

Evidence Review

Knowledge Translation Strategies for Enhancing Nurses' Evidence-Informed Decision Making: A Scoping Review

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ABSTRACT

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Background: Nurses are increasingly expected to engage in evidence-informed decision making (EIDM); the use of research evidence with information about patient preferences, clinical context and resources, and their clinical expertise in decision making. Strategies for enhancing EIDM have been synthesized in high-quality systematic reviews, yet most relate to physicians or mixed disciplines. Existing reviews, specific to nursing, have not captured a broad range of strategies for promoting the knowledge and skills for EIDM, patient outcomes as a result of EIDM, or contextual information for why these strategies “work.”

Aim: To conduct a scoping review to identify and map the literature related to strategies implemented among nurses in tertiary care for promoting EIDM knowledge, skills, and behaviours, as well as patient outcomes and contextual implementation details.

Methods: A search strategy was developed and executed to identify relevant research evidence. Participants included registered nurses, clinical nurse specialists, nurse practitioners, and advanced practice nurses. Strategies were those enhancing nurses' EIDM knowledge, skills, or behaviours, as well as patient outcomes. Relevant studies included systematic reviews, randomized controlled trials, cluster randomized controlled trials, non-randomized trials (including controlled before and after studies), cluster non-randomized trials, interrupted time series designs, prospective cohort studies, mixed-method studies, and qualitative studies. Two reviewers performed study selection and data extraction using standardized forms. Disagreements were resolved through discussion or third party adjudication.

Results: Using a narrative synthesis, the body of research was mapped by design, clinical areas, strategies, and provider and patient outcomes to determine areas appropriate for a systematic review.

Conclusions: There are a sufficiently high number of studies to conduct a more focused systematic review by care settings, study design, implementation strategies, or outcomes. A focused review could assist in determining which strategies can be recommended for enhancing EIDM knowledge, skills, and behaviours among nurses in tertiary care.

BACKGROUND

Evidence-informed decision making (EIDM) depends on clinical expertise to integrate the best quality research evidence along with information about patient preferences, clinical context, and resources (Canadian Nurses Association, 2013; DiCenso, Ciliska, & Guyatt, 2005; Kitson, 2004; Sigma Theta Tau International Honor Society of Nursing, 2005). The consideration of research evidence in practice decisions has achieved some acceptance as an important skill and behaviour for healthcare professionals and is increasingly part of individual standards of practice and institutional accreditation (American Nurses Association, 2010; Canadian Nurses Association,

2013; Nursing & Midwifery Council, 2008; Sigma Theta Tau International Honor Society of Nursing, 2005). Although not the only component of EIDM, it is believed that nurses' use of research evidence in decision making is not as ideal as it should be (Squires et al., 2011).

As nurses are the largest group of health professionals in the healthcare workforce (World Health Organization, 2011), finding ways to enhance the use of research evidence in nursing practice is paramount. Knowledge translation (KT) strategies, such as education, reminders, and champions have been described as ways to ensure that individual stakeholders (such as nurses) are aware of and use research evidence

to inform healthcare decision making (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012). The Effective Practice and Organization of Care (EPOC) group within Cochrane (<http://epoc.cochrane.org/>) and others have conducted several systematic reviews of such KT strategies, as well as organizational and institutional strategies, aimed at reducing barriers and facilitating the use of research evidence in decision making among healthcare professionals (Bero et al., 1998; Boaz, Baeza, Fraser, & European Implementation Score Collaborative Group [EIS], 2011; Flodgren et al., 2011; Forsetlund et al., 2012; Grimshaw et al., 2001, 2004; Heselmans, Van d, Donceel, Aertgeerts, & Ramaekers, 2009; Jamtvedt, Young, Kristoffersen, O'Brien, & Oxman, 2006; O'Brien et al., 2007; Shojania et al., 2010; Thomas et al., 1998, 2000). These reviews mostly relate to changing physician behaviour or are with mixed disciplines, without analyses specific to nurses. Within these reviews, strategies such as reminders, educational outreach, opinion leaders, and audit and feedback resulted in small to moderate improvements in EIDM behaviours and patient outcomes, with insufficient evidence to support multifaceted strategies over single strategies. Only one systematic review by Thompson and colleagues considered the effect of KT strategies on research use in nurses (Thompson, Estabrooks, Scott-Findlay, Moore, & Wallin, 2007). They found a limited number of studies which included mostly educational strategies and concluded that there was insufficient evidence to support the use of educational meetings for increasing research use among nurses (Thompson et al., 2007).

The researcher-knowledge user team for this study was interested in synthesizing the available evidence to determine what strategies used with nurses are effective for promoting EIDM knowledge, skills, and behaviours, as well as improving patient outcomes through nurses' research evidence use. The team decided that a scoping review would be beneficial to help identify and map the literature by study designs, clinical areas, KT strategies, and provider and patient outcomes. Therefore the purpose of this paper is to report on the scoping review of KT strategies implemented and assessed with nurses in tertiary care settings.

METHODS

This scoping review was guided by the recognized framework of Arskey and O'Malley (2005), which includes identifying the research question and relevant studies, study selection, charting the data, and collating, summarizing, and reporting the results. An integrated KT approach also guided this scoping review. Consistent with this approach that aims to include potential users of research in the research process to produce findings which will more likely be relevant to and used by the potential users, the project team engaged knowledge user partners and an advisory committee during the conduct of this scoping review (Canadian Institutes of Health Research, 2013). The knowledge user partners were two academic health centres in Ontario, Canada. The advisory committee included frontline practitioners (nurses, advanced practice nurses) and

nurse decision makers (nurse managers, nurse educators) from these health centres, as well as representatives from provincial and national organizations supporting the project (Canadian Nurses Association and the Registered Nurses Association of Ontario). The knowledge user partners and advisory committee members provided input into the research question(s), inclusion criteria, search strategy, study selection, and data extraction for the review.

Inclusion Criteria

Participants. This scoping review was focused on nurses; defined as registered nurses and advanced practice nurses (including clinical nurse specialists and nurse practitioners). Studies in which participants were only licensed practical nurses, registered practical nurses, or student nurses were excluded due to fundamental differences in training, education, and scope of practice. Studies of nurses as part of a group of healthcare professionals were included if they reported outcome data for nurses separately.

Setting. As the clinical context of care represented by the knowledge user partners is tertiary care and was the context in which the question of this scoping review was developed, the setting was limited to tertiary care. Studies conducted exclusively in primary care, long-term care, outpatient clinics or community settings were excluded.

Interventions. Knowledge translation strategies directed toward participants and aimed at promoting EIDM knowledge, skills, or behaviours, as well as patient outcomes were included. To guide the review, a list of KT strategies was compiled from a review of previous systematic reviews in KT conducted by the EPOC review group and the Health Technology Assessment programme funded by the National Institute of Health Research (Forsetlund et al., 2012; Grimshaw et al., 2004; Haynes, Wilczynski, & Computerized Clinical Decision Support System [CCDSS] Systematic Review Team, 2010; Jamtvedt et al., 2006; Norwegian Satellite of the Cochrane Effective Practice and Organization of Care Group, 2013). Within this framework, the implementation of guidelines is regarded as a KT strategy, but to be included in this review, authors needed to demonstrate that the guideline being implemented was informed by a review of the evidence and its implementation in practice needed to be accompanied by an additional KT strategy. For this review, adopting or implementing a guideline as a single KT strategy did not sufficiently satisfy the inclusion criteria.

Outcomes of interest. The team was interested in both qualitatively and quantitatively reported outcomes. The quantitative outcomes included EIDM knowledge, skills, and behaviour, and patient outcomes. Using the Classification Rubric for Evidence Based Practice (EBP) Assessment Tools in Education framework (Tilson et al., 2011), EIDM knowledge was conceptualized as facts and concepts about EBP. Examples include nurses' ability to define the components of a clinical question, identify resources they would access to search for the best available evidence, or differentiate between types of research

study designs. Skills for EIDM then involve the application of knowledge; such as whether nurses correctly construct a clinical question, appropriately conduct a search of the evidence, or accurately appraise the quality of evidence. Evidence-informed decision-making behaviours reflect the conduct of EIDM in nursing practice. For example, how often do nurses identify and construct clinical questions, search for the best available evidence, or use research evidence in practice. Finally, from a qualitative perspective, the team members were interested in studies of context that might explain why KT strategies were or were not successful.

Study designs. The following quantitative study designs were included: systematic reviews, randomized controlled trials (RCTs), cluster RCTs, non-randomized trials (including controlled before and after studies), cluster non-randomized trials, interrupted time series designs, and prospective cohort studies (Norwegian Satellite of the Cochrane Effective Practice and Organization of Care Group, n.d.). Interrupted time series designs must include a clearly defined point in time at which the intervention occurred and at least three data points before and after the intervention to be included (Norwegian Satellite of the Cochrane Effective Practice and Organization of Care Group, n.d.). All qualitative designs were eligible for inclusion (i.e., descriptive, phenomenology, grounded theory) provided that study authors provided sufficient evidence that a specific qualitative methodology was employed (i.e., referencing a methodology, describing the analysis stage). Mixed methods studies needed to have a quantitative methodology consistent with one of the included study designs, as well as adhere to the inclusion criteria for qualitative designs. Systematic reviews were also included as a method of citation search. Non-systematic reviews, cross-sectional surveys, studies using post-test only, case reports, discussion papers, and editorials were excluded.

Search strategy. The search strategy included electronic bibliographic databases supplemented by additional strategies to identify published and unpublished evidence applicable to the question. The following electronic databases were searched from their inception until the date of the search (November 22, 2013) using search terms relevant to each of the databases: Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database, PubMed, Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Excerpta Medica (EMBASE), Web of Science, Psychological Abstracts (PsycINFO), Education Resources Information Center (ERIC), and Dissertation Abstracts International. The search strategy was developed by a project team member with expertise in KT and systematic review searches (a librarian with a Master of Library Science [MLS] degree and doctorate in Medical Informatics). Along with input provided by the researcher-knowledge user team and advisory committee, the search strategies of systematic reviews with similar questions were reviewed (Scott et al., 2012; Thompson et al., 2007). The search was implemented by a second MLS health science librarian experienced in conducting

searches for systematic reviews. In addition, the EPOC Register was searched by the EPOC Information Specialist and Trials Search Coordinator on May 22, 2013.

To identify additional applicable literature, a hand search of the references lists of included studies and the following key journals for the 12-month period prior to the date the electronic database search was conducted (October 2012 to November 2013): Implementation Science, BioMed Central Health Services Research, Journal of Health Services Research & Policy, and Nursing Research. To identify grey literature the following searches were completed on June 14, 2013: Open Grey (<http://www.opengrey.eu/>); a key registry, KT Plus (<http://plus.mcmaster.ca/kt/>); online sites for relevant conference proceedings, abstracts, and reports (the Research Transfer Network of Alberta (<http://www.aihealthsolutions.ca/rtna/>), KT Canada (<http://ktclearinghouse.ca/ktcanada>), Knowledge Utilization Colloquia (<http://www.kusp.ualberta.ca/en/KnowledgeUtilizationColloquia.aspx>), National Institutes of Health Science of Dissemination and Implementation conferences (http://obssr.od.nih.gov/scientific_areas/translation/dissemination_and_implementation), and Joanna Briggs Institute (<http://joannabriggs.org/>)). Further details of the search strategy can be found in Additional File 1, Search strategy (available with the online version of this article).

Study selection. Following de-duplication, two reviewers independently screened titles and abstracts of potentially relevant references. At the stage of title and abstract screening, if one reviewer screened the reference as relevant or insufficient information was available to determine a citation as irrelevant, the reference was then moved to full-text screening. Two reviewers also independently conducted full-text screening. A third reviewer was available to resolve discrepancies not achieved through consensus, as agreement was necessary for inclusion at this level of screening.

Data extraction. With input from the knowledge user partners, a standardized data extraction form was piloted among members of the project team and modified until consensus was reached on the template. Data were extracted independently by two reviewers using this form, which included year of publication, study design, type and description of KT strategy, and type of outcome(s). When multiple publications representing one reference existed, data were extracted from all relevant publications and the publication containing the most complete data was identified as the primary reference.

RESULTS

Reference Retrieval

The search of electronic databases initially retrieved 69,605 references and 40 references were identified through other search methods. Following de-duplication references, 44,608 references were screened (see Figure 1, Search Strategy Development). Following title and abstract screening, 2,634 references (6%) continued onto full-text screening and as a

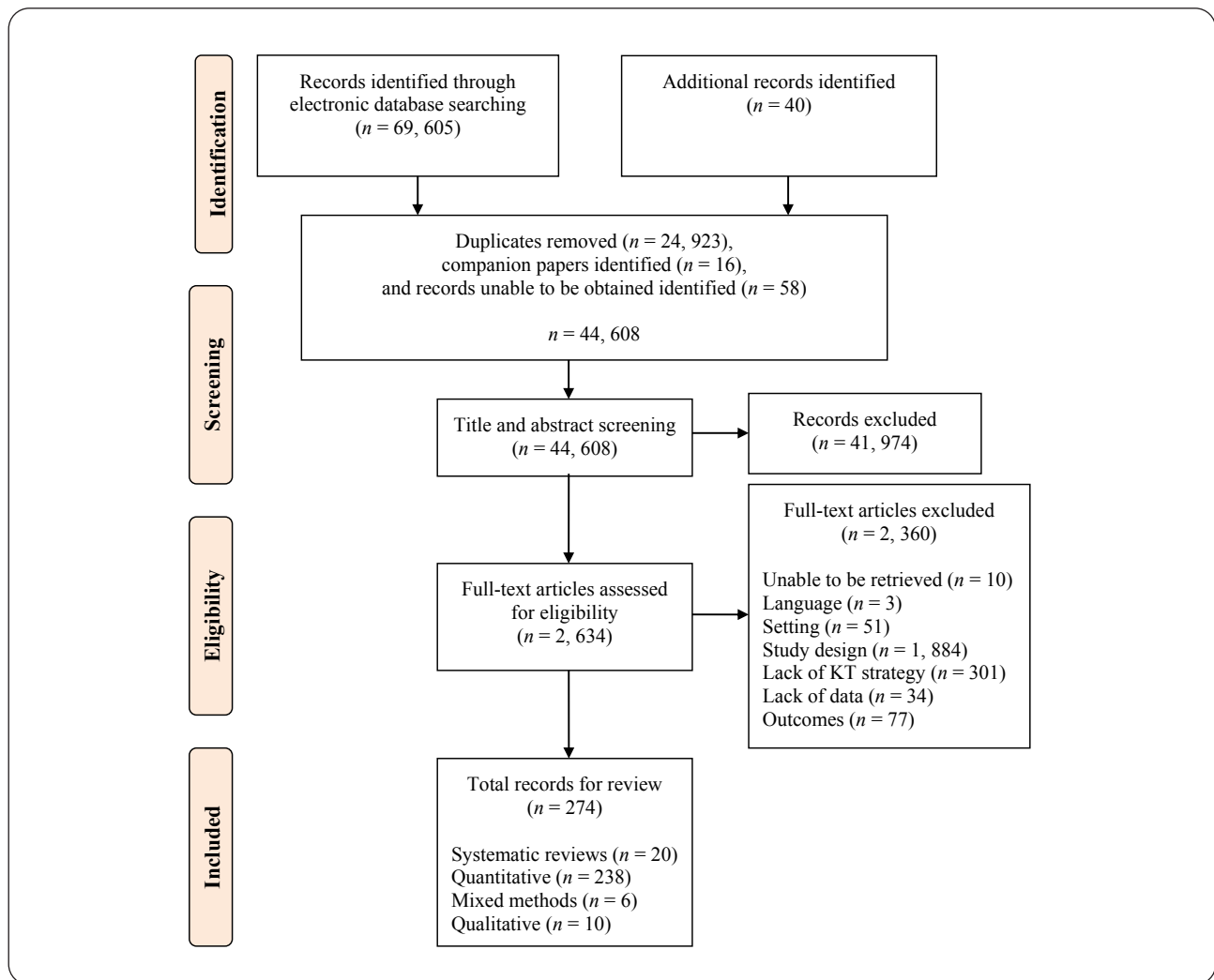


Figure 1. Search strategy development.

result of full-text screening 274 unique references were included.

The primary reasons for exclusion of references at full text screening were: published in a language other than English ($n = 3$), the study design did not meet inclusion criteria ($n = 1,884$), did not include a KT strategy ($n = 301$), did not occur in a tertiary care setting ($n = 51$), did not report quantitative or qualitative data ($n = 34$), and did not report on the outcomes of interest ($n = 77$). The final 274 included references were journal articles or dissertations, with a few references with multiple publications reporting results. These included Graham and colleagues (Graham, Logan, Davies, & Nimrod, 2004) and Davies and colleagues (2002), as well as Kitson and colleagues (2011), Wiechula and colleagues (2009), and McLiesh and colleagues (McLiesh, Mungall, & Wiechula, 2009). Details of all the included references can be found in Additional file 2, Characteristics of included studies (available with the online version of this article).

Study Designs

Of the final 274 included references, 20 were systematic reviews, 238 were quantitative research designs, six were mixed methods designs, and 10 were qualitative research designs. The quantitative research designs included five RCTs, six cluster RCTs, five non-randomized trials, five cluster non-randomized trials, and 217 prospective cohort studies. The designs of the qualitative research studies included eight descriptive studies and two grounded theory studies. The number of references for each study design and outcomes of interest for this review are indicated in Table 1. Some study designs reported on more than one outcome. While no studies reported on all of the outcomes of interest, some studies reported on two or three outcomes. Twelve systematic reviews, two cluster non-randomized trials, two mixed methods studies, and 46 prospective cohort studies reported on two outcomes and two systematic reviews, two prospective cohort studies, and two mixed studies reported on

Table 1. Study Design and Outcomes

Study design	Knowledge	Skills	Behaviours	Patient outcomes	Contextual factors	Total studies by design
Systematic review	2	2	16	16	0	20
RCT	0	0	3	2	0	5
Cluster RCT	0	0	3	3	0	6
Non-randomized trial	0	0	3	2	0	5
Cluster controlled	0	0	5	2	0	5
Prospective cohort	5	13	113	135	0	217
Interrupted time series	0	0	0	0	0	0
Mixed methods	0	0	6	2	6	6
Qualitative	0	0	0	0	10	10

three outcomes (see Additional File 2 for Characteristics of included studies, available with the online version of this article).

Population and Setting

Within the unique references, the target population for receipt of the KT strategy was described as solely nurses, nurses as part of a group of healthcare professionals, or patients cared for by only nurses or nurses as part of a group of healthcare professionals. Additional file 2 provides a summary of the participants for each included reference. Nurses were identified as: nurses, staff nurses, clinical nurses, institutional nurses, charge nurses, clinical resource nurses, registered nurses, licensed practical nurses, nursing assistants, advanced practice nurses, clinical nurse specialists or nurse specialists, clinical nurse educators or clinical educators, nurse managers, administrators, nurse executives, nurse consultants, and nurse researchers. Four systematic reviews specified nurses as the sole population to be included (Gifford, Davies, Edwards, Griffin, & Lybanon, 2007; Randell, Mitchell, Dowding, Cullum, & Thompson, 2007; Thompson et al., 2007; Timmermans, Van Linge, Van Petegem, Van Rompaey, & Denekens, 2012), yet two of these reviews included studies in which the population was nurses as part of group of healthcare professionals (Gifford et al., 2007; Timmermans et al., 2012).

Within tertiary care, the included studies in this scoping review represented a range of clinical areas. Although the clinical area was unable to be determined for a number of references ($n = 27$, 10%) and a number were conducted in various settings ($n = 63$, 23%), many studies were conducted in intensive care units ($n = 50$, 18%), adult surgical units ($n = 23$, 8%), or adult medical-surgical units ($n = 21$, 8%). Additional File 2 (Characteristics of included studies, available with the online version of this article) provides further details of the clinical area and

Table 2 provides information on clinical area by outcomes reported.

The included studies were also implemented in various countries; primarily in the United States ($n = 124$, 45%), Canada ($n = 32$, 12%), Australia ($n = 27$, 10%), and the UK ($n = 21$, 8%), with one additional study was implemented in both the United States and Canada. The remainder of the studies were representative of the following countries: Belgium, China, Denmark, Ireland, Italy, France, Korea, Netherlands, New Zealand, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, Taiwan, and Thailand. Additional File 2 (Characteristics of included studies) provides further details of the country by reference.

Knowledge Translation Strategies

Knowledge translation strategies are usually described as single or multifaceted interventions that are inherently professional, organizational, financial, or regulatory (Cochrane Effective Practice Organization of Care Group, 2013). While the KT strategies described in the included references were both single and multifaceted and included professional, organizational, and financial strategies; most often multifaceted, professional KT strategies were implemented. Tables 3 and 4 report on KT strategy by study design and outcomes reported, respectively.

Of the 274 references included in this review, a multifaceted KT strategy was implemented in approximately three-quarters of the references ($n = 202$) with the remaining references implementing a single KT strategy ($n = 72$). Among the references which implemented a multifaceted strategy, the overwhelming majority of these strategies included an educational component—mainly educational materials or educational meetings ($n = 203$). The only exceptions were two studies in which the multifaceted strategy consisted of a computerized decision support system in addition to audit and feedback (Dobson & Scott, 2007) or the

Table 2. Clinical Area and Outcomes

Clinical area	Knowledge	Skills	Behaviours	Patient outcomes	Contextual factors
Unable to determine	5	7	21	11	62
Various areas	0	0	35	39	36
Intensive care unit	0	3	25	37	0
Critical care	0	0	0	0	1
Medical/surgical	0	0	2	0	0
Internal medicine	0	0	0	1	0
Medical	0	0	0	1	0
Adult medical/surgical	1	0	12	10	0
Adult medical	0	0	3	3	0
Adult surgical	0	0	8	21	0
Neonatal intensive care unit	0	1	6	4	1
Pediatric intensive care unit	0	0	3	2	0
Pediatrics	0	0	4	5	12
Obstetrics & gynecology	0	0	1	2	0
Labour and delivery/post-partum	0	0	12	2	01
Urgent care	0	0	0	1	0
Emergency department	0	3	8	8	0
Cardiology	0	0	1	1	0
Cardiovascular surgical unit/coronary care	0	0	3	0	0
Cardiac/stroke unit	0	0	03	04	0
Neurology	0	1	1	2	0
Oncology	1	0	56	0	0
Adult oncology	0	0	1	0	1
Hemodialysis	0	0	1	0	0
Renal	0	0	1	0	0
Psychiatric/mental health	0	0	1	4	2
Sub-acute geriatric evaluation/management	0	0	1	1	0
Rehabilitation	0	0	0	3	0

creation of a multidisciplinary team plus audit and feedback (Bowman et al., 2005). Additional file 2 (available with the online version of this article) provides details of the types of KT strategies.

Among references that implemented single strategies, educational materials ($n = 28$) and educational meetings ($n = 23$) were the most commonly occurring strategies. The remainder of the studies implementing single strategies included the fol-

lowing professional interventions: audit and feedback, clinical decision support systems, local opinion leaders, reminders, library access, journal clubs, evidence-based training, team learning activities, activities conducted by nurse managers, external inspection, and appreciative inquiry. Single organizational interventions included multidisciplinary teams and changes in organizational infrastructure, and single financial interventions included the use of financial incentives.

Table 3. KT Strategy and Study Design

KT intervention	Systematic review	RCT	Cluster RCT	Non-randomized trial	Cluster controlled trial	Prospective cohort	Mixed methods	Qualitative
Multifaceted	4	3	4	4	4	174	5	4
Educational materials	3	0	1	0	1	23	0	0
Educational meeting	1	2	0	1	0	14	0	5
Audit & feedback	0	0	0	0	0	4	0	0
Clinical decision support system	3	0	0	0	0	0	0	1
Local opinion leader	1	0	0	0	0	0	0	0
Reminders	1	0	0	0	0	0	0	0
Access to library	0	0	1	0	0	0	0	0
Journal club	1	0	0	0	0	0	0	0
Evidence-based practice training program	1	0	0	0	0	0	0	0
Team learning activities	1	0	0	0	0	0	0	0
Nurse manager activities	1	0	0	0	0	0	0	0
External inspection	1	0	0	0	0	0	0	0
Appreciative inquiry	0	0	0	0	0	0	1	0
Multidisciplinary team	0	0	0	0	0	2	0	0
Organizational infrastructure	1	0	0	0	0	0	0	0
Financial incentives	1	0	0	0	0	0	0	0

Outcomes

Evidence-informed decision-making behaviours and patient outcomes as a result of research evidence use were the two most common reported outcomes in the included references. While most references only reported on a single outcome, multiple outcomes were reported in a number of references. Two outcomes were reported in 12 systematic reviews, two cluster non-randomized trials, three mixed methods studies, and 43 prospective cohort studies and three outcomes were reported in two systematic reviews, three prospective cohort studies, and two mixed methods studies. Table 1 identifies the outcomes reported by study design, while outcomes by clinical area and outcomes by type of KT strategy are reported in Tables 2 and 4, respectively.

Two types of EIDM behaviours emerged in this literature: (a) engaging in EIDM activities (i.e., searching for the best available evidence, critically appraising research evidence) in practice and (b) use of research evidence (i.e., an evidence-informed guideline, protocol, pathway) for practice change. Sixteen included studies reported on engaging in EIDM activities. The remaining references, representing the majority of studies ($n = 133$), reported on the use of research evidence for practice change.

For references in which the KT strategy was implemented among a group of healthcare professionals and the outcome of interest was EIDM behaviours, studies had to report the outcomes separately for nurses. When patient outcomes were reported as the result of research use, the study could report

Table 4. KT Strategy and Outcomes

KT intervention	Knowledge	Skills	Behaviours	Patient outcomes	Contextual factors
Multifaceted	1	10	111	122	9
Educational materials	2	3	16	15	0
Educational meeting	2	0	6	12	5
Audit & feedback	0	0	3	2	0
Clinical decision support system	0	0	3	3	1
Local opinion leader	0	0	1	1	0
Reminders	0	0	0	1	0
Access to library	0	0	1	0	0
Journal club	1	1	1	0	0
Evidence-based practice training	1	1	1	0	0
Team learning activities	0	0	1	0	0
Nurse manager activities	0	0	1	1	0
External inspection	0	0	1	1	0
Appreciative inquiry	0	0	1	1	1
Multidisciplinary team	0	0	1	1	0
Organizational infrastructure	0	0	1	1	0
Financial incentives	0	0	0	1	0

that the KT strategy was implemented among only nurses or nurses as part of a group of healthcare professionals. Of the 163 references reporting on patient outcomes, nurses were mentioned as the sole recipients of the KT strategy in 100 studies. The data extraction for this scoping review determined if patient outcomes as the result of research use were identified, not the type of patient outcome.

DISCUSSION

This scoping review has identified the existing body of literature of KT strategies for enhancing nurses EIDM knowledge, skills, behaviours and patient outcomes as a result of nurses' use of research evidence, and mapped it by study design, clinical areas, KT strategies, and provider and patient outcomes among nurses in tertiary care.

Our findings of the use of both single and multifaceted strategies are reflective of those found in the broader KT literature. Also consistent with previous findings is the predominant implementation of multifaceted strategies. Although specifically related to the effectiveness of strategies for guideline dissemination and implementation, the systematic review by Grimshaw and colleagues (2004) found that the majority of studies involved multifaceted strategies (73% of the compar-

isons). This is quite similar to the use of multifaceted strategies among approximately 75% of the references included in this review. The inclusion of an educational component was evident in the approximately 20% of the single strategies and in all but two studies that were described as implementing a multifaceted component. Given the wealth of studies considering an educational component, there is support for conducting a systematic review to determine the strength of the evidence for educational strategies.

The range of included study designs is representative of the notion that most KT strategies are tested in real-life, practice-based settings with study designs other than RCTs (Norwegian Satellite of the Cochrane Effective Practice and Organization of Care Group, n.d.). Despite the fact that the predominant study design was the use of prospective cohort designs, the team found the relatively unexpected number of high-level studies (RCTs, cluster RCTs, non-randomized trials, and cluster non-randomized trials) to be promising (Cochrane Consumer Network, 2012). There are a sufficient number of the latter studies identified through this scoping review to conduct a systematic review without the need to include prospective cohort designs.

Surprisingly there is a lack of mixed methods studies. These studies would have the ability to identify both the effectiveness of the strategy, as well as contextual factors that act as either

facilitators or barriers within the same population. Additional mixed methods studies were identified through the scoping review search, yet a lack of methodological details provided (e.g., primarily details of data analysis) or a descriptive quantitative design may have led to their exclusion. Additional research using mixed methods designs and fulsome methodological reporting should be considered in future studies addressing the question asked in this scoping review.

Similar to the lack of reporting detail for mixed methods studies, there were challenges noted which increased the difficulty of mapping the literature of the KT strategies by study design, clinical areas, and provider and patient outcomes among nurses in tertiary care. In many cases, details of the nurses included in the studies and details about the KT strategy (i.e., intensity, duration, cost) were absent or insufficient to facilitate comparisons. In addition, within the EPOC classifications that were used in this scoping review to organize the summary of KT strategies and facilitate comparison with previous literature, not all of the KT strategies implemented could be easily identified by the team as fitting within a pre-existing EPOC category. For example, among the multifaceted strategies implemented by Wallen and colleagues (2010) was a formal event to promote ongoing mentorship strategies at which the evidence-based practice mentors and nurse leaders were celebrated. Classifying this type of strategy within the EPOC classification as an educational meeting is conceptually difficult and perhaps does not capture the essence of this KT strategy which allowed time for nurses to formally and informally celebrate, discuss, and demonstrate organizational commitment to promoting EIDM. Future efforts might consider ways in which to extend the EPOC classifications to capture these other types of KT strategies which are being used to promote EIDM among nurses in tertiary care.

There were 20 systematic reviews included in this scoping review. Of the four that included only nurses, three of the four considered single KT strategies, i.e., team learning activities (Timmermans et al., 2012), activities of nurse managers (Gifford et al., 2007), and clinical decision support systems (Randell et al., 2007). The review by Thompson and colleagues (2007) was the only review to include single and multifaceted KT strategies among nurses. Furthermore, these reviews considered only the outcome of EIDM behaviour and patient outcomes as a result of EIDM behaviour among nurses. As such, there remains a gap in the literature in regards to understanding the effectiveness of multiple types of KT strategies for promoting nurses' EIDM knowledge, skills, behaviours, and related patient outcomes which a further systematic review can address given the number of studies included in this scoping review representing single and multifaceted KT strategies that considered EIDM knowledge and skills, as well as behaviours and related patient outcomes.

This scoping review has several limitations. The language of the included references was limited to English due to the language fluency of the team. In addition, the team determined that although guidelines are considered as a KT strategy by

EPOC, for the purposes of this scoping review the implementation of guidelines needed to be accompanied by an additional KT strategy. As such, this scoping review does not reflect the body of literature on guidelines as a sole KT strategy for nurses in tertiary care. For inclusion a guideline, protocol, or pathway also had to have some related reported evidence to inform the development of the guideline, protocol, or pathway, which may have further narrowed the included guideline literature. In addition, the team did not appraise the quality of this evidence or of the guideline, protocol, or pathway and thus conclusions about the quality of the evidence being implemented cannot be drawn. Given the inclusion and exclusion criteria, the generalization of the findings of this scoping review is limited to nurses working within tertiary care and is not representative of other settings or populations (i.e., student nurses). Lastly, although the search strategy was developed by a project team member with expertise in KT and systematic review searches, there are still challenges in searching the literature in the field of KT. For example, McKibbon and colleagues (2010) identified 100 terms to describe KT research. As such, it is possible that potential studies may have been missed for inclusion in this scoping review.

CONCLUSIONS

The findings of this scoping review indicate that across a variety of clinical settings in tertiary care diverse professional, organizational, and financial KT strategies (both single and multifaceted) have been evaluated for their ability to promote EIDM knowledge, skills, behaviours, and patient outcomes as a result of nurses' research use in practice. There are sufficient numbers of studies using experimental or quasi experimental study designs to conduct a more focused systematic review. Given the number of studies that met the inclusion criteria for this scoping review, it is likely that a systematic review could synthesize findings by clinical area, type of KT strategy, and outcomes. Findings from such a review could assist decision makers in determining which KT strategies can be recommended in their local context for enhancing EIDM knowledge, skills, and behaviours among nurses in tertiary care, as well as discover if there is a link to improvement in patient outcomes.

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LINKING EVIDENCE TO ACTION

- Professional, organizational, and financial knowledge translation (KT) strategies are being implemented to enhance evidence-informed decision making (EIDM) among nurses in tertiary care.
- The KT strategies being implemented are largely multifaceted strategies which incorporate an educational component.
- There are a sufficient number of studies to conduct a more focused systematic review to address a gap in the existing synthesized literature.
- Future efforts to evaluate KT strategies should consider the use of mixed methods study designs.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web site:

Additional File 1: Search Strategy

Additional File 2: Characteristics of Included Studies