



Scoping review of nursing-related dissemination and implementation research in German-speaking countries: Mapping the field

Scoping Review zum Stand der pflegebezogenen Disseminations- und Implementierungsforschung in deutschsprachigen Ländern: eine Bestandsaufnahme

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Abstract

Implementing evidence-based innovations into care practice is a complex, slow and haphazard process. Dissemination and implementation (DI) research seeks to understand and optimize that process, to close gaps between research and practice and to improve quality of care. While there is a growing body of international DI research, little is known about the number and types of DI research studies and the DI topics studied in German-speaking nursing settings. This scoping review therefore evaluates the state of nursing-related DI research in German-speaking countries, discusses these results in light of the international state of DI research and provides directions for future research. We searched international databases (Web of Knowledge including Medline, CINAHL, PsycInfo, and GeroLit), German library meta-search engines, six German-language key trade journals, and reference lists of included articles. In total, 186 references representing 140 research projects were included in our review. Quality appraisal used five validated checklists. Methodological quality of the included studies was generally low. A total of 92 studies assessed the effects of DI strategies, 67 studied DI barriers and facilitators, 64 evaluated the impact or characteristics of DI processes, and 5 reported on the development or validation of DI research tools. None of the included studies focussed on methodological questions of DI research or on development and testing of DI theories and models. Future nursing-related DI research in German-speaking countries should particularly focus on these latter topics. Taking into account the international state of DI research will be especially crucial for those research activities.

Abstract

Evidenzbasierte Innovationen in die Pflegepraxis zu implementieren, ist eine Herausforderung. International steht ein wachsender Fundus an Arbeiten der Disseminations- und Implementierungsforschung (DI-Forschung) zur Verfügung, die versuchen, DI-Prozesse besser zu verstehen, zu optimieren und damit die Versorgungsqualität zu verbessern. Über die Zahl und den Fokus von DI-Forschungsarbeiten in deutschsprachigen Pflegesettings ist hingegen wenig bekannt. Dieses scoping Review untersucht daher diesen Forschungsstand, diskutiert diesen vor dem Hintergrund der internationalen DI-Forschung und gibt Empfehlungen für



künftige Forschungsaktivitäten. Durchsucht wurden internationale Datenbanken (Web of Knowledge einschließlich Medline, CINAHL, PsycInfo und GeroLit), sechs deutschsprachige Pflegezeitschriften sowie die Literaturlisten der eingeschlossenen Quellen. Insgesamt wurden 186 Publikationen eingeschlossen, die 140 Forschungsprojekte repräsentierten. Die Studienqualität wurde mittels fünf international bewährter Checklisten eingeschätzt. Die Qualität der Studien war tendenziell gering. 94 Forschungsprojekte evaluierten DI-Strategien, 67 erforschten Einflussfaktoren auf DI-Prozesse, 64 untersuchten Auswirkungen, Merkmale oder Verläufe von DI-Prozessen und 5 berichteten über die Entwicklung oder Validierung von Erhebungsinstrumenten für DI-Variablen. Methodologische Fragen der DI-Forschung oder die Entwicklung und Testung von DI-Theorien wurden in keiner der eingeschlossenen Studien thematisiert. Künftige pflegewissenschaftliche DI-Forschung im deutschsprachigen Raum sollte sich vor allem den letztgenannten Themen verstärkt widmen. Dabei wird es insbesondere darauf ankommen, die internationalen DI-Befunde zur Kenntnis zu nehmen, systematisch zu berücksichtigen, darauf aufzubauen und diese ggf. zu erweitern.

Keywords

Dissemination and Implementation Research – Nursing – German-speaking Countries – Scoping Review

Keywords

Disseminations- und Implementierungsforschung – Pflege – deutschsprachige Länder – Scoping Review

INTRODUCTION

Nursing practice in German-speaking countries, to a wide extent, does not comply with what we know from research (Walker Schlaefli, 2005; Breimaier et al., 2011; Köpke et al., 2013). This is in line with international findings pointing to serious research-practice gaps across countries, healthcare disciplines and settings (Grol & Grimshaw, 2003; Estabrooks et al., 2008; Grimshaw et al., 2012). Consequently, care recipients receive treatment that is less than optimal or even ineffective or harmful, diminishing not only healthcare productivity and individuals' health and quality of life, but actually costing lives (Eccles et al., 2009; Grimshaw et al., 2012). However, implementing research into care practice is complex, time consuming, unpredictable and difficult to manage (Greenhalgh et al., 2005; Kitson, 2009; Sterns et al., 2010).

A growing body of international research focuses on how to most effectively improve research implementation in healthcare practice. This research has numerous names, such as translational research, research utilization, knowledge translation, innovation diffusion, implementation research, and others (e.g. McKibbon et al., 2010). Despite this multitude of terms and definitions, reflecting the heterogeneous perspectives of different research groups, scholarly disciplines and healthcare systems, a common core of this field of study is "readily identifiable to those familiar with the field" (Estabrooks et al., 2008, 2): the problem of getting new knowledge into practice in order to improve the quality of care (Graham et al., 2006; Estabrooks et al., 2008). We use the term dissemination and implementation (DI) science or research in this article; it translates relatively easily into German (unlike many other English terms), and it is becoming the term primarily used in German-language discourses. Key terms used in this text (dissemination, implementation and DI research) are defined in box 1.

Box 1: Definitions of key DI terms

"Dissemination is an active approach of spreading evidence-based interventions to the target audience via determined channels using planned strategies." (Rabin & Brownson, 2012, 26)

"Dissemination research is the systematic study of processes and factors that lead to widespread use of an evidence-based intervention by the target population. Its focus is to identify the best methods that enhance the uptake and utilization of the intervention." (Rabin & Brownson, 2012, 31)

"Implementation is the process of putting to use or integrating evidence-based interventions within a setting." (Rabin & Brownson, 2012, 26); **"Implementation** is dissemination plus action to actively encourage the adoption of recommendations contained in a message." (Mowatt et al., 1998, 669)

"Implementation research seeks to understand the processes and factors that are associated with successful integration of evidence-based interventions within a particular setting (e.g. a worksite or school). Implementation research assesses whether the core components of the original intervention were faithfully transported to the real-world setting (i.e. the degree of fidelity of the disseminated and implemented intervention with the original study) and is also concerned with the adaptation of the implemented intervention to local context. Another [...] essential component of implementation research involves the enhancement of readiness through the creation of effective climate and culture in an organization or community." (Rabin & Brownson, 2012, 31)



Research sponsors around the world have recognized DI research as an important area for funding (e.g. Smits & Denis, 2014), research agendas have been developed (e.g. Dagenais et al., 2009; Eccles et al., 2009; Titler et al., 2009; Proctor et al., 2011), and countless studies and topics relevant to this field of study have been identified, mapped and systematized (e.g. Fixsen et al., 2005; Greenhalgh et al., 2005; Estabrooks et al., 2008). Nursing science as well as policy in German-speaking countries, however, have so far paid little attention to this international body of research, although the theory-practice problem is widely discussed (e.g. Brandenburg, 2005; de Jong, 2006; Höhmann, 2008; Wilbert-Herr, 2008; Lüthi, 2011). Compared with Anglo-Saxon and Nordic European countries, the state of nursing science and nursing education is clearly less developed in the German speaking countries (Lehmann et al., 2014). Although university education is offered, it is not required for professional qualification. Most nurses in German-speaking countries have completed vocational training. They lack competences such as (a) translating their practice problems into research questions that can be answered by scientific studies, (b) searching for and critically appraising scientific studies that might help them to resolve practice problems, and (c) understanding studies in English language (while no adequate studies in German language are available for many topics) (Meyer & Köpke, 2012b). Nursing in German-speaking countries is just on its way to become an academic discipline, and therefore, has not yet taken into account many of the international research topics – such as, in this case, DI research.

Recently, nursing research scientists in German-speaking countries have highlighted the importance of considering and building on international DI research to overcome the gaps between research, practice and policy (Bartholomeyczik, 2008; Meyer & Köpke, 2012a; Quasdorf et al., 2013; Roes et al., 2013a; Roes et al., 2013b), and have begun publishing research studies related to this field (Saxer, 2002; Schubert & Wrobel, 2009; Breimaier et al., 2011; Breimaier et al., 2013; Köpke et al., 2013). However, the number and types of DI research studies and the DI topics that have been studied in German-speaking nursing settings have not been delineated. While it is important to take into account the huge body of international DI research, these findings may not be readily be translatable to the context of German-speaking countries. Structural and cultural differences require (a) a critical evaluation of the adaptability and usefulness of international DI research findings for German speaking contexts and (b) own DI research in German-speaking countries to study the specific conditions, barriers, facilitators and potentially effective strategies in DI processes. Therefore, it is crucial to providing directions for future DI research in German-speaking countries and to demonstrating if and how

future research can build on and be linked to international findings. Findings of DI research specific to the German-speaking countries may also be potentially interesting to the international scientific community as these findings eventually may include new methods, knowledge and ideas not yet published in English language.

THE REVIEW

Aim

The aim of this review is to explore the extent, range, nature and quality of nursing-related DI research in German-speaking countries. Therefore, we want to identify research gaps and provide recommendations for priority areas of focus in future research. We present the number and proportion of DI research papers by year of publication, country of origin, publication language, study setting, study type, and DI topic studied. Furthermore, we assessed the methodological quality of the included studies. Specifically, we report on the types of barriers and facilitators, and the DI strategies assessed in the included studies. We compare the results of this review to the international state of DI research in the discussion, based on selected international DI reviews and original studies of high methodological quality.

Design

Due to the broad, explorative nature of our research aim, the diversity of the DI research field, and the fact that it has not been reviewed comprehensively in German-speaking nursing settings before, we undertook a scoping review following the framework developed by Arksey and O'Malley (2005) and enhanced by Levac et al. (2010) and Daudt et al. (2013). Following the definition of the Canadian Institutes of Health Research (CIHR), we define scoping reviews as “exploratory projects that systematically map the literature available on a topic, identifying the key concepts, theories, sources of evidence, and gaps in the research” (CIHR, 2013). In scoping reviews, knowledge in a broad thematic area is systematically selected, collected and summarized “for the purpose of identifying where there is sufficient evidence to conduct a full synthesis or where insufficient evidence exists and further primary research is necessary” (CIHR, 2013).

We followed the five stages suggested in the Arksey and O'Malley (2005) framework: (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, and (5) collating, summarizing and reporting the results. Although scoping reviews, in contrast to systematic reviews, do not necessarily assess study quality (Arksey & O'Malley,

2005; Davis et al., 2009; Grant & Booth, 2009), we included this step. We agree with Levac et al. (2010) and Daudt et al. (2013) that information about study quality will facilitate interpretation of results.

Search strategy

General procedure and key words

We adapted to the needs of this study search strategies that were effectively used in previous international reviews studying DI research topics (Estabrooks et al., 2003; Estabrooks et al., 2008; Squires et al., 2011a; Squires et al., 2011b; Squires et al., 2011c; Boström et al., 2012). These search strategies usually contain: (a) terms that describe the topic to be brought into practice (e.g. evidence, innovation, research knowledge, guidelines, technology) and (b) terms that describe the process of bringing these topics into practice (e.g. diffusion, dissemination, implementation, use, utilization, translation, transfer, adoption, uptake). We completed the search in January 2013 and searched for texts published as early as the limit of the respective databases allowed up to 31 December 2012. Our detailed search algorithms are presented in additional file 1.

Data sources

We searched the following international databases: (a) Web of Knowledge (including Web of Science, Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, and Medline), (b) CINAHL, (c) PsycINFO, and (d) GeroLit. In the German-speaking regions nursing research results are largely published in the grey literature: non-peer reviewed journals, textbooks or reports. Therefore, we also searched two German library meta-search engines: *Online-Katalog des Südwestdeutschen Bibliotheksverbundes (SWB)* and *Gemeinsamer Verbundkatalog (GVK) des Gemeinsamen Bibliotheksverbundes (GBV)*. Further, we searched the following German language key trade journals by hand, starting with the first published issue of each journal: *Die Schwester der Pfleger*, *PADUA*, *Pflege*, *Pflege & Gesellschaft*, *Pflegewissenschaft* (called *PrInternet* until 2007), and *Pflegezeitschrift*. Finally, we scanned the reference lists of publications that met our inclusion criteria (below) and asked colleagues if they knew of further texts relevant to this review.

Inclusion criteria

We included publications if they (a) pertained to the topic of DI research (as defined in the introduction and operationalized in more detail in box 2), (b) focussed on nurses or care aides working in any kind of professional

healthcare setting (home or community care, hospital, nursing home, rehabilitation, etc.), (c) reported the results of either primary research (randomized or non-randomized clinical trials, pre-post studies, cohort or case-control studies, cross-sectional studies, qualitative research or mixed-methods studies) or rigorous research syntheses (meta-analyses, systematic reviews, meta-narrative reviews, scoping reviews, etc.), (d) were published in German or English Language, and (e) were conducted in a German-speaking country (Germany, Austria, Switzerland, Liechtenstein, or Luxembourg). We operationalized our understanding of DI research in more detail. DI research agendas (Dagenais et al., 2009; Eccles et al., 2009; Titler et al., 2009; Proctor et al., 2011) and comprehensive reviews and textbooks relating to the field of DI research (Fixsen et al., 2005; Greenhalgh et al., 2005; Straus et al., 2009; Brownson et al., 2012; Grol et al., 2013b) typically refer to five broad topics of DI research (box 2): barriers and facilitators, DI strategies, DI process evaluation, DI theories and models, and methodologies and measurement. We considered a study to be DI research if it examined at least one of these five topics.

Box 2: Topics of DI research

Barriers and facilitators: Identification and analysis of factors positively or negatively affecting the success of DI processes. These factors can be located at the levels of (a) the individuals involved i.e., characteristics, attitudes, behaviours, ... of care providers or patients, (b) the innovation, i.e. characteristics of the intervention, program, guideline, ... to be introduced, (c) the organization, i.e. organizational context conditions such as leadership, culture, structures, processes, resources, ..., and (d) the environment, i.e. the political, economic, cultural, social or legal situation in which individuals and organizations are embedded (Chaudoir et al., 2013).

DI strategies: Development and evaluation of strategies to influence the success of DI processes. A huge number of such strategies are available. For example, the Cochrane Effective Practice and Organisation of Care Review Group (EPOC, 2010) provides a taxonomy that subsumes over 50 types of DI interventions under four broad categories: professional, financial, organizational, and regulatory interventions. Those interventions are often combined in multi-faceted or tailored intervention complexes (Cheater et al., 2005; Grimshaw et al., 2006). We also subsume national strategies to support DI processes and evidence-based practice under this category (Eccles et al., 2009; Titler et al., 2009).



DI process evaluation: DI processes can be evaluated from various perspectives. Their impact can be measured at the patient level (e.g. quality indicators or quality of life), care provider level (e.g. attitudes, behaviours, job satisfaction, stress), process level (e.g. implementation fidelity), and system level (e.g. wait times, length of stay, expenditures) (Graham et al., 2010). We also subsume ethical issues of DI processes under this category, such as benefits versus unexpected (perhaps negative) effects of DI processes, necessary prerequisites (e.g. resources, competences, support) for DI success or normative reasons for or against DI. How DI processes differ with regard to inherent patterns or development over time is another evaluation focus. For instance, Ward et al. (2009) found that DI processes can be linear, cyclical or dynamic multidirectional.

DI theories and models: Development and testing of theories and models that seek to describe, explain and/or predict DI processes. A wide range of such theories and models exist (Estabrooks et al., 2006; Graham & Tetroe, 2007; Rycroft-Malone & Bucknall, 2010a; Grol et al., 2013a). They can be used to assess barriers and facilitators of DI processes, to guide the development of DI interventions, to select outcomes/variables to evaluate DI processes, to guide DI processes, to detect gaps in DI research, to design DI research projects, or to interpret DI research results (Rycroft-Malone & Bucknall, 2010b).

Methodologies and measurement: Development and validation of research methodologies and outcome measures that are appropriate to evaluating DI processes. DI measures can be designed to assess various outcomes: predictors of DI processes, i.e. any barriers and facilitators mentioned above, as well as dependent outcomes on various levels, i.e. the above-mentioned variables to measure the impact of DI processes. Methodological discussions refer to appropriate outcomes and measures, validation methods, methods to develop and evaluate complex DI interventions, research methods to deal with the complexity in DI processes (e.g. mixed methods, realist evaluation, action research, nested designs), etc. (Titler et al., 2009).

Study identification

Two reviewers independently screened titles and abstracts of identified references (Figure 1, $n=7298$ after duplicate removal). Full text copies ($n=862$) were retrieved if at least one of the two reviewers rated the publication as potentially relevant to our study or considered the details provided by titles and abstracts to be insufficient for

a decision on inclusion. Two team members independently reviewed all retrieved texts and discussed differences until consensus was reached. We included 109 references identified in the database search. Two research team members independently searched the selected journals by hand and resolved discrepancies by consensus. We included 77 additional citations, 36 of them identified in the journal hand search, 22 detected by reference list screening, and 19 recommended by colleagues. In total, we included 186 publications, which represent 140 research projects.

Quality appraisal

Our unit of analysis in this step was the research project. If two or more publications reported on the same research project, we rated the methodological quality of the whole project based on the information provided by all publications relating to that project.

We used five tools to assess the methodological quality of the included research projects. Systematic reviews were evaluated using the Assessment of Multiple Systematic Reviews (AMSTAR) tool (Shea et al., 2007b), a reliable and valid instrument for this purpose (Shea et al., 2007a; Shea et al., 2009; Kang et al., 2012). The AMSTAR assesses definition of an *a priori* design, study selection and data extraction, literature search, inclusion and exclusion criteria, list of included and excluded studies, characteristics and scientific quality of included studies, appropriateness of conclusions and methods used to combine findings, publication bias, and conflict of interest. The Quality Assessment Tool for Quantitative Studies (EPHPP, 2009) was used to assess randomized controlled trials (RCTs); non-randomized quantitative studies were evaluated using either Estabrooks' Quality Assessment and Validity Tool for Cross-sectional Studies or Estabrooks' Quality Assessment and Validity Tool for Before/After-Cohort Design Studies. All three tools have been used and described in detail in previous systematic reviews (e.g. Estabrooks et al., 2003; Estabrooks et al., 2009; Squires et al., 2011a; Squires et al., 2011c; Squires et al., submitted). The three tools assess the study quality with a focus on appropriateness of sample, research design, outcome measurement, and statistical analysis. Qualitative studies were assessed using the Critical Appraisal Skills Program (CASP) Qualitative Research Checklist (CASP, 2013). The dimensions assessed are: research aims, appropriateness of methodology, research design, recruitment strategy, data collection, relationship between researcher and participants, ethical issues, data analysis, statement of findings, and value of research.

We rated the overall quality of a study with a scoring method developed by de Vet et al. (1997), used in the systematic reviews noted in the previous paragraph. For each study, we calculated the ratio of the obtained

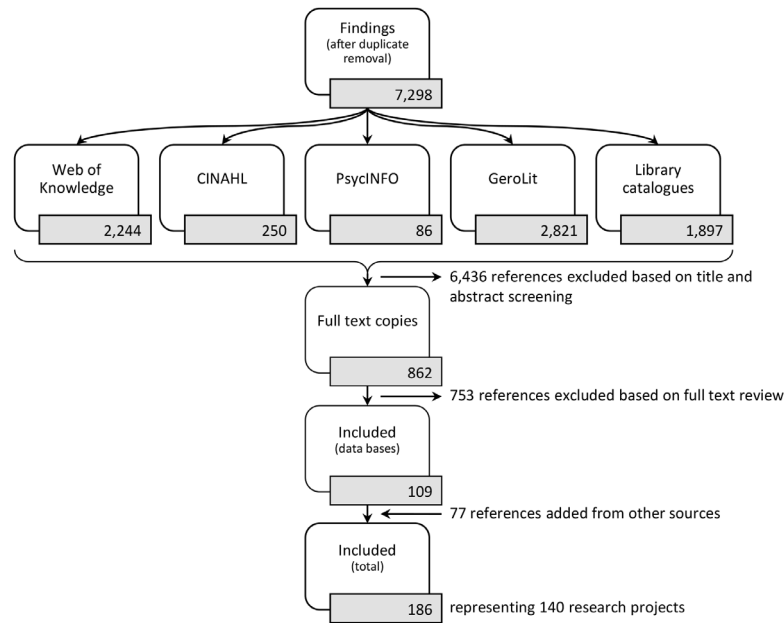


Fig 1. Identification and selection of studies.

score to the maximum possible score, which varied with the checklist used and the number of checklist items applicable to the study of interest. Based on this quality score with a possible range of 0–1, we ranked studies as weak (≤ 0.50), low moderate (0.51–0.66), high moderate (0.67–0.79), and strong (≥ 0.80).

As suggested by Pluye et al. (2009), we evaluated separately each study component of the mixed methods studies included (quantitative experimental, quantitative observational, and qualitative), using the corresponding checklist (described above). However, we did not calculate an overall quality score of all study parts as suggested by Pluye et al. (2009) to avoid having weak study components compensated by strong components. Instead, for each mixed methods study, we present a quality score for each study component.

Charting the data and collating and summarizing the results

For each research project included, one team member extracted data based on all available publications. We extracted information on year of publication, title, journal, country of origin, publication language, study design, study purposes/objectives, DI research topic(s), practice/situation to be changed/in focus, study setting and sample, applied DI interventions, assessed outcomes, data collection/analysis methods and instruments, and main results. A second team member double-checked data extraction for accuracy. Discrepancies were resolved by consensus. We created tables, charts, and maps summarizing the characteristics and content of the included studies.

RESULTS

Description of studies included

We included 188 references reporting on 140 research projects: 5 systematic reviews (3.6%), 12 RCTs (8.6%), 7 controlled trials (CTs, non-randomized; 5.0%), 26 one-group pre-post studies (18.6%), 32 cross-sectional studies (22.9%), 27 qualitative studies (19.3%), and 31 mixed methods studies (22.1%). The characteristics of the studies included are summarized in additional file 2. The earliest paper identified was published in 1989 (Käppeli, 1989). The number of DI research references published per year rose above 10 for the first time in 2002 and reached its current peak of 29 in 2012. Over 60% of the included DI research studies ($n=113$) were published after 2006, which demonstrates the relative infancy of this research field in German-speaking countries. Almost a quarter of the included references ($n=46$, 24.7%) were published in sources other than journals: 30 project reports, 8 books, 3 book sections, 3 PhD theses, 1 Bachelor's thesis, and 1 Master's thesis. In total, the vast majority of the 140 journal-based references were published in German, Swiss, or Austrian journals, primarily publishing articles in the German language ($n=87$, 62.1%).

As Figure 2 demonstrates, most of the 140 research projects identified ($n=106$, 75.7%) were conducted in Germany, followed by Switzerland ($n=25$, 17.9%) and Austria ($n=5$, 3.6%). Four research studies were multi-national: two included settings in Germany, the Netherlands and the United Kingdom; one included



settings in Germany and the Netherlands; and one included settings in Germany, Switzerland, and Austria. Four studies were excluded, although they were available in German language, as they were conducted in non-German-speaking countries: one Dutch study (Duimel-Peeters et al., 2009), one Italian study (conducted in the German-speaking province of South Tyrol; Casanova et al., 2010), one Swedish study (Kihlgren et al., 1990; Kihlgren et al., 1994), and one American study (Dufault et al., 1995, 1999; both originally published in English and translated into German). Of the 140 research projects, 93(66.4%) were published in the German language, 34 (24.3%) in English, and 13 (9.3%) in both English and German. Of the 106 research projects in German nursing settings, 79 projects (74.5%) were only published in the German language. Projects in Austrian settings (n=5) were also mainly published in German (n=4, 80%). In contrast, results from most projects in Swiss settings (n=25) were available in English (n=16, 64%).

Table 1 gives an overview of the study settings of the included research projects. More than half of them were conducted in hospital settings, with far fewer in nursing homes and homecare services.

Methodological quality of studies

Single method studies

Methodological quality of the 109 research projects applying a single method was low for most studies (see Figure 3 for details; the quality ratings of each research project are given in additional file 2). Overall, 78 studies (71.6%) were rated as weak, 8 as low moderate (7.3%), 12 as high moderate (11%), and 11 as strong (10.1%).

Mixed methods studies

Methodological quality of the 31 mixed methods research projects was also generally low (Figure 4). Particularly, the quantitative parts of the mixed methods studies were poor: low moderate for two projects and weak for the rest of the studies. The qualitative study parts of the most mixed methods studies were also low (n=23 weak and n=3 low moderate). However, we identified two mixed methods research projects with high moderate qualitative study parts and three projects with strong qualitative study parts.

DI research topics of studies

Of the 140 research projects included in this review, 67 studied factors supporting or inhibiting the dissemination or implementation of an intended change (barriers and facilitators); 92 studies evaluated the impact

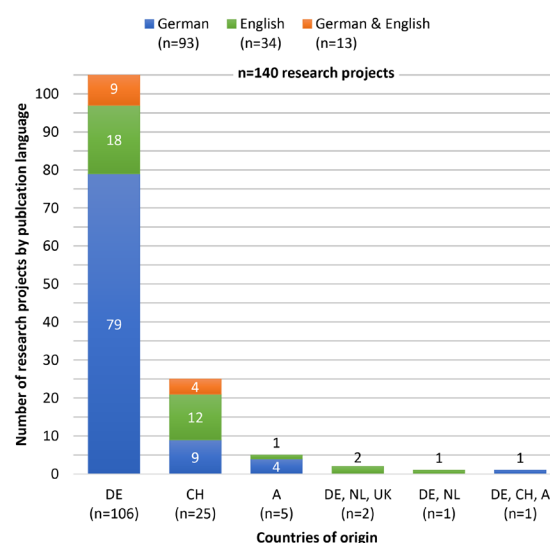


Fig 2. Number of identified research projects by country of origin and publication language.

Table 1. Study settings of the included research projects

Setting	Research projects	
	n	%
Hospital	72	51,4%
Nursing Home	28	20,0%
Home Care	12	8,6%
Multiple Health Care Institutions	12	8,6%
Hospital, Nursing Home & Home Care	9	6,4%
Hospital & Home Care	2	1,4%
General Practice	1	0,7%
Hospice	1	0,7%
Local Authority District	1	0,7%
Nursing Home & Group Dwelling	1	0,7%
Nursing Home & Home Care	1	0,7%
Total	140	100,0%

of some kind of intervention on ordering, directing, and shaping DI processes (*DI strategies*); 64 research projects evaluated either the patterns and characteristics of the DI process (e.g. development over time or implementation fidelity) or the impact of the DI process (e.g. on the situation of care providers or on the facility) (*DI process evaluation*); only five studies reported on the development or validation of instruments to assess independent or dependent DI variables (e.g. barriers to/facilitators for DI or research utilization, a focus pertaining to the category *methodologies and measurement*). We were unable to identify any study dealing with methodological questions in DI research or with development and testing of *DI theories and models*.

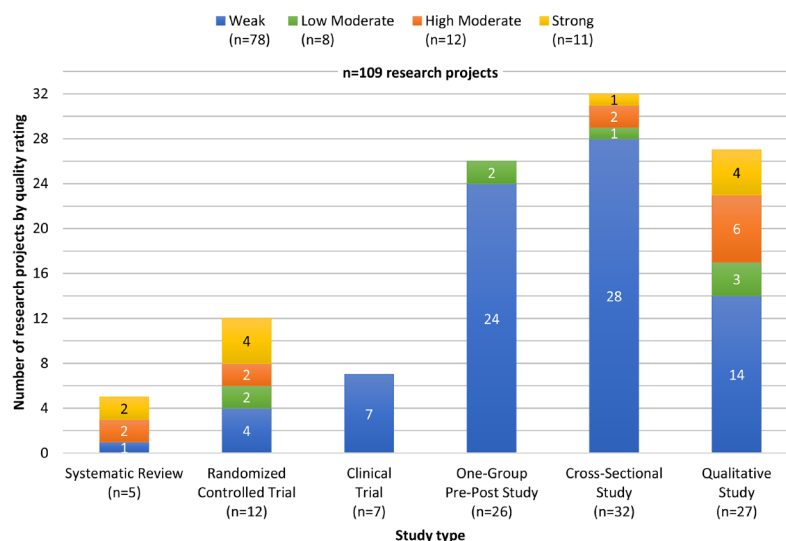


Fig 3. Methodological quality of single method research projects.

Project No. in additional file 2	Study types				
	Randomized Controlled Trial	Clinical Trial	One-Group Pre-Post Study	Cross-Sectional Study	Qualitative Study
1	W				W
2			LM		LM
8		W			W
9		W			W
17			W	W	W
39			W		W
54				W	W
63			W		W
65			W		W
68		W		W	W
69				W	W
71			W		W
72			W		W
74			W		HM
75				W	W
78		W			W
83			W		W
84				W	W
93			W		S
96			W		W
97			W		W
102			W		LM
103			W		HM
105			W		W
107		W			S
109			W		W
110			W		S
111			W		W
115				W	W
119				LM	W
143			W		LM

Fig 4. Methodological quality of mixed methods research projects (see additional file 2 for references; W = weak, LM = low moderate, HM = high moderate, S = strong).

Figure 5 illustrates the number of research projects with a particular study design by their DI focus. All five systematic reviews assessed the effectiveness of DI strategies, mostly various types of educational or training interventions. One review (Sachs, 2006, 2010) also assessed barriers to and facilitators for implementing nursing best practice guidelines. RCTs, CTs, and on-group pre-post studies primarily focussed on the evaluation of DI strategies (n=12, 7, and 23, respectively). Only four of the RCTs, one CT, and three pre-post studies evaluated

the DI process itself, and only one RCT and one pre-post study assessed barriers to and facilitators for DI. The latter topic was primarily assessed by cross-sectional (n=25) and qualitative studies (n=23). Nine cross-sectional and 12 qualitative research projects assessed the impact of one or more DI strategies, and 14 cross-sectional and 15 qualitative research projects evaluated the DI process in any form. The five projects reporting on instrument development and validation were all designed as cross-sectional studies.

Barriers to and facilitators for DI processes

Most of the research projects assessing DI barriers and facilitators (n=55) focussed on organizational context conditions, such as leadership, climate, or culture. Characteristics of individual care providers (e.g. attitudes or competences) were reported in 48 studies, 21 studies assessed characteristics of the innovation (e.g. complexity or relative advantage), 7 studies focussed on structural or environmental context conditions (e.g. the political or economic situation), and 6 studies evaluated how the characteristics of individual residents/patients or their relatives influenced DI processes.

DI strategies

The variety of DI strategies evaluated in the included studies is high (Figure 6). Clearly, the most popular type of DI strategies was educational interventions (n=71 studies), followed by coaching, facilitation, or supervision interventions. Most of the studies focussed on some kind of strategy directed towards care providers (professional strategies). Evaluation of organizational strategies was also frequently reported (e.g. structural strategies, such as

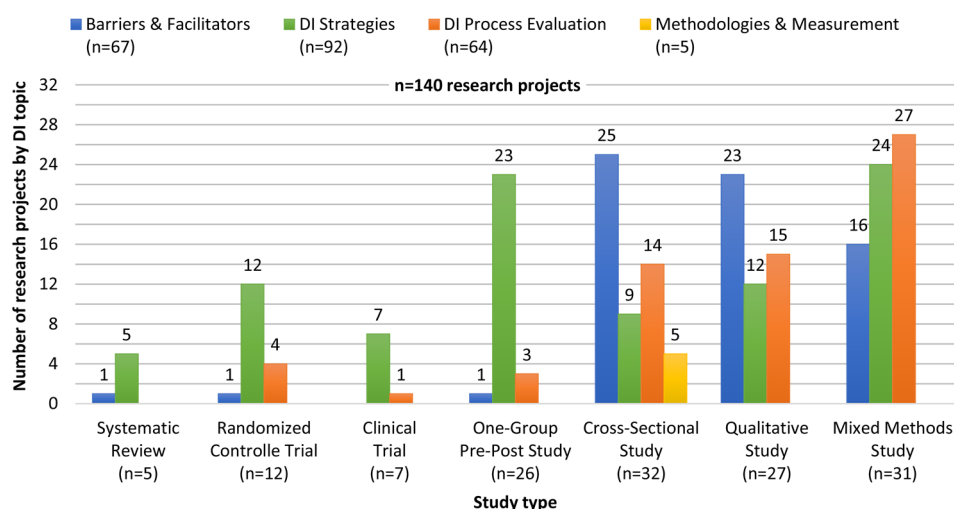


Fig 5. Number of research projects by study type and DI topic studied.

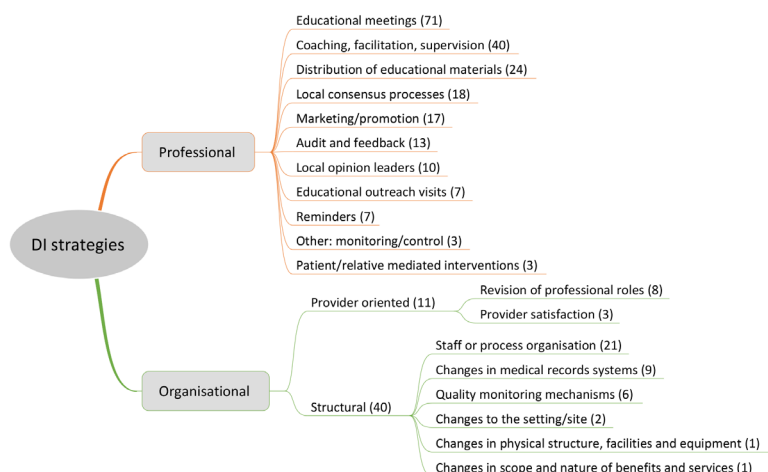


Fig 6. Types of DI strategies assessed in the included studies (based on the Taxonomy of DI strategies of the Cochrane Effective Practice and Organisation of Care Review Group (EPOC, 2010)).

staff or process organization). We could not identify any study focussing on financial or regulatory DI strategies.

Focus of change

The practices or situations that the included research projects intended to change were manifold (Figure 7). Thirty of them (20.8%) focussed on care of particular patient or resident groups (e.g. persons with dementia or diabetes), $n=20$ (13.9%) intended to improve administrative care tasks (e.g. care planning or handovers), $n=40$ (27.7%) intended to change direct care practices, not limited to a specific patient/resident group (e.g. oral health care or nutrition management). General behaviour of care providers (e.g. use of research or hand hygiene) was the focus of $n=33$ projects (22.9%). Six studies (4.2%) aimed to improve the situation of care providers (e.g. their health-related situation or teamwork), and 24 studies (16.7%) aimed to change organization of care

in general (e.g. implementation of Case Management or of a quality development system).

Instrument development or validation studies

Four of the five studies are in this category (Saxer, 2002; Walker Schlaefli, 2005; Schubert & Wrobel, 2009); Breimaier et al. (2011) reported on the translation of international scales into German language or on the use and validation of translated tools. In one study, Schnittger et al. (2012) reported on the development and validation of a new tool.

DISCUSSION

This study is the first to explore the state of nursing-related DI research in German-speaking countries. When we began this review, we expected to be able to identify

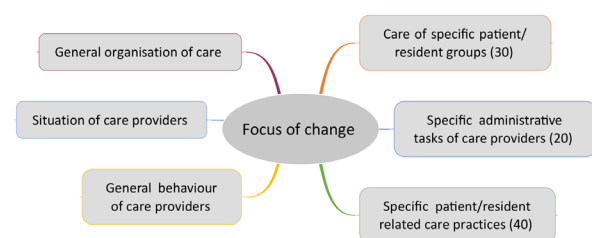


Fig 7. Focus of change of the included studies.

only a few relevant references. Surprisingly, we found 186 publications reporting on 140 research projects. Many of these publications do not use terms specific to DI research to describe their research purposes and focus (e.g. implementation, knowledge translation, diffusion/dissemination, etc.), and hence cannot be easily identified as DI research. However, a closer look reveals that they correspond with our definition of DI research. Although these studies are connected by their (mostly implicit) focus on studying DI processes, they are not explicitly linked, and the landscape of nursing-related DI research in German-speaking countries is fragmented. The majority of the included studies referred to neither the German-language nor to the international DI research literature in deriving research questions, guiding study design or interpreting and discussing results.

Methodological quality of the included studies was predominantly low across all research designs. Frequently important methodological details (such as research tools used, sampling methods, statistical or qualitative analyses applied, etc.) and results (such as sample characteristics, *p* values or confidence intervals, relationship between researchers and participants in qualitative studies, etc.) were not reported. The reported methods were to a large extent not sufficiently justified by the authors (in quantitative as well as in qualitative studies) and the data collection tools often were not validated (or psychometric properties were not reported). Therefore, trustworthiness of the reported results is limited and only very careful conclusions can be drawn.

The greatest number of studies in our review focussed on the evaluation of DI strategies (*n*=94). This topic has also received extended attention in the international DI research. As early as 1998, Bero et al. conducted a review of systematic reviews evaluating the effectiveness of DI strategies. They identified 18 reviews, with the earliest published in 1988. Today, the Cochrane Effective Practice and Organisation of Care Group (EPoC) has published 88 reviews (EPoC, 2014), many of them evaluating DI strategies such as local opinion leaders (Flodgren et al., 2011), audit, and feedback (Ivers et al., 2012) or inter-professional education (Reeves et al., 2013). Particular gaps in German-language DI strategy research exist in

financial, regulatory, and patient-related organizational strategies. Financial and regulatory DI strategies are not wide spread in practice, as Breimaier et al. (2013) found in a survey study assessing implementation strategies used in Austrian, Dutch, and German nursing homes and hospitals. They are difficult to apply and to study; funding for financial incentives in DI processes is limited and strategies depend on cooperation with regulatory bodies and on long-term, large-scale evaluation (Robertson & Jochelson, 2006; Breimaier et al., 2013). International evidence on their effectiveness is thus limited (Robertson & Jochelson, 2006; Breimaier et al., 2013). The international evidence on patient-oriented intervention is promising; Grimshaw et al. (2004) suggest that patient-oriented interventions may have positive effects on professionals' performance. However, these study results are limited due to methodological quality issues or insufficient description of the intervention or the DI processes.

The DI topic of barriers and facilitators was the second most studied (*n*=68 studies). The number of international DI studies pertaining to this subject is huge. In a selective review of international systematic DI reviews, Quasdorf et al. (2013) identified various factors positively or negatively affecting DI processes. In the German-language as well as in the international DI research literature on barriers and facilitators in DI processes, one of the most significant gaps is assessing factors on various levels simultaneously and studying their complex interactions (Chaudoir et al., 2013). Another important research gap is how characteristics of patients/residents and their relatives affect DI processes (Chaudoir et al., 2013).

The 65 studies evaluating DI processes primarily focussed on care providers' situation, experiences and opinions, such as user acceptance of the innovation, job satisfaction, or participants' rating of a training course. Fidelity of DI processes or the impact of these processes on organizational variables, such as costs or length of stay was rarely assessed. Ethical issues, such as side effects of DI processes, were only discussed explicitly and comprehensively by one research project (Höhmman et al., 2009; Höhmman et al., 2010). Given the complexity of DI processes and their frequent failure (e.g. Greif et al., 2004; Kitson, 2009) ethical issues thus seem to be under-reported. We could also find no study dealing with the development of DI processes over time and their inherent patterns. In the international literature, this topic is receiving increasing attention. Based on a review of 28 DI models, Ward et al. (2009) suggested that DI processes can be categorized as being either linear, cyclical, or dynamic multidirectional. Based on the analysis of 106 semi-structured interviews with leaders, Oborn et al. (2013) suggested a more complex classification.



They developed five ‘archetypes’ for organizing DI processes: (a) a multidisciplinary knowledge brokering approach, (b) designated knowledge brokers who are centrally managed, (c) modular independence of the systems involved (research, health policy, health organizations), (d) building and elaborating on existing networks, and (e) a central management controlling various interconnected DI projects.

A serious gap in German-language DI research is the development, validation, and use of specific and robust research tools. Only five studies focussed on this topic. Measurement issues are also an important gap in international DI research (e.g. Proctor & Brownson, 2012). However, there are numerous tools available to assess DI variables (e.g. Squires et al., 2011b; Chaudoir et al., 2013). German-speaking researchers have started to translate and validate well-tested international tools (e.g. Hoben et al., 2013; Hoben et al., 2014). Methodological challenges specific to DI research have not been evaluated in any of the studies included in this review. This topic is also receiving increasing attention in international DI research (Alexander & Hearld, 2012; Landsverk et al., 2012; Albright et al., 2013).

The most serious gap in German-language DI research pertains to the development, testing, and application of DI theories. The importance of using theory in DI research has been conclusively justified (e.g. Eccles et al., 2005; ICEBeRG, 2006; Rycroft-Malone & Bucknall, 2010b). Because of the complex nature of the contexts in which change occurs and of the innovations to be implemented, not using theory to justify decisions and to identify important barriers, facilitators or key intervention components “is an expensive version of trial-and-error, with no *a priori* reason to expect success or to have confidence of being able to replicate success if it is achieved” (Eccles et al., 2005, 108). Rycroft-Malone and Bucknall (2010b) describe five important functions of DI theories in DI research: (a) they should guide the development and evaluation of DI strategies, (b) they should be used to identify appropriate outcomes, measures, and variables of interest, (c) they should guide the evaluation of DI processes, (d) they should be used for identifying new DI research questions and for (e) interpreting and understanding DI research results. There are numerous theories and models available that might serve these purposes. These included general theories with no DI-specific focus (e.g. organizational theories, learning theories or systems, and complexity theories, see Grol et al. (2013a) for an overview), implementation-specific theories (e.g. Weiner’s (2009) theory on organizational readiness for change or May’s (2013) extended Normalization Process Theory) or various DI models and frameworks (see Tabak et al. (2012) for an overview). Despite this diversity of potentially usable

theories, the vast majority of our included studies did not explicitly apply such theories. This has been criticized in international DI research as well (e.g. Grimshaw et al., 2004; Davies et al., 2010). We were also unable to identify any studies testing existing DI theories or developing new ones.

Recommendations

Development and validation DI strategies

Future DI studies intending to develop and evaluate DI strategies in German-speaking nursing settings should take into account the huge international pool of research related to this topic. In particular, financial, regulatory, and patient-related organizational strategies should be studied, as they constitute an important research gap in German-speaking countries.

Barriers and facilitators in DI processes

This topic also has been subject to a great number of international research studies and systematic reviews. This international knowledge base is important and should be systematically used in future German-language nursing research projects studying barriers and facilitators in DI processes. Assessing factors on various levels simultaneously and studying their complex interactions should be a major focus of future DI research in German-speaking countries. Applying advanced statistical methods, such as multi-level models and latent-variable models, will be as crucial as integrating qualitative and qualitative methods (mixed methods). Furthermore, the association of characteristics of patients and their relatives with DI processes is not well understood and should be studied in more detail.

Evaluation of DI processes

Ethical issues, such as side-effects or failing of DI processes, must be focussed in more detail in future DI research in German-speaking countries. These issues seem to be under-reported in the available research. Ineffective or harmful DI strategies not only can increase healthcare costs but also can affect the quality of care staffs’ work-life and quality of care. Understanding the varied patterns and characteristics of DI processes – particularly their development over time – is another crucial focus. This knowledge is a prerequisite for the successful management of DI processes (Fixsen et al., 2005; Greenhalgh et al., 2005). German-language DI research should, therefore, focus on this topic and connect to and build on the relevant results of the international DI research.



Development, validation, and use of DI research tools

There is a lack of specific and robust quantitative DI research tools in German-speaking countries. These tools are needed to assess DI processes in big samples, using statistical methods. Therefore, the activities of translating, adapting, and validating robust international DI research tools, as well as developing and validating new robust tools, is a high priority task of future DI research in German-speaking countries. Methodological aspects, such as the appropriateness of different methods for different DI research focuses, should also subject to future DI research in German-language countries.

Development and validation of DI theories

Theory-related issues should be tackled as the highest priority in German-language DI research. The international body of DI research provides a rich resource of DI theories and models. Additionally, there are various theories not specific to DI that can be of great value for DI specific theory development (for example, systems and complexity theory, educational theories, psychological theories of planned behaviour, etc.).

Limitations

Our search was limited to literature published up to the end of December 2012. While we were not able to conduct a comprehensive update of the literature for 2013, we are aware that various studies important to this review have now been published (e.g. Breimaier et al., 2013; Köpke et al., 2013). These publications demonstrate that DI research has started to receive increasing attention in the German-speaking regions. However, these new publications do not change the overall conclusions of this review. Another limitation of this review pertains to the large amount of grey literature in German-language nursing research. Although we applied rigorous search methods, it is possible that we did not identify all relevant literature; this grey literature is not well indexed and may not have been listed in any of the sources we searched. Due to the scoping nature of this review and because of the huge number of studies included, we did not analyse the findings of the included studies in detail. We leave this to more specific reviews in the future. While using rigorous methods and tools proven to be useful in previously published high-quality systematic reviews, our approach to derive a quality score for the evaluated studies based on the checklists used can be challenged. Particularly for evaluating the methodological quality of qualitative studies and mixed methods studies, there is still no consent about the most appropriate approach (Pluye et al.,

2009). Finally, we only focussed on empirical research. Theoretical discussions and debates were not included. They might contain other important information about the state of DI science in the German-speaking countries. A narrative review of this pool of information will be an important focus for future research.

CONCLUSION

This review sets out the state of nursing-related DI research in German-speaking countries and discusses it in relation to the international DI research literature. Although results from a great number of research projects pertaining to this field have been published, serious gaps exist in the German-language DI research literature. Most research projects do not take into account the international DI research literature and their methodological quality is predominantly poor. Regulatory, financial, and patient-oriented DI strategies have not been studied yet in German-speaking countries, the characteristics of patients/residents and their relatives have received relatively little attention as factors affecting DI processes, and the simultaneous assessment and analysis of barriers/facilitators on multiple levels (i.e. patient/resident and their relatives, care providers, communities/teams, organizations, and structural/environmental conditions) is in its infancy. Ethical issues in DI processes, their potential side effects, and their impact on organizational outcomes are another topic requiring more attention in future German-language DI research. Methodological issues of DI research and the development, validation, and use of robust research tools have also seen only limited attention. The most serious gap clearly is the lack of studies using, developing, or testing DI theories. Linking to and building on the international literature in DI research and theory will be crucial for future DI research activities in German-speaking countries.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

MH conceptualized, designed and led the review and executed the search. MH, CB, IB, TQ, CR and DW undertook the study screening and selection, data extraction, and appraisal of evidence. MH wrote the first draft of the paper, all co-authors commented on it, provided feedback on various drafts and approved the final manuscript.



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