Knowledge translation and implementation research in nursing

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What is already known about the topic?

- Knowledge translation research in nursing is predominated of descriptive studies.
- A valid knowledge base for issuing recommendations on implementation strategies is lacking.

What this paper adds?

- A description of intervention strategies used in recent implementation research in nursing.
- An analysis and discussion of issues involved in the evaluation of complex interventions for implementing evidence-based practice.

1. Introduction

Knowledge translation and implementation research is an emerging field in healthcare science. It is certainly not a new idea. The use of research has been on the healthcare agenda for a long time, but has only received greater notability during the past two decades. It is a research field with significance for all healthcare professionals and has immense global implications (Sanders and Haines, 2006). A striking example is the estimation that up to 70% of the 4 million infants that die each year in the neonatal period could be saved if basic evidence-based practices were used (primarily nursing care interventions) (Lawn et al., 2005; Darmstadt et al., 2005). Another example is the persistent problem of pressure ulcers in hospitalized patients. Inadequate compliance to existing guidelines results in a high prevalence of ulcers, leading to patient suffering, prolonged hospitalization, a need for continued intensive care and a financial burden on the health care system (Laat et al., 2006). The Institute for Healthcare Improvement in the US has added pressure ulcers prevention as 1 of 12 interventions to reach the campaign goal of saving 5 million lives from medical harm (IHI, 2006). In a widely cited report based on data from the US and the Netherlands Grol and Grimshaw (2003) reported that 30–40% of all patients do not receive healthcare based on current relevant knowledge and as much as 20–25% of all patients receive harmful or unnecessary care. These figures largely concern medical treatment, but there is no reason to assume that nursing care would prove to be more evidence based if such information were available. The World Health Organization (WHO) has realized the serious nature of this situation, stating “stronger emphasis should be placed on translating knowledge into action to improve public health by bridging the gap of what is known and what is actually done” (WHO, 2004, p. V). This urgent request conveys implications for nursing research. It is no longer reasonable to predominantly do research on, for example, patients’ experiences of healthcare or surveys on working conditions of the nursing staff. I am well aware that qualitative research is essential in understanding and improving nursing care. However, internationally there is a growing demand for more intervention research in order to establish evidence on the effectiveness of various nursing practices (Rahm-Hallberg, 2006). It is indeed necessary to

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raise the level of evidence on the impact of nursing though it is also appropriate to take that reasoning one step further. For evidence-based knowledge to be used, intervention research is needed on how to implement such knowledge. In joint efforts researchers, decision-makers and practitioners need to enhance our understanding of how to get evidence into practice and, through that, improve processes in and outcomes of healthcare. Thus, the aim of this paper is to present a discussion on issues in the field of knowledge translation and implementation research. The discussion is primarily based on the literature of the past 3–4 years and by that strategy adds to Titler’s (2004) paper on methods in translation science.

2. Concepts and definitions

A large number of terms are used in the literature for the process of getting knowledge into practice, including knowledge utilization, knowledge transfer, evidence-based practice and innovation diffusion (Graham et al., 2006; Estabrooks et al., 2006). Terms vary depending on the discipline from which they originate and thus may differ slightly in meaning. This paper uses the concepts of knowledge translation (KT) and implementation research (IR). The Canadian Institutes of Health Research (CIHR) defined KT as “… a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system (CIHR)” (Eccles and Mittman, 2006, p. 1). As you may have recognized, these two definitions complement each other. The KT definition is general and highlights the importance of the exchange between researchers and users, the need of synthesizing research outcomes before application and that implementation is a complex undertaking involving a good deal of social interaction (Graham and Tetroe, 2007). The IR definition emphasizes the need to study research uptake scientifically. Both perspectives unite in the overall objective of improving quality of healthcare. A third concept of interest in this field is complex interventions. Interventions in healthcare organizations aimed at changing behaviours and organizing those behaviours, such as implementing clinical guidelines, are usually comprised of multiple components that may act both independently and inter-dependently (Medical Research Council, MRC, 2000; Blackwood, 2006). The greater the difficulty in defining what, exactly, are the ‘active ingredients’ of an intervention and how they relate to each other, the greater the likelihood you are dealing with a complex intervention (MRC, 2000, p. 1). Evaluations of complex interventions require specific considerations, part of which will be discussed in this paper. Finally, as evidence-based practice (EBP) is the ultimate objective of KT, it is appropriate to give the concept of EBP a precise meaning by referring to the definition proposed by Dawes et al. (2005, p. 7). EBP requires that decisions about health care are based on the best available, current, valid and relevant evidence. These decisions should be made by those receiving care, informed by the tacit and explicit knowledge of those providing care, within the context of available resources.

3. Nursing and research uptake— what do we know?

The use of evidence in nursing practice is a field that has received increased attention over the years. This growth can be noted in the appearance of journals as Evidence-Based Nursing and Worldviews of Evidence-Based Nursing, in the increasing number of systematic reviews on various clinical topics and in the very large number of publications on evidence-based practice. There is a history of 40 years of research on research utilization in nursing and a marked increase of reports from the beginning of 1990s, which runs parallel to the development of the evidence-based movement (Estabrooks et al., 2004). As in nursing research, generally the bulk of the work is descriptive. For example, some 45 studies using the Barriers Scale (measuring barriers to research use among nurses, Funk et al., 1991) have been published (Hutchinson and Johnston, 2006), but only one entailed evaluation of an intervention (Fink et al., 2005). A large number of papers have examined predictors of research use among nurses, predominantly individual characteristics (Estabrooks et al., 2003), and to a minor extent organizational factors (Meijers et al., 2006). Such research has largely been based on a bi-variate correlational design failing to take into account complex and interactive associations between determinants and research utilization. An exception from this pattern is two recent articles by Estabrooks’ research group in which structural equation modelling and multilevel analysis were used in combination with sophisticated statistical techniques (Estabrooks et al., 2007; Cummings et al., 2007). These two papers revealed factors (such as Internet use, lower levels of emotional exhaustion, facilitation, nurse-to-nurse collaboration, staff development and ability to control policy) that predicted nurses’ use of research. However, in these two studies, as in other studies examining predictors of research use, research utilization is treated as the outcome variable of interest. Estabrooks (2007) suggested that researchers must strive to use research utilization as an intermediate outcome, focusing on patient or system outcomes as endpoints. Such study designs would enhance the opportunities to understand the course of events in the ‘black box’ of implementation.

A further deficiency with existing KT research is its limited use of theory. This is particularly interesting as prominent KT researchers in nursing, such as Stetler (1994) and Titler et al. (1994), had already in the early
1990s proposed models for research utilization. However, with some exceptions, such as the diffusion of innovation theory (Rogers, 2003) and the Promoting Action on Research Implementation in Health Services (PARIHS) framework (Rycroft-Malone et al., 2002), there is a poor record of theory use to guide study design and develop measures for KT research (Estabrooks et al., 2006). Most striking in viewing nursing KT history is, however, the fact that rigorous research evaluating interventions aimed at changing nurses’ behaviour is still scarce. In Estabrooks et al.’s (2004) review of the literature on research utilization in nursing and allied health professions only 1.3% (7/544) of the identified articles evaluated implementation strategies. Notably, 60% of these 544 articles were classified as general opinion papers.

4. Implementation strategies

Several systematic reviews have been published on interventions for changing practitioners’ behaviour (e.g. Bero et al. (1998), Grimshaw et al. (2001), Grol and Grimshaw (2003) and Grimshaw et al., 2004). A range of implementation interventions appear to be useful (see Box 1) although at present researchers are unable to make recommendations on when to use a specific intervention to support implementation in a specific setting (Grimshaw et al., 2004). These reviews, however, were largely limited to studies on medical practice and outcomes linked to physician performance. Because the nature and social structure of work differs substantially between the medical and the nursing profession, it is not reasonable to draw far-reaching implications for nursing practice from these reports (Thompson et al., 2007). Within nursing, a review on the effectiveness of dissemination and implementation of guidelines was published as early as 1999 (Thomas et al., 1999). Findings indicated that included studies were of poor quality, education materials frequently used for dissemination and education interventions might be effective for implementing guidelines. When considering the continuous stream of publications on EBP in nursing, these results should be outdated and no longer relevant. But remarkably, despite nearly one additional decade of research, the general findings of this review still appear to be relevant. In a recent review on interventions aimed at increasing research use in nursing (Thompson et al., 2007) only four studies (Dufault et al., 1995; Hong et al., 1990; Tranmer et al., 2002; Tsai, 2003) met the inclusion criteria. The most common intervention was education (three of the four studies evaluated educational meetings), but findings were inconclusive regarding the effectiveness of intervention strategies. Inclusion criteria allowed for only randomized controlled trials (RCTs) or controlled before and after (CBA) designed studies and outcomes had to be derived from the measurement of research use or compliance with all behaviour recommendations in a specific guideline. Similar to 1999 review, the quality of the studies reviewed was judged as poor.

To find more concrete examples of interventions in implementation research in nursing I selected the 10 studies

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a Adapted from Grol and Grimshaw (2003). The division in subgroups is tentatively made by the author.
that were excluded in the final assessment in Thompson et al.’s (2007) study. The following interventions directed to nurses were evaluated in these reports: interactive workshops and information through existing communication channels (Davies et al., 2002), marketing strategy (Hodnett et al., 1996), e-mail reminders (McDonald et al., 2005; Murtaugh et al., 2005; Feldman et al., 2005), patient self-care guide and training to support teaching and support skills (Feldman et al., 2004), ward-based teaching package (Gould and Chamberlain, 1997), interactive educational sessions, change agents and feedback reports (Jones et al., 2004), peer feedback (Moongtui et al., 2000) and teaching and organizational interventions (committees) (Krichbaum et al., 2005). Eight of the 10 studies showed either no or uncertain effects. To extend the list of studied interventions further a simple search on Medline for the past 3 years (2005–2007) was performed using guideline implementation intervention nurs* as search phrases. A review of the tables of content of the journal Worldviews on Evidence-Based Nursing for this 3-year period was also done. These measures yielded an additional 11 studies reporting on KT interventions. These interventions included self-learning packet and one-on-one teaching (Abbott et al., 2006), education and information meetings (Blackwood and Wilson-Barnett, 2007), information communication, reminders, audit feedback and education (Bucknall, 2007), audit and feedback and educational outreach (Cheater et al., 2006), educational sessions, facilitators and information tools (Edwards et al., 2006), consensus process, audit and feedback and educational activities (Helm et al., 2006), organizational measures, such as, EBP philosophy in job descriptions, journal clubs, EBP workshops (Fink et al., 2005), education, information through hospital communication channels and new utensils (mattresses) (Laat et al., 2006), coaching protocol, on-line tutorial, workshop and performance feedback (Stacey et al., 2006) small group training sessions (Taylor, 2006) and facilitation (Wallin et al., 2005). About half of these studies showed either no or uncertain effects.

From the 25 above-mentioned studies, it appears that study designs in general were weak, with only a few of the studies being RCTs. Most of these studies were quasi-experiments with before and after comparisons, but some of these did not include control group comparisons. Interventions were most often multi-faceted, with information activities and education as prominent elements. Even if the use of multiple components might appear logical in relation to enhancing the strength of the intervention, it must be noted that it is extremely difficult to evaluate which component(s), if any, is effective. Furthermore, considering that in their review Grimshaw et al. (2004) found that multi-faceted interventions were no more effective than single interventions, some caution is warranted when the focus is limited to multi-faceted interventions. While there are many interventions available for change of practice, we should not cling to education as the universal implementation strategy, especially when traditional didactic education has not shown much potential in accomplishing change (Grol and Grimshaw, 2003). Thus, it is appealing that interventions, such as reminders and audit and feedback, which have shown promise in changing behaviour among physicians (Grimshaw et al., 2004), appear as strategies in nursing KT studies.

Another issue is the terminology used to designate the different strategies for implementing evidence. In the present review of implementation strategies in nursing I relied on the descriptions used by each author. Interventions, however, were not always adequately described and labeling seemed inconsistent. This problem is probably related to the lack of a common theoretical framework for KT and contributes to the problems of implementation. Leeman et al. (2006) suggested a theory-based framework to inform the comprehension and selection of methods for implementing change in nursing. A different classification framework of interventions was developed by the Cochrane Effective Practice and Organization of Care Group (EPOC). Both these approaches deserve further attention as they can contribute both theoretically and operationally in getting evidence into practice. A careful description of the intervention is also required to follow the consolidation of standards for reporting of trials (CONSORT) (Moher et al., 2001) and the CONSORT statement for cluster RCTs (Campbell et al., 2004). To be clear about the components of an intervention (e.g., duration and frequency, deliverer and receiver and mode of delivery) are important in achieving a better understanding of implementation strategies (Thompson et al., 2007).

Because the present overview of the literature on interventions was not a systematic review, quality assessment or a deeper analysis of the referred studies was not undertaken. Conclusions based on the overview are also hampered by the primitive search strategy used. However, although the number of intervention studies appears to increase, we still know stunningly little about the effectiveness of various approaches to implement evidence into clinical practice. Unfortunately, it is quite appropriate to echo Titler’s conclusion from 2004: although there are a myriad of initiatives aimed at increasing use of evidence in practice, there is little systematic evidence of the effectiveness of these initiatives (p. 38). As long as the knowledge is this limited it might be advisable, both in research and clinical practice, to choose a simple and cheap implementation strategy over a complicated and expensive one.

5. Implementation research in nursing—thoughts and suggestions

The observant reader has probably already noticed my point of view; if we want to understand what strategies are working in changing practice to be more evidence-based, then we must test these strategies. There are, however, a number of issues to consider in evaluating complex KT interventions, including the level of knowledge on the
clinical topic of interest and its change priority, the design of the study, linkage to theory, the influence of contextual factors and measurement and outcomes. In the following sections some comments are given on these issues.

5.1. Clinical topic

To setup an implementation study there must be something to implement, i.e. there is a need for well-developed and accurate knowledge on the clinical problem of interest. Thus, a history of rigorous research on the topic and a synthesis of the knowledge generated are required. The level of knowledge in a specific field might also reflect the opportunities to perform evaluation research; with less developed knowledge, there might be a lack of useful measures to evaluate changes in care processes and patient outcomes. Yet, well-developed knowledge is not the only criterion. There should be a potential for and a need of improvement in the clinical area.

5.2. Study design

In the medical field RCTs have been the ‘golden standard’ in implementation research. The Medical Research Council in the UK suggests that RCTs are likely the optimal study design to minimize bias and provide the most accurate estimate of a complex intervention’s benefits (MRC, 2000, p. 2). The RCT is generally considered the most accurate method to assess cause and effect relationships (Thompson, 2004) and a well-conducted RCT should generate a relatively precise estimation of the effectiveness of an intervention. For example, it has been shown that guideline implementation through reminders has a median improvement effect of 14% (changes in practitioner behaviour or patient outcomes) and that various intervention strategies (reminders, audit and feedback, educational outreach and dissemination of educational materials) have an overall improvement effect of 9% (Grimshaw et al., 2004). RCTs reduce bias by decreasing the impact of various contextual factors while unknown predictors of study outcomes are balanced between control and intervention groups. In fact, data from the ideal RCT are context-free. However, there are authors challenging the usefulness of RCTs in evaluating complex social interventions. Walsh (2007), for instance, claims that the variance in context, content, application and outcome is too high in these kinds of evaluations for RCTs to provide valid and reliable answers to the ‘does it work’ question. He means that the answer is too often, ‘yes, sometimes’. Seers (2007) also hesitates using RCTs in the evaluation of complex interventions. Rhetorically, she asks if the results are really robust when so many factors additional to the intervention are at play. Such weaknesses and the equal distribution of confounders between control and intervention appear to contribute to the regular RCT approach not providing helpful information about the circumstances under which a specific intervention works particularly well or not. This is clearly shown in Grimshaw et al.’s (2004) report. Despite the review of 235 studies this research team was unable to provide recommendations on when a specific implementation strategy should be used (or not used). To some extent this lack of guiding recommendations was a consequence of the many different combinations of interventions that were tested in the reviewed studies. In many studies researchers appear to have a preference for studying a novel strategy or combination of known strategies instead of replicating and evaluating previously used interventions. This approach makes it hard to aggregate findings and generate clear conclusions. Another recurrent scarcity in the reviewed studies was the lack of examination of the implementation process. The RCT design in implementation research must preferably be completed with process evaluations and specific measurements of context in order to increase explanatory power and understanding of the generalizability of a specific intervention (MRC, 2000; Seers, 2007). Process evaluation uses both quantitative and qualitative methods and can take many forms: individual interviews with key stakeholders, questionnaire surveys, observations and focus groups with staff and/or patients may elucidate the process of change and the important ingredients in that process (Blackwood, 2006; Oakley et al., 2006). In their document on evaluation of complex interventions the Medical Research Council in UK (2000) emphasizes that qualitative research is particularly helpful in understanding why something happens and identifying which are the active ingredients of such interventions. A good example of such research is the study by Graham et al. (2004) that explored the factors influencing the introduction of guidelines for fetal health surveillance, where Davies et al. (2002) had previously reported on the impact of the implementation strategy used (interactive workshops). Referring to my own experience I achieved better insight into how the intervention was performed and how it was perceived by the nursing staff by using focus groups in a quasi-experiment on implementation of guidelines in neonatal care (Wallin et al., 2005).

Obviously RCTs have not been used in implementation research in nursing to any greater extent; rather, RCTs are the exception, not the rule of single-site interventions and quasi-experiments. This is understandable considering that RCTs are complicated, costly and require a well-developed knowledge base in both the area of interest and trial methodology. Clinical research is a practical undertaking and thus, beside scientific considerations, designing a study is always a matter of feasibility and affordability. This suggests that single-site studies will probably continue to occur since many practitioners who implement innovations and guidelines want to evaluate the effects of their efforts. Titler (2004) advocates for investigating ‘natural experiments’ because it is a way to capitalize on ‘real world’ initiatives that otherwise would be too costly or not feasible to investigate. We might be able to learn from single-site interventions which are conducted in a rigorous and reproducible
way and by adding recurrent findings from cases. However, single-site studies with before and after measurement provide results that are highly open for alternative interpretations regarding relationships between intervention and outcomes. In fact, most often it is not clear that the intervention is the cause of the effects. This problem is mirrored by the low rating of quality of included studies in the published reviews (Thomas et al., 1999; Thompson et al., 2007).

If RCTs are difficult and expensive to perform and single-site studies present invalid results, what are the alternatives? Other approaches suggested for evaluating complex interventions include interrupted time series design, action research, detailed case studies and controlled before and after studies (Shojania and Grimshaw, 2005; Seers, 2007). Some of the advantages and disadvantages of these approaches are briefly described here. The interrupted time series design does not imply an intervention that repeatedly needs to be ‘turned-on’ and ‘turned-off’. It is an approach that looks at multiple time periods (e.g., monthly outcomes the year before and the year after the intervention). This procedure provides a much more accurate estimation of effects than short measurement periods before and after the intervention. Action research can offer useful information on impact of contextual factors but has a problem with generalizability of the findings. Sustainability might also be a problem as the researcher, from being highly involved in the intervention, often leaves the field of study at a given time point. Case studies should also be useful for in-depth information about contextual effects, but is similar to action research in that it is difficult to draw any general conclusions. Controlled before–after studies normally generate much more valid outcomes than single-site experiments because the experiment institutions are compared with similar institutions that did not implement the intervention. General trends in outcomes are detected that otherwise could be assessed as an impact of the intervention.

In summary, in implementation research the choice of study design ultimately depends on the research question. Research is an additive process and many approaches have been used to establish the current level of knowledge. Recognizing the need of establishing evidence-based practice, it is time to scale up the learning about implementing guidelines and well-supported nursing interventions. Although there are several problems with the RCT method, it seems to be the right way to go at the present time. Particularly when it is supplemented with a thorough process evaluation of the intervention under study.

5.3. Theoretical basis of implementation interventions

The need for theory to guide implementation research is currently under intensive debate (Rycroft-Malone, 2007). A main argument for use of theory is the need to gain a fuller understanding of the range of factors at different levels that interact and determine whether and to what extent an implementation intervention results in change (Grol et al. (2007)). In planning for any intervention it is essential to identify such factors and their potential interaction and effect. Available theories can be helpful in several ways: for example, they can help in describing and deriving these factors, setting up testable hypotheses and in discussing outcomes of a study. Estabrooks et al. (2006) and Grol et al. (2007) provide reviews of theoretical perspectives useful in developing testable KT interventions. Michie and Abraham (2004, p. 33) defined theory as a system of ideas or statements held as an explanation or account of a group of factors or phenomena. Grol et al. (2007) divided theories into impact and process theories, where impact theories describe how an intervention will facilitate change and process theories can be used for planning and organizing implementation activities. In his criticism of RCTs for evaluating complex interventions Walsh (2007) asserted that the theoretical basis for an intervention (why and how it works) is even more important than its empirical performance (whether it works). Opponents claim that instead of theory more common sense and rigorous evaluations of important outcomes are needed (Oxman et al., 2005). I concur with the proponents of theory use (e.g. Eccles et al. (2005)), that well-developed theory is a required prerequisite if progress is to be made in the KT field. An indication on the underdevelopment of linking theory to implementation research is that only 10% of the studies in Grimshaw et al.’s (2004) review provided an explicit theoretical rationale for the intervention under evaluation.

In KT there are primarily two theoretical frameworks that have been used in nursing: Rogers’ “Diffusion of innovation” (2003), originally developed in rural sociology, and “Promoting Action on Research Implementation in Health Services”, developed in 1990s as a reaction to prevailing linear models for research uptake (Kitson et al., 1998; Rycroft-Malone et al., 2002). Rogers suggested that four main elements influence the spread of a new idea: the innovation, communication channels, time and the social system. His work has been very influential in KT research generally. In nursing it guided the development of measures like the Barriers Scale (Funk et al., 1991) and the nurses practice questionnaire (Brett, 1987). Both these instruments have been extensively used, however, mainly in descriptive studies. The “Diffusion of innovation” framework has also been applied in recent studies, e.g. Squires et al. (2007) in exploring the role of organizational policies for promoting research use among nurses, but also in framing of intervention studies, e.g. Fink et al. (2005) and Abbott et al. (2006). The developers of the PARIS has emphasized the strength of and interplay between the evidence being used, the capacity of the context in terms of coping with change and the type of facilitation needed to ensure a successful change process. PARIS has attracted a large group of researchers in the field of KT in nursing. There are a number of publications from recent years (e.g., Alkema and Frey (2006), Brown and McCormack (2005), Cummings et al. (2007), Doran and
Sidani (2007), Ellis et al. (2005) and Wallin et al. (2006a)) that either use PARIHS to establish a study framework or evaluate components of it. Although this framework is obviously useful and has potential for further development, I believe there is a need for more specific theories on issues such as individual learning and behaviour change as well as organizational learning and change. In its richness, Grol et al.’s (2007) review should be highly useful for further guidance on the development of implementation strategies. The review covers theories from the fields of cognition, learning, social influence, motivation, communication, leadership, professional development, organization, economy and other domains.

Somewhat tentatively speaking, but also based on the literature reviewed for this paper, I would like point out a few implementation strategies of interest for evaluation in further studies. While various educational interventions have been the main target for nursing researchers, I think a broader range of strategies should be considered. Decision support in the form of reminders has shown a strong potential in medical studies. It would be highly appropriate to examine if that is also valid for nurses, preferably by evaluating the effects of computer-based decision support linked to the patient record. Audit and feedback is another field where nursing studies are lacking. Is it a useful strategy to enhance the use of evidence in practice? Evaluation is part of the PARIHS framework, which puts a strong emphasis on facilitation as the primary method to support implementation of evidence. This emphasis, however, is not based on an extensive empirical base. The validity of the PARIHS framework needs to be examined through intervention studies and the areas which I believe are most interesting is the impact of facilitation, leadership and evaluation. These components should be highly feasible for controlled studies. A final thought on the issue of interventions to evaluate is the need of conducting studies where only one strategy, maybe two, is evaluated. Enhanced knowledge on the effects of separate interventions should provide greater opportunities to design multi-faceted strategies.

5.4. The influence of contextual factors

The difficulties of implementing evidence might largely be explained in terms of contextual influences. Proving that an intervention works in one setting does not necessarily mean it will work in a different context (McCormack et al., 2002; Greenhalgh et al., 2004; Rycroft-Malone et al., 2004; Dopson and Fitzgerald, 2005; French, 2005; Wallin et al., 2006b; Estabrooks et al., 2007; Cummings et al., 2007). Factors frequently described as influencing the success or failure of a process of change include leadership, resources, time, support functions, staff development, interpersonal relationships, job pressure and organizational culture and climate. These factors, however, are probably not important factors in all settings. Rather, it seems to be the case that each practice environment (such as a particular unit or department) offers its own specific set of factors that hinder or promote the implementation of new knowledge. A key element in the advancement of KT research is to find ways to integrate contextual factors into the study design in order to better understand the impact of such factors.

An approach advocated to enhance the potential for successful change processes is the identification of barriers to change, i.e. ‘mapping the terrain’ before starting an implementation project and based on the identification of barriers develop specific interventions to decrease their impact. Shaw et al. (2005) reviewed 15 RCTs using this approach. Barriers were predominantly identified through interviews and focus groups with professionals. The ‘content’ of barriers varied widely as did interventions to limit their influence. Shaw and coworkers, however, could not identify an overall significant positive impact of this strategy. Similar findings were reported in a multiple-case analysis by Bosch et al. (2007). This research group noted that few of the included studies used a consistent approach in linking the improvement intervention to the identified barriers, which resulted in a mismatch between barriers and interventions. Unfortunately, these two studies underscore that, even if barriers are identified, little is known about how to match barriers to interventions and what interventions are effective in overcoming barriers. In nursing there has been an extensive use of the Barriers Scale as a survey tool, but not as a diagnostic component in intervention studies (Hutchinson and Johnston, 2006). The Barriers Scale measures perceptions of barriers to research utilization regarding the nurse, the setting, the research, and the presentation of research. In a recent study nurses’ perceptions of barriers were compared to their ratings of research use in clinical practice (Boström et al., 2008). Significant differences in the perceptions of barriers were identified between research users and non-research users on the subscale the nurse, the research and the presentation. Knowing that these factors actually are linked to research use might provide some confidence for researchers assessing barriers of research use. However, the lack of difference between the research users and non-research users on the subscale the setting is problematic. Organizational barriers are often highlighted as the prominent barriers to evidence-based practice. According to Boström et al.’s findings this is either not completely true, or is the Barriers Scale not assessing the ‘right’ barriers. Similar to findings in Bosch’s and Shaw’s studies Boström et al. conclude that the instrument identifies barriers at a generic level. Assessing barriers with wide-ranging characteristics not only make it difficult to link potential barriers to specific implementation strategies but also to design tailored interventions to decrease the barriers. There is probably a need of more specific measures on barriers. Like in many other areas of implementation research—a lot of work remains.

Another path to take is to make assessment of contextual factors as a ‘built-in’ component of the implementation study. In their review on innovation diffusion in healthcare Greenhalgh et al. (2004) emphasized that implementation...
research needs to involve contextual aspects; otherwise, the contribution of a study to understand the change process runs the risk of being rather limited. Assessing context could obviously be part of the previously described ‘process evaluation’ in which both qualitative and quantitative approaches are appropriate. Within the dimension of context, the concepts of organizational culture and organizational climate have received much attention. In a review on measurement of these concepts Gershon et al. (2004) identified 12 instruments, among them the nursing work index (NWI) (Aiken and Patrician, 2000). Personally, I have experience of working with the quality-work-competence (QWC) questionnaire (Wallin et al., 2006b) and the creative climate questionnaire (CCQ) (Boström et al., 2007). Both the QWC and CCQ instruments were useful in assessing work environment factors and in linking outcomes to staff perceptions of change of practice. However, instruments specifically developed to measure features of context that are known to be valid or potential predictors of KT are rare. One recent attempt is the context assessment index (CAI) (McCormack and McCarthy, 2007), which is an instrument developed to assess contextual factors in continuity care. It links to the PARIHS framework by focusing on measurement of leadership, culture and evaluation. In Canada, Estabrooks’ research team is developing the ‘Alberta Context Tool’, but no report is yet available on this instrument. Presuming that quantitative data collection on context is feasible and generates valid and reliable information, such data should preferably be integrated in the statistical analysis of intervention outcomes. Using (multi-level) multivariate regression analysis to include data on contextual factors would address the relative contribution of intervention and contextual factors in explaining the variation of outcome variables (Brown and Prescott, 2006). Such a procedure requires careful consideration in the planning stage of the study and access to a skilled statistician. In return, the opportunities to understand the influences of contextual factors would be greatly improved.

5.5. Outcome measurement

Outcome measurement in implementation research is primarily an issue of measuring performance of care processes and outcomes of care. Performance measures normally focus on practitioners’ behaviour (e.g., adherence to guideline recommendations) and outcome indicators assess the impact on patients when using evidence-based practice. In Grimshaw et al.’s (2004) review 225/235 studies used process measures and 50/235 studies used outcome measures. This domination of process measurement in the evaluations probably reflects difficulties in developing valid and reliable measures on care outcomes. Another reason for the lesser focus on measurement of outcomes is that it might take time for change to occur while researchers at the same time are pressured to conduct and report the findings from the study. Neither time nor resources are available for waiting; therefore the true impact of the intervention might be missed. The issue of sustainability of change is most often a neglected area of research. It is clearly challenging, both financially and methodologically, to extend interventions studies to be able to examine outcomes in a longitudinal perspective.

Thompson et al.’s review (2007) on interventions aimed at increasing nurses’ use of research punctuates some of the methodological challenges associated with measurement. Many studies in implementation research measure multiple outcomes (e.g., compliance to a large number of guideline recommendations). Such an approach makes it difficult to determine whether the intervention had the intended effect. For instance, is it when there is a significant difference between intervention and control on 3 of 15 measured outcomes, or is it when there is a difference on 5 of 10, or must the difference be on all 15 of the variables? In line with many others (e.g. Grimshaw et al. (2004), Shojania and Grimshaw (2005) and Thompson et al. (2007)), I want to underline the importance of deciding on a primary outcome. Having a primary outcome variable is necessary for sample size calculations (power analysis) and should preferably constitute the variable with the highest weight in interpretation of the results. Which variable should then be selected as primary outcome? I am well aware about the hardship of identifying or developing appropriate patient outcome measures, nevertheless I believe patient outcomes should be prioritized in evaluating the impact of implementing evidence-based practice and constitute first hand alternatives. Another measurement issue, closely discussed in Thompson et al.’s review, is the potential need to assess what is happening in the ‘black box’ of implementation. It would be highly useful to follow the course of learning and research utilization. Such assessment would provide information about the implementation process and generate data that could be used in comparisons between different studies and different implementation strategies.

Another important issue in designing a study and interpreting its results is how the intervention is targeted and the unit of analysis. This issue is closely linked to sample size. Most of the implementation studies in nursing are, or should be, based on provider institutions (or units/groups/clusters) instead of individual patients or providers. For many reasons, it is difficult to conduct implementation targeted to specific patients or individual staff members within a unit and thus it is normally better that the whole unit serves as the unit of analysis. Consequently, an intervention is (randomly) allocated to one or many units (often called clusters in this kind of research) and effects are compared with units to which no (or another) intervention is allocated. This means that the sample size of primary interest is the number of clusters, not the number of individuals within the clusters. Unit of analysis error occurs when an analysis of the data is performed such that individuals in the intervention clusters
are compared with individuals in the control clusters without accounting for dependency between individual observations and the cluster to which they belong. Unfortunately, this is a frequent mistake in implementation research in nursing (Thompson et al., 2007). Ignoring clustering effects normally results in underestimation of sample size, which may seriously flaw the results of the study (Wears, 2002; Dawson, 2004).

6. Conclusions

The current overview has examined some of the recent literature in the knowledge translation and implementation research field in nursing. It shows that progress is being made in several important areas, but researchers still need to contend with a number of challenging issues in moving the field from descriptive research to intervention studies on implementation strategies. Compared to Titler’s (2004) paper on methods in translational science many of the issues discussed remain unchanged. The recent – and growing – literature has made it possible to look at this field of research with somewhat updated glasses. Current issues may be summarized as follows:

- Directing intervention studies to clinical areas where implementation of evidence-based practice has a strong improvement potential.
- Selecting the most promising intervention strategies for evaluation—and keeping the focus there.
- Increasing the use of theory in developing intervention strategies and designing studies to increase the potential to answer such questions as what works, for whom and when?
- Mobilizing knowledge and resources for setting up more robustly designed studies (if possible, RCTs).
- Completing trials with a careful process evaluation in order to understand which components of context and intervention are active in accomplishing change.
- Developing the assessment of barriers to change and increasing the understanding on how to overcome barriers with tailored interventions.
- Including contextual factors in the planning and evaluation of implementation studies.
- Deciding on primary outcome variables and unit of analysis to carry out a valid evaluation of intervention effects.

The successful handling of such issues does not involve a straightforward and simple research agenda. Rather, it requires programmatic, purposeful and sustainable work. It entails a strong network of collaboration among nursing researchers within and across nations as well as collaboration with researchers from other disciplines. Implementation research is fundamentally interdisciplinary. Last but not least, carrying out useful implementation research requires a strong mobilization of funding.

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