSTERS

Breimaier HE, Lohrmann C. *Internal consistency and construct validity of measures used to retrospectively evaluate the process of a fall prevention clinical practice guideline implementation project in a hospital setting.* Global Implementation Conference 2015, MAY 26–28, 2015; Dublin, IRELAND. (Digital poster) [http://gic2015.paperlessevent.com.au/posters-list/].

Breimaier HE, Lohrmann C. *The Consolidated Framework for Implementation Research (CFIR): A useful theoretical framework for assessing influencing factors and evaluating a guideline implementation process.* 2nd Biennial Global Implementation Conference, AUG 19, 2013; Washington, D.C., USA. [http://globalimplementation.org/_static/gii/uploads/files//t-13_measures_breimaier_the-consolidated-framework-for-implementation-research.pdf].

Breimaier HE, Lohrmann C. *Participatory action research (PAR): A promising approach for implementing a clinical practice guideline in an acute care hospital setting.* 2nd Biennial Global Implementation Conference, AUG 20, 2013; Washington, D.C., USA. [http://globalimplementation.org/_static/gii/uploads/files//m-14_measures_breimaier_participatory-action-research_.pdf].

PRESENTATIONS ON NATIONAL AND INTERNATIONAL CONFERENCES

Breimaier HE, Lohrmann C. *Internal consistency and construct validity of measures used to retrospectively evaluate the process of a fall prevention clinical practice guideline implementation project in a hospital setting.* Digital poster. Global Implementation Conference 2015, MAY 26–28, 2015; Dublin, IRELAND.

Breimaier HE, Lohrmann C. *Measuring organizational culture: How appropriate is the Competing Values Framework (CVF)?* 15th International Conference on Knowledge, Culture, and Change in Organizations, FEB 20, 2015; Berkeley, CA, USA.

Breimaier HE, Lohrmann C. *Von der Forschung in die Praxis – Wege einer erfolgreichen, forschungsbasierten Implementierung einer Evidenz basierten Leitlinie in die Pflegepraxis.* Pflegekongress14, NOV 27–28, 2014; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *An evaluation of the process of implementing an evidence-based guideline into hospital-based nursing care.* 18th International Nursing Research Conference, NOV 13, 2014; Vitoria-Gasteiz, SPAIN.

Breimaier HE, Lohrmann C. *Wissenschaftliche Aspekte des Implementierungsprojektes – Sturzleitlinie.* Symposium Forschungsimplementierung Graz, SEPT 23, 2013; Graz, AUSTRIA.

Breimaier HE, Lohrmann C. *The Consolidated Framework for Implementation Research (CFIR): A useful theoretical framework for assessing influencing factors and evaluating a guideline implementation process.* Poster. 2nd Biennial Global Implementation Conference, AUG 19, 2013; Washington, D.C., USA.

Breimaier HE, Lohrmann C. *Participatory action research (PAR): A promising approach for implementing a clinical practice guideline in an acute care hospital setting.* Poster. 2nd Biennial Global Implementation Conference, AUG 20, 2013; Washington, D.C., USA.

Breimaier HE, Lohrmann C. *Aktionsforschung – der Weg für eine effektive Implementierung einer Leitlinie in die Pflegepraxis.* 20. Österreichische Gesundheits- und Krankenpflegekongress, JULY 4, 2013; Bregenz, AUSTRIA.

Breimaier HE, Lohrmann C. *Aktuelle Forschungsaktivitäten und alter(n)sbezogene Projektaktivitäten des Instituts für Pflegewissensschaft. Implementierung einer Leitlinie zur Sturzprävention.* Poster. Österreichische Plattform für Interdisziplinäre Alternsfragen (ÖPIA), NOV.6, 2012; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *Empfehlungen zur Implementierung einer Leitlinie.* Symposium Dekubitus, NOV 16, 2012; Graz, AUSTRIA.

Breimaier HE, Lohrmann C. *Effectiveness of a multifaceted approach to implement a fall prevention guideline into nursing practice in a hospital setting. A before and in-between-assessment.* Sigma Theta Tau International's 23rd International Nursing Research Congress, JULY 31, 2012; Brisbane, AUSTRALIA.

Breimaier HE, Lohrmann C. *Umsetzung der Evidence-based Leitlinie zur Sturzprophylaxe im klinischen Bereich mit Aktionsforschung.* Pflegesymposium Graz, APRIL 12, 2012; Graz, AUSTRIA.

Breimaier HE, Lohrmann C. *The Consolidated Framework for Implementation Research (CFIR) – a useful baseline audit for guideline implementation?* 15th International Nursing Research Conference, NOV 18, 2011; Madrid, SPAIN.

Breimaier HE, Lohrmann C. *Effectiveness of interventions used most frequently to implement clinical practice guidelines (CPGs) into acute nursing practice.* 12th European Doctoral Conference in Nursing Science (EDCNS), SEPT 16, 2011; Maastricht, THE NETHERLANDS.

Breimaier HE. *Strategien der Praxis-Theorie-Vernetzung in der Pflege.* Expertentag der Schule für allgemeine Gesundheits- und Krankenpflege am Kaiserin-Elisabeth Spital der Stadt Wien; JUNE 8, 2011; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *Action research – an appropriate approach to implement a clinical practice guideline into an acute care setting?* 11th European Doctoral Conference in Nursing Science (EDCNS), SEPT 17, 2010; Berlin, GERMANY.

Breimaier HE, Lohrmann C. *Implementierung von Leitlinien und Standards: eingesetzte Strategien in österreichischen Krankenhäusern und Pflegeheimen.* Pflegekongress10, OCT 28, 2010; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *Eingesetzte Strategien zur Implementierung von Leitlinien und Standards am Beispiel österreichischer Krankenhäuser und Pflegeheimen.* Poster. Fachtagung für Gesundheitsberufe: Evidence-based Practice – was bringt die Zukunft? MARCH, 5–6, 2010; Bern, SWITZERLAND.

Breimaier HE, Lohrmann C. *Nutzung von Standards und Leitlinien in österreichischen Krankenhäusern und Pflegeheimen – Ergebnisse einer Forschungsstudie.* 5th Symposium der Grazer Gesellschaft der Pflegewissenschaft, SEPT 29, 2009; Graz, AUSTRIA.

Breimaier HE, Lohrmann C. *Nurses' wishes and perceived obstacles regarding nursing research and utilization – comparison of different educational curricula.* 6th Biennial Joanna Briggs Colloquium in association with 12th International Nursing Research Conference, NOV. 13, 2008; Córdoba, SPAIN.

Breimaier HE, Lohrmann C. *Klinische Leitlinien: Das Nonplusultra in der Pflegepraxis?* 4th Symposium der Grazer Gesellschaft der Pflegewissenschaft, OCT 22, 2008; Graz, AUSTRIA.

Breimaier HE, Lohrmann C. *Missing values. The necessity to critically discuss the survey-questionnaire*. 9th European Doctoral Conference in Nursing Science (EDCNS), SEPT 13, 2008; Maastricht, THE NETHERLANDS.

Breimaier HE, Lohrmann C. *Nursing science and nursing practice. What are nurses' attitudes, knowledge and wishes as to nursing research and research utilization?* 13th Research Conference of the Workgroup of European Nurse Researchers (WENR), SEPT 3; Vienna, AUSTRIA.

Breimaier HE, Lohrmann C. *Nursing science and nursing practice. Nurses' attitudes, knowledge, wishes and perceived obstacles regarding nursing research and research utilization.* The Royal College of Nursing of the United

Kingdom Research Society (RCN) 2008 International Nursing Research Conference, APRIL 9, 2008; Liverpool, UK.

Breimaier HE, Lohrmann C. *Forschung in der Praxis – das Salz in der Suppe?* 3rd Symposium der Grazer Gesellschaft der Pflegewissenschaft, NOV 13, 2007; Graz, AUSTRIA.

Breimaier HE, Lohrmann C. *Nursing science and nursing practice. Nurses' knowledge, attitudes and wishes about nursing research.* Poster. 8th European Doctoral Conference in Nursing Science (EDCNS), SEPT 7–8, 2007; Vienna, AUSTRIA.

Breimaier HE. *Vorbereitung von Tropeneinsätzen: Erfahrungen als Kinderkrankenschwester mit der Vorbereitung für und der Arbeit im Entwicklungsdienst im Jemen.* 8th Symposium der Deutschen Gesellschaft für Tropenchirurgie: Eine Welt – Eine Chirurgie? Eine Welt – Eine Pflege, NOV 12, 1999; Jena, GERMANY.

Breimaier HE. *Erlebnisreise einer Forschungsfrage zum Thema Flügelhemd.* Tag der Pflegenden, Caritas-Gemeinschaft für Pflege- und Sozialberufe Augsburg e. V., JUNE 30, 1999; Augsburg, GERMANY.