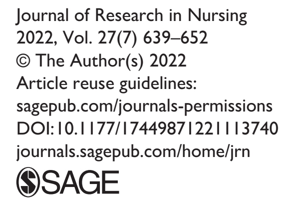
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Using mixed-methods in evidence-based nursing: a scoping review guided by a socio-ecological perspective

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Abstract

Background: Increased pressure for evidence-based practice in nursing necessitates that researchers use effective approaches. Mixed-methods research (MMR) has potential to improve the knowledge and implementation of evidence-based nursing (EBN) by generating outcome-based and contextually-focused evidence.
Aims: To identify methodological trends in how MMR is used in EBN research.
Methods: Searches were completed in PubMed, CINAHL, and Google Scholar using the terms "nursing", "mixed-methods", and "evidence-based". Seventy-two articles using MMR to address EBN and published 2000–2021 were reviewed across content themes and methodological domains of the Socio-Ecological Framework for MMR.
Results: Mixed-methods research has been used to study how EBN strategies are perceived, developed and assessed, and implemented or evaluated. A few studies provided an MMR definition reflecting the *methods* perspective, and the dominant MMR rationale was gaining a comprehensive understanding of the issue. The leading design was concurrent, and half of studies intersected MMR with evaluation, action/participatory, and/or case-study approaches. Research quality was primarily assessed using criteria specific to quantitative and qualitative approaches.
Conclusions: Mixed-methods research has great potential to enhance EBN research by generating more clinically useful findings and helping nurses understand how to identify and implement the best available research evidence in practice.

Keywords

evidence-based nursing, evidence-based practice, literature review, mixed-methods research, nursing research, socio-ecological framework

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Introduction

There has been increased pressure from diverse stakeholders for healthcare professionals to utilise evidence-based practices (EBP), which integrate research evidence, patient preference, and clinical expertise to provide quality patient care (Breimaier et al., 2015; Gorsuch et al., 2020; Melnyk et al., 2018; Sackett et al., 1996). Many studies have shown that EBP improves patient safety and clinical results and reduces healthcare costs and variation in patient outcomes (Black et al., 2015; Laibhen-Parkes et al., 2018). It is particularly important that nurses use EBP as they make up the largest group of healthcare professionals and play a major role in improving the safety and quality of care. Therefore, it is not surprising that the Institute of Medicine has identified EBP as a core competency of nursing (American Nurses Association, 2015).

Nevertheless, nurses' use of EBP remains inconsistent (Breimaier et al., 2015; Laibhen-Parkes et al., 2018), and they continue to have difficulty implementing EBP knowledge and skills in practice (Camargo et al., 2018; Gorsuch et al., 2020). Longstanding barriers to nurses' use of EBP include a lack of access to research-based evidence and educational tools, lack of authority and organisational support to change clinical practice, and lack of time to implement new ideas (Black et al., 2019; Gorsuch et al., 2020). These factors constrain nurses' EBP knowledge and competence, which can lead to ineffective practices that jeopardise patient safety and well-being (Black et al., 2015; Camargo et al., 2018). U.S. national surveys have found that nurses do not feel competent in any of the 24 competencies necessary to implement EBP (Melnyk et al., 2018) and that nurse leaders lack competencies in several basic steps in the EBP process (Harper et al., 2017). Given the high stakes of poor quality of care, it is imperative to leverage research strategies that can fully illuminate the complex challenges of EBP use in nursing care contexts.

Evidence-based nursing (EBN) has been defined as "the conscientious, explicit and judicious use of theory-derived, research-based information in making decisions about care delivery…in consideration of individual needs and preferences" (Ingersoll, 2000: 152). Although randomised controlled trials have been considered the gold standard of evidence, context, and experience of nursing care require the use of multiple methods that can generate both contextualised and outcome-oriented forms of evidence (Ingersoll, 2000). Mixed-methods research (MMR) that integrates quantitative and qualitative approaches is becoming increasingly used in nursing research to address a wide range of health care issues (Bressan et al., 2017; Halcomb and Hickman, 2015; Shorten and Smith, 2017; Younas et al., 2019). There has been a steady rise in MMR studies in nursing journals, and some nursing journals have published special issues devoted to MMR. For instance, the Journal of Research in Nursing's June 2017 special issue highlighted how MMR can generate findings that are more readily adopted in health care practice (Lesser, 2017).

Mixed-methods research has been recognised to have potential to improve the knowledge base for EBN by capitalising on the MMR advantages to generate both outcome-based and contextually focused evidence (Breimaier et al., 2015; Flemming, 2007; Mathieson et al., 2018). Qualitative research, as part of an MMR approach, can inform the design and conduct of intervention effectiveness studies (Flemming, 2007), secure patients' and providers' perspectives on EBP adoption and implementation (Barbour, 2000), and provide the context for evaluating EBP in nursing (Ailinger, 2003). Despite these advantages of MMR for optimising EBN practice, quantitative approaches continue to dominate EBN research (Kidd and Twycross, 2019; Noble and Shorten, 2018). Recent reviews of EBN articles found that qualitative approaches were used in only 15–20% of studies, and MMR approaches were used in one study (Kidd and Twycross, 2019; Noble and Shorten, 2018). Other review articles have displayed similar research designs with an emphasis on randomised controlled trials (Adiewere et al., 2018).

To better understand how MMR can support EBN, we conducted a scoping literature review to identify methodological trends in how nursing researchers use MMR to address EBN problems. The review was guided by a comprehensive Socio-Ecological Framework for MMR (Plano Clark and Ivankova, 2016) that shapes researchers' decisions when applying MMR in EBN studies.

Methodology

Conceptual framework

The Socio-Ecological Framework for MMR (Plano Clark and Ivankova, 2016) aims to provide an understanding of how different MMR methodological components and study contexts influence researchers' approaches to designing and implementing MMR studies and places the MMR process in the centre of the framework. Figure 1 presents the framework as consisting of five methodological domains including MMR definitions, rationales, designs, quality, and MMR intersection with other approaches and designs nested within three hierarchical layers representing the influences of personal, interpersonal, and social contexts on the MMR process.

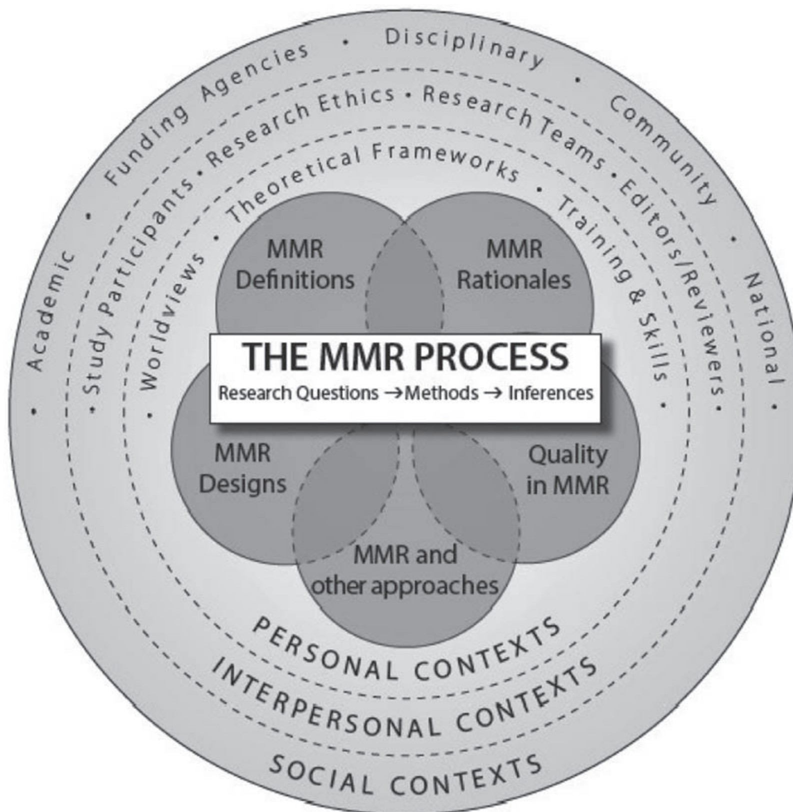

Figure 1. Socio-ecological framework for mixed-methods research.
**Reprinted from Plano Clark and Ivankova (2016) with permission of SAGE Publications.

Literature search

Electronic searches were conducted in two prominent nursing research databases, PubMed and CINAHL, to identify empirical journal articles addressing various aspects of EBP in nursing. The review was limited to English-language studies published between 2000 and 2021. The search terms used were “nursing”, “mixed-method”, and “evidence-based”. The abstracts of identified articles were screened to determine their relevance to this review, and full texts were obtained for articles deemed as relevant. The full article texts were examined to determine their eligibility for inclusion in the review. The bibliographies of these articles were also examined to identify additional relevant studies.

The PRISMA diagram for the study selection process is presented in Figure 2. Of the 262 articles identified, 85 duplicates were identified and excluded. Forty-eight articles were excluded because they were reviews, proposals, or commentaries, and 57 articles were excluded because they did not use MMR or address EBN. This resulted in a total of 72 articles for inclusion in this review.

The selected articles were grouped into three content themes based on the aspect of EBN examined. In cases where an article reflected more than one theme, the content and research objectives of the article were used to determine the most appropriate classification. Articles were then analysed using the five methodological domains of the Socio-Ecological Framework for MMR to identify methodological trends in the use of MMR within and across themes.

Results

Three themes emerged across the 72 reviewed studies: (1) *perspectives* on EBN strategies, (2) *development and assessment* of EBN strategies, and (3) *implementation or evaluation* of EBN strategies. The first theme describes the perspectives of different stakeholders (e.g., practitioners, patients, educators, researchers, and managers) on EBP and its role in nursing (e.g., beliefs, behaviours, and barriers/facilitators). The second theme refers to the development and assessment of EBN strategies such as interventions, practice guidelines, and measurement instruments. The third theme addresses the implementation and evaluation of EBN strategies in practice. Table S1 shows the distribution of the articles across the three themes. The most common theme was *perspectives* (n = 31, 43%) followed by *implementation/evaluation* (n = 30, 42%) and *development and*

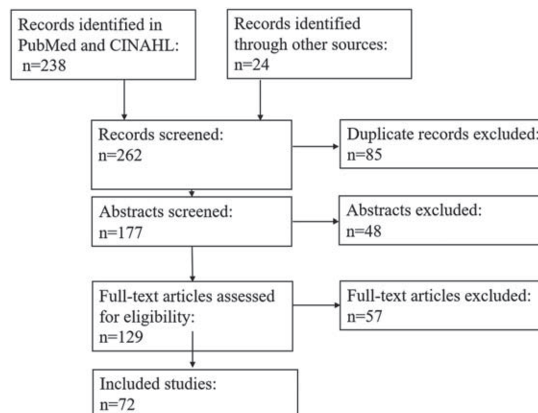

Figure 2. PRISMA diagram. Source: Based on Moher et al. (2009).

Table 1. Results by content themes and methodological domains.

MMR domains	Perspectives on EBN *n* = 31 (43%)	Development and assessment of EBN *n* = 11 (15%)	Implementation/ Evaluation of EBN *n* = 30 (42%)	Grand total *n* = 72(%)
MMR definitions				
Stated perspectives				
Method	1 (3)	2 (18)	3 (10)	6 (8)
Methodology	1 (3)	0 (0)	0 (0)	1 (1)
Citation only	2 (6)	1 (9)	2 (7)	5 (7)
None	27 (87)	8 (73)	25 (83)	60 (83)
MMR rationales				
Stated rationales				
Gaining comprehensive understanding	5 (16)	2 (18)	11 (37)	18 (25)
Using Qual to gain deeper understanding of Quan	9 (29)	3 (27)	4 (13)	16 (22)
Strengthening validity	1 (3)	2 (18)	3 (10)	6 (8)
Separate rationales for Qual and Quan but not MMR	7 (23)	1 (9)	3 (10)	11 (15)
None	9 (29)	3 (27)	9 (30)	2 (29)
MMR designs				
Concurrent	18 (58)	9 (82)	21 (70)	48 (67)
Quan→ Qual	6 (19)	2 (18)	6 (20)	14 (19)
Qual →Quan	7 (23)	0 (0)	3 (10)	10 (14)
MMR and other approaches				
Evaluation	2 (6)	1 (9)	9 (27)	11 (15)
Action and participatory research	3 (10)	0 (0)	3 (10)	6 (8)
Case Study	4 (13)	0 (0)	2 (7)	6 (8)
Case study and evaluation	0 (0)	0 (0)	2 (7)	2 (3)
None	22 (71)	11 (91)	19 (50)	47 (65)
MMR quality				
Quan and Qual	29 (94)	11 (100)	28 (80)	64 (89)
Quan only	1 (3)	0 (0)	2 (10)	4 (6)
Qual only	1 (3)	0 (0)	2 (7)	3 (4)
MMR	0 (0)	0 (0)	0 (0)	0 (0)
None	0 (0)	0 (0)	1 (3)	1 (1)

assessment (*n* = 11, 15%). The findings for each content theme and methodological domain of the Socio-Ecological Framework for MMR are discussed next and summarised in Table 1.

Defining MMR

Four major perspectives on defining MMR - method, methodology, philosophy, and community of research practice - were reported in the MMR literature (Plano Clark and Ivankova, 2016). These

perspectives reflect different views on what constitutes MMR and what aspects of mixing are emphasised in the MMR process. In our review, only seven (9%) articles included a definition of MMR. Most articles (*n* = 6, 8%) defined MMR from a methods perspective, which implies mixing quantitative and qualitative methods of data collection and analysis within a single study. This perspective on MMR was observed mostly among *development and assessment* (*n* = 2, 18%) and *implementation/evaluation* (*n* = 3, 10%) articles. O'Brien et al. (2012) applied "quantitative and qualitative methods" (p. 2, *development and assessment* theme) to identify predictors of participant attrition and home visit completion…in a… nurse-family partnership programme. Nordsteien et al. (2017) used "quantitative data collection and analysis...supported by qualitative data" (p. 24, *implementation/evaluation* theme) to evaluate the influence of a collaborative library-faculty teaching intervention on nursing students' use of evidence-based research tools.

The *methodology* definition of MMR, which supports mixing qualitative and qualitative approaches throughout the entire research process, was only reflected in Strandberg et al.'s (2014) *perspectives* article. The authors used "quantitative and subsequent qualitative approaches" (p. 57) to examine how nurses understand the concept of research utilisation. Six studies (8%) provided a citation to an underlying methodological source instead of defining MMR. The general absence of an MMR definition in the reviewed articles aligns with existing literature indicating that the reporting of MMR approaches in nursing research is incomplete and inconsistent, and that this significantly limits nurses' ability to understand and utilise MMR evidence in clinical practice (Bressan et al., 2017).

Rationales for MMR

Rationales for MMR are the arguments that researchers make to justify their decision to use MMR in a single study. A wide range of rationales have been discussed in the literature indicating the extensive applicability of MMR to address a variety of complex problems including EBP (Ivankova et al., 2018; Plano Clark and Ivankova, 2016; Shorten and Smith, 2017). About half of the reviewed studies (*n* = 42, 54%) stated rationales for using MMR to address the research purpose. Thirteen articles (17%) provided separate rationales for using quantitative and qualitative methods in the study, and this was mostly present within the *perspectives* (*n* = 7, 23%) and *implementation/evaluation* (*n* = 5, 14%) themes. Three major rationales for using MMR were identified in the reviewed articles: (1) gaining a comprehensive understanding of the issue, (2) using a qualitative approach to gain a deeper understanding of quantitative results, and (3) strengthening validity (see Table 2 for examples of rationales across three themes).

The most frequently stated rationale was gaining a comprehensive understanding of the issue (*n* = 19, 24%), and it was observed mostly in the articles focused on EBN *implementation/evaluation* (*n* = 12, 34%). The second most common rationale, using a qualitative approach to gain a deeper understanding of quantitative results, (*n* = 17, 22%), was noted primarily within the *perspectives* (*n* = 9, 29%) and *development and assessment* (*n* = 3, 25%) themes. The least stated rationale, using MMR to strengthen the validity of results (*n* = 6, 8%), was most commonly used within the *development and assessment* (*n* = 2, 17%) and *implementation/evaluation* (*n* = 3, 9%) themes. In addition to the three major reasons for using MMR, some articles provided EBN-focused rationales. Horwood et al. (2021) stated that "real world evaluation based on mixed-methods including routine data" (p. 9, *implementation/evaluation* theme) was needed to test the feasibility and acceptability of implementing a nurse-led, telephone management service for patients diagnosed with chlamydia or gonorrhea.

Table 2. Examples of rationales for mixed-methods research.

Gaining comprehensive understanding of the issue
Perspectives on EBN Strategies
"The mixed-methods design enabled us to get as complete a picture as possible." (Strandberg et al., 2016: 7)
Development and Assessment of EBN Strategies
"The design was a concurrent mixed-methods design used to engender multiple perspectives about a complex phenomenon." (Stoddart et al., 2012: 51)
Implementation or Evaluation of EBN Strategies
"Mixed-methods was the chosen design…to provide complementary insights…and to allow for data triangulation." (Sawan et al., 2021: 716)
Used Qual to gain deeper understanding
Perspectives on EBN Strategies
"The qualitative findings were used to better understand and explain the quantitative results." (Strandberg et al., 2014: 57)
Development and Assessment of EBN Strategies
"Focus groups allowed in depth exploration of experiences and promoted sharing and discussion of ideas." (Griffiths et al., 2015: 466)
Implementation or Evaluation of EBN Strategies
"We utilized a mixed-methods design… to apply another lens for an in-depth investigation of facilitation." (Dogherty et al., 2012:4)
Strengthen validity
Perspectives on EBN Strategies
"Reliability is facilitated by applied, structured, quantitative methods to qualitative data." (Blackstone et al., 2017: 352)
Development and Assessment of EBN Strategies
"To ensure that our recommendations were applicable to current clinical practice, we… gathered robust data using several methods." (Conway et al., 2014: 1050)
Implementation or Evaluation of EBN Strategies
"Triangulation of parent survey findings with… qualitative interviews increases the internal and external validity of the findings." (Aventin et al., 2020: 14)
Unique rationale
Implementation or Evaluation of EBN Strategies
"Qualitative approaches can be used for several purposes before, during, and after a trial. Following the trial, collection and analysis of qualitative data can (a) assist investigators in exploring reasons why an intervention succeeded or failed; (b) explain variations in the effectiveness of the intervention; (c) examine the suitability of the theory used to guide the trial; and (d) generate additional questions and hypotheses." (Ersek and Jablonski, 2014: 3)

MMR designs

Three core mixed-methods designs have been advanced in the MMR literature: a concurrent Quan + Qual and two sequential Quan → Qual and Qual →Quan (Creswell and Plano Clark, 2018; Plano Clark and Ivankova, 2016). A concurrent Quan + Qual design, in which quantitative and qualitative components are implemented independently and both sets of results are combined to produce integrated conclusions, was the dominant design in the reviewed studies. It was used in two-thirds of studies across themes (n = 52, 67%) and in over half of studies within each theme. Parsons et al. (2021) integrated quantitative survey results with qualitative interview findings to… determine the acceptability and feasibility of a referral and case management intervention (*development and*

assessment theme). Eaton et al. (2015) explored the EBP beliefs and behaviours of nurses who provide cancer pain management by collecting and analysing survey and interview data separately, and then interpreting both sets of results together (*perspectives* theme).

Among sequential designs, in which one study phase is completed first and its findings inform the next phase, Quan → Qual design (*n* = 15, 19%) was observed more often than Qual → Quan (*n* = 11, 14%) design. Quan → Qual design was used equally across the themes, accounting for seven (20%) *implementation/evaluation* articles, two (19%) *perspectives* articles, and two (17%) *development and assessment* articles. De La Rue-Evans et al. (2013) conducted qualitative interviews to determine when and why nurses performed specific activities and then used the findings to inform the implementation and evaluation of new guidelines for preventing sleep disturbances among patients with traumatic brain injury (*implementation/evaluation* theme). Lam and Schubert (2019) used quantitative survey results on organisational drivers of EBP to guide qualitative interviews exploring factors impacting nursing students' understanding of EBP and information-seeking behaviours (*perspectives* theme)

Compared to Quan→ Qual design, Qual→ Quan design was used differently among the themes. The design prevailed within the *perspectives* (*n* = 7, 23%) theme and was equally common within the *implementation/evaluation* (*n* = 3, 9%) and *development and assessment* (*n* = 1, 8%) themes. Dale et al. (2005) used qualitative interview data to develop a quantitative survey measuring perceived versus actual barriers and facilitators to protocol uptake (*perspectives* theme). De La Rue-Evans et al. (2013) analysed qualitative interview data to inform the implementation and quantitative evaluation of new sleep hygiene guidelines (*implementation/evaluation* theme).

MMR and other approaches

Mixed-methods research has methodological flexibility to intersect or meaningfully combine with another design or methodology to form complex designs (Creswell and Plano Clark, 2018; Plano Clark and Ivankova, 2016). Such intersection allows for addressing multifaceted research problems by using MMR to enhance another design or approach. In this review, intersecting MMR with another approach was observed in about one-third of studies (*n* = 25, 35%) and mostly in *implementation/evaluation* (*n* = 25, 50%) and *perspectives* (*n* = 9, 29%) studies. Intersecting with evaluation approaches was most common, occurring in 12 (15%) studies. This is not surprising since EBN employs evaluation to continuously test and refine practices to improve patients' and clinician' outcomes. Using MMR with evaluation was most commonly noted in *implementation/evaluation* (*n* = 9, 27%) and *development and assessment* (*n* = 1, 9%) studies. Amacher et al. (2016) embedded an MMR design within an evaluation methodology to assess the satisfaction of patients and providers with a fall prevention programme (*implementation/evaluation* theme). Parsons et al. (2021) embedded MMR design in a process evaluation to develop and refine an intervention to promote earlier return to work among staff with common mental health disorders (*development and assessment* theme).

Some studies intersected MMR with action/participatory or case study approaches. Each approach was observed in six studies (8%) and only in *perspectives* and *implementation/evaluation* studies. Mixed-methods research with action/participatory approaches was noted in three studies (10%) in each theme, Breimaier et al. (2015) collected and analysed quantitative and qualitative data using participatory action research to assess the effectiveness of a fall-prevention guideline in an acute care hospital setting (*implementation/evaluation* theme). Combining MMR with case study research was noted twice as often in the *perspectives* theme (*n* = 4, 13%) than in the *implementation/evaluation* theme (*n* = 2, 7%). Russell et al. (2019) used data from quantitative clinical records and

qualitative interviews to construct case studies on eight family practices describing factors affecting their uptake of an intervention to prevent vascular disease (*perspectives* theme).

MMR quality

Mixed-methods research quality are the decisions that researchers make about how to assess the quality of an MMR study (Creswell and Plano Clark, 2018; Plano Clark and Ivankova, 2016). Among the reviewed articles, the leading strategy was separately reporting the quality of quantitative and qualitative study components (*n* = 69, 88%), which occurred mostly within the *development and assessment* (*n* = 12, 100%) and *perspectives* (*n* = 29, 94%) themes. Gifford et al. (2012) engaged multiple investigators in a quantitative randomised controlled trial and used research-based guides for qualitative interviews to pilot an intervention to promote guideline adherence (*development and assessment* theme). Lin et al. (2020) administered a previously validated quantitative survey, collected qualitative data until data saturation was reached, and maintained audit trails and memos throughout the research process (*implementation/evaluation*).

Quality assurance was discussed in some studies for only the quantitative component (*n* = 4, 6%) or the qualitative component (*n* = 3, 4%). These articles focused exclusively on EBN *perspectives* or *implementation/evaluation*. Miller et al. (2018) used a quantitative instrument shown to have "superior sensitivity and specificity" (p.91) in accurately identifying alcohol misuse in comparable target populations (*implementation/evaluation* theme). Ersek and Jablonski (2014) employed multiple investigators to develop and confirm qualitative themes on barriers and facilitators to protocol adoption (*implementation/evaluation* theme). No studies discussed quality assurance for the overall MMR process, which is not surprising since quality criteria for MMR studies remain one of the most debated topics (Plano Clark and Ivankova, 2016; Tashakkori et al., 2021).

Discussion

This paper synthesised 72 empirical MMR articles in EBN to explore how researchers employ MMR within and across three content themes addressing various aspects of EBN: stakeholder perspectives on EBN, development and assessment of EBN strategies, and implementation/evaluation of EBN strategies. Our review was guided by five methodological domains of the Socio-Ecological Framework for MMR including MMR definitions, rationales, designs, quality, and MMR intersection with other approaches and designs. The findings suggest that this framework is a useful tool for identifying methodological trends in EBN research and understanding how EBN researchers approach MMR, justify the choice of MMR, and design and implement MMR to address a variety of EBN issues.

Summary of methodological trends

Most studies in this review did not provide a definition or citation for MMR, and the definitions provided overwhelmingly reflected the methods perspective. In contrast, most articles reported a rationale for using MMR. Gaining a comprehensive understanding of the issue was the most frequently cited rationale, particularly in the studies aimed at evaluating EBN practices. Some EBN-specific rationales were also noted that emphasised the advantages of using MMR for addressing clinical questions within a context.

Another clear trend is the dominant use of a concurrent Quan + Qual design, which is consistent with the noted popularity of this design in health science research due to its relative time efficiency

(Curry and Nunez-Smith, 2015; Ivankova and Kawamura, 2010). Meanwhile, evaluation, action/participatory, and case study were the primary approaches that embedded MMR to form complex designs, and study quality was assessed using criteria traditionally associated with quantitative and qualitative approaches rather than MMR-specific criteria. To better understand these trends in MMR use in EBN, it is important to examine the contexts that may have influenced how the researchers designed, conducted and reported MMR (Plano Clark and Ivankova, 2016).

The influence of MMR contexts

According to the Socio-Ecological Framework for MMR, three types of study contexts influence a researcher's decision for how to apply MMR in a study: personal, interpersonal, and social. Personal contexts include researchers' background knowledge, philosophical assumptions, and use of theoretical models. Interpersonal contexts incorporate relations with study participants, research teams, and editors/reviewers of the journals that publish MMR. Social contexts include institutional structures, disciplinary conventions, and societal priorities related to promoting MMR (Plano Clark and Ivankova, 2016). These contexts directly and indirectly influence the study process and the use of MMR and likely played a role in how MMR was applied to address EBN issues.

Researchers' focus on EBN along with their knowledge of and an adopted worldview on MMR may have influenced their perspectives on MMR, rationales for using MMR as a methodology of choice, and use of quality criteria associated with either quantitative or qualitative approaches. It is not surprising that EBN researchers elected to use MMR since it can provide a more complete understanding of EBN issues (Shorten and Smith, 2017). The tendency to define MMR as the mixing of different methods is consistent with how researchers design and report MMR in health sciences (Curry and Nunez-Smith, 2015; Wisdom et al., 2012).

At the interpersonal level, the interdisciplinary nature of most research teams, availability of resources and access to study participants may have affected methodological decisions about the type and sequence of quantitative and qualitative data collection and analysis (Creswell and Plano Clark, 2018) resulting in the dominant use of concurrent Quan + Qual design. Concurrent designs often associated with time constraints to complete funded research capitalise on teamwork and the skills each team member brings into an MMR project (Curry et al., 2012). The diversity of research skills also likely facilitated intersecting MMR with other approaches and designs and provided opportunities for more informed discussions of quality considerations related to different study components.

The influence of social contexts is evident in the adoption of MMR in nursing research (Halcomb and Hickman, 2015). Evidence-based nursing authors may expect readers to be familiar with MMR so feel no need to define or describe it. In contrast, it is possible that the authors expected some pushback regarding their choice of MMR, so they felt the need to provide a rationale for using it. Support from universities and funding agencies, which is evident from authors' affiliations in most studies may have made concurrent designs more likely due to budget constraints and improved access to participants (e.g., patients and health care providers) through existing academic networks.

Implications for using MMR in EBN research and practice

Mixed-methods research has the potential to advance knowledge of EBN and its impact on EBN outcomes. In the traditional hierarchy of evidence that clinicians and researchers often rely on, evidence from quantitative research designs such as clinical trials ranks as the strongest form of evidence (Melnyk and Fineout-Overholt, 2019). This creates a dilemma for researchers debating

whether to use qualitative and MMR approaches to generate evidence to include in nursing curricula as well as for nurses aiming to interpret and apply MMR findings in practice. It also increases the likelihood that nursing researchers and educators are more familiar with quantitative methodologies compared to qualitative and mixed-methods methodologies and thus, need more comprehensive guidance on the strengths of MMR (Bressan et al., 2017).

Nurse researchers can help address this dilemma by clearly explaining their approaches to MMR, rationales for using MMR to address the EBN problems, decisions about MMR designs, and criteria for assessing MMR study quality. Doing so may mitigate the continued dominance of quantitative methodologies in EBN (Kidd and Twycross, 2019; Noble and Shorten, 2018) by encouraging researchers to consider less traditional evidence hierarchies when designing their studies and by illustrating the feasibility of applying MMR to a range of EBN problems and contexts. The emphasis on methodological pluralism that characterises MMR also encourages researchers to use multiple methods and different data sources to produce alternative types of evidence on important antecedents and outcomes of EBN care that may not be apparent in quantitative data. For example, a researcher can use quantitative data to draw generalisations about the prevalence of adherence to nursing guidelines and use qualitative data to develop transferable findings on nurses' and doctors' perceived barriers to EBP as in Storm-Versloot et al. (2012).

Advancing MMR application in EBN research may subsequently result in the use of research designs that yield more clinically and contextually relevant study designs given that the traditional hierarchy of evidence does not fit all clinical questions (Melnyk and Fineout-Overholt, 2019: 192). It can also improve the quality of nursing care by increasing the likelihood that nurses make clinical decisions that consider the needs of patients and clinicians, a key component of EBN highlighted in this review that may not be reflected in quantitative research evidence.

Limitations

This review has several limitations. The selected articles are primarily from two prominent nursing databases, and the search terms used may have influenced the resulting pool of papers. Another limitation is the subjectivity involved in classifying articles into mutually exclusive themes and methodological content domains. Additionally, it was necessary to draw inferences based on the provided information in cases of ambiguity.

Conclusions

This review provides insight into the variety of MMR approaches nursing researchers use to generate new types of evidence in support of EBN practice. Mixed-methods research has significant potential to enhance EBN research aimed at improving patient care and outcomes by producing more clinically useful findings and helping nurses understand how to identify and implement the available research evidence in practice. We hope that this paper encourages nurses and policymakers searching for effective strategies to apply MMR-generated evidence by illustrating the ways in which MMR has been used to inform the development, implementation, and evaluation of EBN strategies.

Key points for policy, practice, and/or research

- Mixed-methods research has the potential and utility to advance knowledge of EBN research by providing a multifaceted understanding of complex EBN issues.
- The Socio-Ecological Framework for MMR can facilitate an understanding of the varied ways in which EBN researchers apply MMR to design studies addressing different aspects of EBN.
- Using MMR can help nurses and policymakers develop and implement strategies to facilitate the translation of research into real-world improvement in patient safety and quality care.

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Supplemental material

Supplemental material for this article is available online.

References

Ailinger RL (2003) Contributions of qualitative research to evidence-based practice in nursing. *Revista Latino-Americana de Enfermagem* 11(3): 275–279.

Adiewere P, Gillis RB, Imran Jiwani S, et al. (2018) A systematic review and meta-analysis of patient education in preventing and reducing the incidence or recurrence of adult diabetes foot ulcers (DFU). *Heliyon* 4(5): e00614.

Amacher AE, Nast I, Zindel B, et al. (2016) Experiences of general practitioners, home care nurses, physiotherapists and seniors involved in a multidisciplinary home-based fall prevention programme: A mixed method study. *BMC Health Services Research* 16.

American Nurses Association (2015) *Nursing: Scope and Standards of Practice*. 3rd ed. Silver Spring, MD: Nursesbooks.org.

Barbour RS (2000) The role of qualitative research in broadening the 'evidence base' for clinical practice. *Journal of Evaluation in Clinical Practice* 6(2): 155–163.

Black TA, Balneaves GL, Garossino HC, et al. (2015) Promoting evidence-based practice through a research training program for point-of-care clinicians. *The Journal of Nursing Administration* 45(1): 14–20.

Black A, Ali S, Baumbusch J, et al. (2019) Practice-based nursing research: evaluation of clinical and professional impacts from a research training programme. *Journal of Clinical Nursing* 28(13–14), 2681–2687.

Breimaier HE, Halfens RJG, Lohrmann C, et al. (2015) Effectiveness of multifaceted and tailored strategies to implement a fall-prevention guideline into acute care nursing practice: a before-and-after, mixed-method study using a participatory action research approach. *BMC Nursing* 14, 18(1).

Bressan V, Bagnasco A, Aleo G, et al. (2017) Mixed-methods research in nursing – a critical review. *Journal of Clinical Nursing* 26(19–20): 2878–2890.

Camargo FC, Iwamoto HH, Galvão CM, et al. (2018) Competences and barriers for the evidence-based practice in nursing: an integrative review. *Revista brasileira de enfermagem* 71(4): 2030–2038.

Creswell JW and Plano Clark VL (2018) *Designing and Conducting Mixed Methods Research*. 3rd ed. Thousand Oaks, CA: SAGE.

Curry L and Nunez-Smith M (2015) *Mixed Methods in Health Sciences Research: A Practical Primer*. Thousand Oaks, CA: SAGE.

Curry LA, O'Cathain A, Plano Clark VL, et al. (2012) The role of group dynamics in mixed methods health sciences research teams. *Journal of Mixed Methods Research* 6(1) 5–20.

Dale S, Levi C, Ward J, et al. (2015) Barriers and enablers to implementing clinical treatment protocols for fever, hyperglycaemia, and swallowing dysfunction in the Quality in Acute Stroke Care (QASC) Project- A mixed methods study. *Worldviews on Evidence-Based Nursing* 12(1): 41–50.

De La Rue-Evans L, Nesbitt K and Oka RK. (2013) Sleep hygiene program implementation in patients with traumatic brain injury. *Rehabilitation Nursing* 38(1): 2–10.

Eaton LH, Meins AR, Mitchell PH, et al. (2015) Evidence-based practice beliefs and behaviors of nurses providing cancer pain management: A mixed-methods approach. *Oncology Nursing Forum* 42(2): 165–173.

Ersek M and Jablonski A. (2014) A mixed-methods approach to investigating the adoption of evidence-based pain practices in nursing homes. *Journal of Gerontological Nursing* 40(7): 52–60.

Flemming K (2007) The knowledge base for evidence-based nursing: a role for mixed methods research? *Advances in Nursing Science* 30(1): 41–51.

Gifford WA, Davies BL, Graham ID, et al. (2013) Developing leadership capacity for guideline use: A pilot cluster randomized control trial. *Worldviews on Evidence-Based Nursing* 10(1): 51–65.

Gorsuch CPF, Gallagher Ford L, Koshy Thomas B, et al. (2020) Impact of a formal educational skill-building program based on the ARCC model to enhance evidence-based practice competency in nurse teams. *Worldviews on Evidence-Based Nursing* 17(4): 258–268.

Halcomb E and Hickman L (2015) Mixed methods research. *Nursing Standard: Promoting Excellence in Nursing Care* 29 (32): 41–47.

Harper MG, Gallagher-Ford L, Warren JI, et al. (2017) Evidence-based practice and U.S. healthcare outcomes: findings from a national survey with nursing professional development practitioners. *Journal for Nurses in Professional Development* 33(4): 170–179.

Horwood J, Brangan E, Manley P, et al. (2020) Management of chlamydia and gonorrhoea infections diagnosed in primary care using a centralised nurse-led telephone-based service: mixed methods evaluation. *BMC Family Practice* 21(1): 265.

Ingersoll GL (2000) Evidence-based nursing: what it is and what it isn't. *Nursing Outlook* 48(4): 151–152.

Ivankova NV, Herbey II, Roussel LA, et al. (2018) Theory and practice of using mixed methods in translational research: a cross-disciplinary perspective. *International Journal of Multiple Research Approaches* 10: 356–372.

Ivankova NV and Kawamura Y (2010) Emerging trends in the utilization of integrated designs in the social, behavioral, and health sciences. In: A Tashakkori and C Teddlie (eds). *SAGE Handbook of Mixed Methods in Social and Behavioral Research*. 2nd ed. Thousand Oaks, CA: SAGE, 581–612. Available at: http://www.doi.org/10.4135/9781506335193 (accessed 27 Oct 2021).

Kidd L and Twycross A (2019) EBN perspectives: nursing issues. *Evidence Based Nursing* 22(4): 101–104.

Laibhen-Parkes N, Kimble LP, Melnyk BM, et al. (2018) An adaptation of the original Fresno test to measure evidence-based practice competence in pediatric bedside nurses. *Worldviews on Evidence-Based Nursing* 15(3): 230–240.

Lam CK and Schubert C (2019) Evidence-Based Practice Competence in Nursing Students: An Exploratory Study With Important Implications for Educators. *Worldviews on Evidence-Based Nursing* 16(2): 161–168.

Lin F, Marshall AP, Gillespie B, et al. (2020) Evaluating the implementation of a multi-component intervention to prevent surgical site infection and promote evidence-based practice. *Worldviews on Evidence-Based Nursing* 17(3): 193–201.

Lesser J (2017) Guest editorial. *Journal of Research in Nursing*, 22(4): 261–263.

Mathieson A, Grande G, Luker K, et al. (2018) Strategies, facilitators and barriers to implementation of evidence-based practice in community nursing: a systematic mixed-studies review and qualitative synthesis. *Primary Health Care Research and Development* 20: e6-e6.

Melnyk BM, Gallagher-Ford L, Zellefrow C, et al. (2018) The first U.S. study on nurses' evidence-based practice competencies indicates major deficits that threaten healthcare quality, safety, and patient outcomes. *Worldviews on Evidence Based Nursing* 15(1): 16–25.

Melnyk BM and Fineout-Overholt E (2019) Critically appraising qualitative evidence for clinical decision making. In: Melnyk BM and Fineout-Overholt E (eds) *Evidence-based Practice in Nursing & Healthcare: A Guide to Best Practice*. 4th ed.. Philadelphia: Wolters Kluwer, 192.

Miller LB, Brennan-Cook J, Turner B, et al. (2018) Utilizing an evidence-based alcohol screening tool for identification of alcohol misuse. *Journal of Addictions Nursing* 29(2): 90–95.

Moher D, Liberati A, Tetzlaff J, et al. (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Plos Medicine* 6(7): e1000097.

Noble H and Shorten A (2018) Nursing issues. *Evidence Based Nursing* 21(1): 4–6.

Nordsteien A, Horntvedt MT, Syse J, et al. (2017) Use of research in undergraduate nursing students' theses: a mixed methods study. *Nurse Education Today* 56: 23–28.

O'Brien R, Moritz P, Luckey D, et al. (2012) Mixed methods analysis of participant attrition in the nurse-family partnership. *Prevention Science* 13(3): 219–228.

Parsons V, Juszczyk D, Gilworth G, et al. (2021) A case management occupational health model to facilitate earlier return to work of NHS staff with common mental health disorders: a feasibility study. *Health Technology Assessment* 25(12): 1–94.

Russell G, Lane R, Parker S, et al. (2019) Preventive evidence into practice: What factors matter in a facilitation intervention to prevent vascular disease in family practice? *BMC Family Practice* 20(1): 113.

Plano Clark V and Ivankova N (2016) *Mixed Methods Research: A Guide to the Field*. Thousand Oaks, CA: SAGE.

Sackett DL, Rosenberg WMC, Gray JAM, et al. (1996) Evidence based medicine: what it is and what it isn't. *British Medical Journal* 312: 71–72.

Shorten A and Smith J (2017) Mixed methods research: expanding the evidence base. *Evidence Based Nursing* 20(3): 74–75.

Storm-Versloot MN, Knops AM, Ubbink DT, et al. (2012) Long-term adherence to a local guideline on postoperative body temperature measurement: mixed methods analysis. *Journal of Evaluation in Clinical Practice* 18(4): 841–847.

Strandberg E, Catrine Eldh A, Forsman H, et al. (2014) The concept of research utilization as understood by Swedish nurses:

Demarcations of instrumental, conceptual, and persuasive research utilization. *Worldviews on Evidence-Based Nursing* 11(1): 55–64.

Tashakkori A, Johnson RB and Teddlie C (2021) *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*. 2nd ed. Thousand Oaks, CA: SAGE.

Wisdom JP, Cavaleri MA, Onwuegbuzie AJ, et al. (2012) Methodological reporting in qualitative, quantitative, and mixed methods health services research articles. *Health Services Research* 47(2): 721–745.

Younas A, Pedersen M, Tayaben JL, et al. (2019) Review of mixed-methods research in nursing. *Nursing Research* 68(6): 464–472.

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