ABSTRACT

The purpose of this paper is to review mixed methods (qualitative and quantitative) nursing studies in order to evaluate the rigor of each method used within a single study. Qualitative methodologies were evaluated utilizing standard evaluation criteria including credibility, confirmability, meaning in context, recurrent patterning, transferability and saturation in order to assess the vigor and truthfulness of the qualitative method. Quantitative studies were judged for rigor and strength based on validity, reliability and generalizability. CINAHL database was searched for nursing studies conducted over a three year period using mixed method(s) and nursing as the search terms. The search strategy yielded 53 mixed methods research studies which were primarily deductive in nature using open ended semi-structured questions to explain the quantitative data. These authors concluded that mixed methodological studies in the current literature are descriptive quantitative studies and do not employ qualitative methodologies.

Key Words: Mixed methods, nursing, methodology, method

Introduction

The purpose of this paper is to review mixed methods (qualitative and quantitative) nursing studies in order to evaluate the rigor of each method used within a single study. For the purposes of this review, the author’s have defined mixed methods as the combined use of more than one methodology in a single study. While methodologies within paradigms (qualitative and quantitative) may be mixed, the crux of this paper is examining mixed methodologies across paradigms. The premise of this paper is that conducting a research study using both quantitative and qualitative methods within the same study is theoretically impossible since their foundations are non-congruent and mutually exclusive. Qualitative research methods lend themselves towards a holistic and subjective phenomenon whereas quantitative studies are variable focused, measurable and objective.

Parse (2009) noted in her editorial in Advanced in Nursing Science voiced concern over the use of mixed methods:

If scholars conducting research using quantitative methods with the addition of interview questions call their work mixed methods studies, the inference is that both quanti-
Mixed Methodologies

The controversy over combining methodologies in nursing research has been present in the literature for many years. More nursing scholars than other disciplines dialogue about this controversy. Leininger (1992) viewed it as a barrier in the advancement of qualitative paradigmatic research. She believed that mixing research methods across qualitative and quantitative paradigms violated the fundamental purposes and integrity of the paradigms (Leininger, 1992). Haase and Myers (1988) were concerned that mixed methods could mean one methodology was less valued if it was subsumed under the other. They cautioned that both paradigms may not be equally valued in this approach. However, they did accept that the results of a combined methods approach could be complementary. Haase and Myers (1998) believed the paradigmatic assumptions of both could be reconciled and paradigms integrated leading to successful combining of methods. The strategy of triangulation, including multiple data sources, collection techniques, many theories and investigators, was suggested as a solution to the integration of the paradigms. Educational researchers, Howe and Eisenhart (1990) suggested that researchers forge ahead “with whatever works”, a pragmatist approach, and believed that the qualitative and quantitative debates slowed research in important areas. These early perspectives were nested within the paradigm wars about the value of qualitative versus quantitative research in nursing and other disciplines.

Paradigmatic Incongruence

The paradigm wars over the quantitative and qualitative debate raised the stakes in the philosophical and theoretical controversy over mixed methods research. Three schools of thought arose around the conflict of theoretical and philosophical differences in this newer research method. Some authors chose to bypass the paradigmatic incongruencies in their mixed methods discussions. Others questioned the paradigmatic conflict and provided rationale for reconciling the assumptions in their uses of mixed methods research. The third approach taken by several researchers was to acknowledge the incongruencies in epistemological and ontological thought, and propose solutions to reframe mixed methods research.

For some discussions on mixed methods, there was little to no dialogue of a paradigmatic conflict in mixed methods research (Borkan, 2004; Happ, Dabbs, Tate, Hricik, & Erlen, 2006; Lieber, 2009; Tashakkori & Teddlie, 2003). Their approaches were “nuts and bolts” on strategies for conducting mixed methods research that included data reduction, data integration, and combined data analysis. In most cases, the research strategies were not considered specific to either a qualitative or quantitative paradigm. A quantitative paradigm was often implied and a discussion of reconciling the study’s philosophical assumptions bypassed. Some social scientists justified the incongruencies in mixed methods research by arguing that the research question was more crucial to the study than the paradigm or research design (Ercikan & Roth, 2006; Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2003).

There were three popular perspectives for those who attended to the paradigmatic differences in mixed methods research and attempted to reconcile the diverse assumptions of the qualitative and quantitative paradigms. These included those who advocated for pragmatism as the new third paradigm and
considered it the basic philosophical underpinning of mixed methods research; those who conceived of the superiority in research results when using pluralistic methodologies compared to a single method research; and those who viewed methodologies on a continuum of qualitative and quantitative with mixed methods in the middle.

Many mixed methods researchers and authors maintained that the underlying philosophy of mixed methods research was pragmatism (Creswell, Plano Clark, Gutman, & Hanson, 2003; Howe, 1988; Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2003). They did not aim to solve the epistemological and ontological differences among qualitative and quantitative approaches, but offered pragmatism as a “complementary philosophical partner” (Johnson & Onwuegbuzie, 2004, p.14). Mertens (2003) argued against basing methodological choices solely on a pragmatist philosophy, and asked the questions of who the research is practical for and to what end.

Sandelowski (2000) and Twinn (2003) argued that qualitative and quantitative approaches were not mutually exclusive and that mixed methods research was necessary to unravel the complexity of human phenomena. Some viewed the philosophical perspectives of qualitative and quantitative methodologies as sitting at either end of a continuum with mixed methods research between them (Doyle, Brady, & Byrne, 2009; Johnson. & Onwuegbuzie, 2004). Muncey (2009) agreed that there were false dichotomies between subjective and objective worlds, however she differed in this view believing that both were realities so integrated that it was difficult to conceive of them as dichotomous. By accepting the thought that qualitative and quantitative paradigms were “false dichotomies”, this dismissed the need to use any specific methodology as a guide toward truth and validity in research.

Several nursing scholars acknowledged the irreconcilable differences in paradigms in mixed methods research, and went on to reframe the differences from within and outside of both paradigms. Leininger (1990, 1992) viewed mixing methods as possible only within the same stream of the same paradigm. In Leininger’s work on Choices in the Stream of Inquiry (1990) she did not find that mixing methods within one stream (e.g. ethnography and audio-visual) created any methodological conflict. Gilbert (2006) and Morse (2009) proposed within study mixed-methods approaches using a qualitative methodology. Gilbert (2006) deemed that this approach eased the tensions inherent in the binary division between the inductive and deductive approaches of qualitative and quantitative.

Some nursing scholars presented perspectives on mixed methods that acknowledged the paradigmatic conflict, but gave rise to some thought on how to reconcile these differences. Morse, Niehaus, Wolfe, and Wilkins (2006) described the critical role of the theoretical drive (i.e. inductive or deductive) in maintaining validity in mixed-methods research. Maintaining a theoretical drive ensures the validity of the research project, with the dominant core component and the supplementary data or findings fitting into the core component. Understanding the theoretical drive, and being consciously aware of the direction that one is working as either inductive or deductive facilitates the methodologically congruent conduct of mixed method design (Morse et al., 2006). Weaver and Olson (2006) conducted an integrative review that identified a trend in the nursing literature towards using multiple paradigms for nursing research. Mixed methods research was one of the approaches described by them that respected theoretical perspectives when each paradigmatic contribution was clarified in advance. Their approach to reconciling paradigmatic assumptions was consistent with Morse and Niehaus’ (2009) work on principles and procedures in mixed methods design.
Sale, Lohfeld and Brazil (2002), health research scholars, expressed concern that many researchers embrace mixed methods without a critical examination of the underlying paradigmatic assumptions of qualitative or quantitative methodologies. Due to these differences, Sale et al. (2002) considered that the two paradigms did not study the same phenomena, therefore qualitative and quantitative methods could not be combined except for complementary purposes. They proposed that there could be an additive outcome in the findings when the two methods were labeled as such within the same study. Sale et al. (2002) projected a new complementarity paradigm underpinned by a new epistemology, ontology, and methodology.

Guiding Question
The question that guided a critical review of mixed methods studies was: Do research studies that claim to be using a mixed methods (quantitative-qualitative) approach meet both qualitative and quantitative criteria for evaluation of rigor? The aim was to judge the rigor of nursing studies using a mixed methods approach and to evaluate the quality of meaning and truthfulness in studies using both paradigms.

Evaluation Criteria
Quantitative and Qualitative Methodologies
Quantitative methods examine causal (linear) relationships among measurable variables. Numerical data is manipulated through the use of statistics in order to describe phenomenon or assess magnitude and reliability of relationships among variables (Alasuutari, Bickman, & Brannen, 2008; Polit & Beck, 2004). Qualitative methods provide diverse ways to discover meanings, patterns, characteristics, contexts and experiences of individuals and groups with a focus on understanding and gaining insights about largely unknown or vaguely known phenomena (Leininger, M., 1991). There are other differences between quantitative and qualitative methods that appear contradictory including: one is deductive and one is inductive, one assumes a dynamic reality while the other is based on a fixed and measurable reality, one requires immersion of the researcher into the context, the other is context free, and one utilizes a small sample purposefully selected while the other requires a large randomly selected sample. See Table 1 for a complete list of differences in qualitative and quantitative methods.

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductive</td>
<td>Deductive</td>
</tr>
<tr>
<td>Assumes a dynamic reality</td>
<td>Assumes a fixed and measurable reality</td>
</tr>
<tr>
<td>Giving voice/words</td>
<td>Measurement via instruments/experimental</td>
</tr>
<tr>
<td>Active participation/participants</td>
<td>Passive participation/subjects</td>
</tr>
<tr>
<td>Immersion/context/interviews</td>
<td>Predetermined measures/tools</td>
</tr>
<tr>
<td>Small sample, purposefully selected</td>
<td>Large representative sample/randomly selected</td>
</tr>
<tr>
<td>Analyzed from raw data to patterns and themes</td>
<td>Reported in statistical values/numbers</td>
</tr>
<tr>
<td>Data classified by themes</td>
<td>Data classified by variables</td>
</tr>
<tr>
<td>Models and theories or propositions</td>
<td>Hypotheses testing between variables</td>
</tr>
<tr>
<td>Goals of the research is to describe or explain (understand)</td>
<td>Goal of research to explore, predict, or describe</td>
</tr>
</tbody>
</table>

Table 1: Characteristic differences between qualitative and quantitative methodologies
Mixed Methodologies

Mixed methods take qualitative research out of the critical interpretive framework, and divides inquiry into dichotomous categories of exploration versus confirmation (Denzin, N. & Lincoln, Y., 2005). Similar to the perspective of Denzin and Lincoln (2005), the thrust for this paper is to assure that mixed method studies as defined by the use of both qualitative and quantitative methods, are not expending the rigor of the one method in order to assure the rigor of the other.

Qualitative evaluation

The qualitative evaluation criteria for the study reviews were based on six qualitative evaluation criteria (Leininger, M. 1991; Lincoln, Y. & Guba, E, 1985), and quantitative evaluation criteria (Polit & Beck, 2004). Evaluative criteria for qualitative studies included six criteria that are used to judge vigor and truthfulness of the study findings. Credibility is the truth value of the findings or the believeability of the words of the participants and is based in the environmental context of the participants. Confirmability is the establishment of verifiable direct evidence from primary documents or experiences the researcher has with the people. A mutual understanding is reached between the research and the people about a certain phenomena. Meaning in context (Mishler, 1979) assures that the data is relevant to the situation, or in other words, meaning is absent without the presence of context. Recurrent patterning reveals consistency and recurrence in patterned sequences while saturation is evidenced by the data collection continuing until there is no new information coming forth from the participants. Transferability is similar to generalizability except that transferability recognizes that similar meanings, relevancies can be “transferred” to similar situations, circumstances, and contexts.

Quantitative evaluation

Quantitative evaluation criteria include validity, reliability and generalizability. In quantitative studies validity results from a randomized sample, equal groups if an experimental study, the use of valid and reliable instruments, and the assurance that any conflict of interest has been minimized. Reliability is largely concerned with an adequate sample size so that conclusions can be drawn with precision and accuracy. A power analysis to calculate effect size is integral to sound experimental research studies. Generalizability is of utmost importance in quantitative studies, as it allows the results or treatments to be applied to the population at large. Clinical significance and cost-benefit ratios are critical issues that come forth from quantitative methods and are evaluated.

METHODS

Search Strategy

The specific focus of the literature search was mixed methods (quantitative and qualitative) studies conducted in nursing over a 3 year period. The key words used to search the literature included the terms: mixed method(s) and nursing from the publication years of January 2007-June 2010. Only the CINAHL database was searched as it encompasses most nursing peer-reviewed journals. Each study was fully reviewed if it was identified as mixed methods by the investigator and published in a regional or international nursing journal. The two most significant questions addressed in the study reviews were: Did the study use a quantitative and qualitative methodology? And if not what was the nature of the data and analysis, quantitative or qualitative or both?

Study Review Criteria

In order to answer these questions, criteria for evaluation of each study were developed by the authors. These criteria included the type of the research question or
aim (e.g. narrow/deductive vs. broad/inductive), the study procedures (e.g. interview, survey, focus group), the presence or absence of a theoretical framework, the data analyses methods (e.g. statistical, thematic analysis), and presence and kind of established evaluation criteria used by the investigator to judge the quality and limitations of the study (e.g. quantitative, qualitative, mixed evaluation criteria).

To determine whether quantitative or qualitative or both types of quality evaluative criteria were used by the investigators, evidence evaluation tools developed for point-of-care clinicians known as Let Evidence Guide Every New Decision (LEGEND) guided the process (Clark, Burkett, & Stanko-Lopp, 2009). These tools assist clinicians in rendering a judgment of the quality of the study. A compilation of the key evaluative criteria from both the qualitative evidence appraisal form and the quantitative descriptive evidence appraisal form was assembled.

**Review of the Data**

Data was extracted from each mixed methods study on the research question, theoretical framework, procedural strategies, data analyses, and evaluation criteria applied by the investigator. Each mixed methods study was then analyzed for these criteria and summative findings recorded. A judgment was made for each mixed methods study in order to answer the most significant questions above on methodological soundness.

### RESULTS

#### Research Questions and Study Procedures

The search strategy yielded 53 mixed methods nursing research studies from 6 countries, with the United States producing 19 mixed methods nursing studies and Aus-

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specifics</th>
<th>Frequency (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authors’ Country of Origin</td>
<td>USA</td>
<td>19/53 (36%)</td>
</tr>
<tr>
<td></td>
<td>Australia</td>
<td>16/53 (30%)</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>9/53 (17%)</td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>7/53 (13%)</td>
</tr>
<tr>
<td></td>
<td>Belgium</td>
<td>1/53 (&lt;1%)</td>
</tr>
<tr>
<td></td>
<td>China</td>
<td>1/53 (&lt;1%)</td>
</tr>
<tr>
<td>Focused or Broad Question</td>
<td>Focused</td>
<td>53 (100%)</td>
</tr>
<tr>
<td></td>
<td>Broad</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Study Methods</td>
<td>Questionnaire</td>
<td>31/113 (27%)</td>
</tr>
<tr>
<td></td>
<td>Interview</td>
<td>31/113 (27%)</td>
</tr>
<tr>
<td></td>
<td>Instrument</td>
<td>23/113 (20%)</td>
</tr>
<tr>
<td></td>
<td>Focus Group</td>
<td>19/113 (17%)</td>
</tr>
<tr>
<td></td>
<td>Field Notes</td>
<td>5/113 (4%)</td>
</tr>
<tr>
<td></td>
<td>Chart Review</td>
<td>4/113 (3.5%)</td>
</tr>
<tr>
<td>Use of Theoretical Framework</td>
<td>Yes</td>
<td>21/53 (40%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>32/53 (60%)</td>
</tr>
<tr>
<td>Data Analysis Methods</td>
<td>Statistical Analysis</td>
<td>8/53 (15%)</td>
</tr>
<tr>
<td></td>
<td>Thematic Analysis</td>
<td>4/53 (8%)</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>41/53 (77%)</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>Quantitative</td>
<td>32/53 (60%)</td>
</tr>
<tr>
<td></td>
<td>Qualitative</td>
<td>4/53 (8%)</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>17/53 (32%)</td>
</tr>
</tbody>
</table>

*Table 2: Review of Mixed Methods Studies*
mixed methods study identified the research question(s) or aim and all were narrowly focused to the domain of interest, implying an underlying deductive process of discovery. A variety of primarily deductive conceptual frameworks were described in slightly more than a third of the studies, including some examples such as self-care, self-efficacy, hope, presence, and adaptation.

A wide variety of study procedures were used to gather data within the mixed methods studies. Those most commonly used included semi-structured interviews and questionnaires (e.g. most often these were surveys with open-ended questions at the end), established instruments and focus groups. Most studies used more than one type of method; usually these were a combination of more traditional quantitative methods (e.g. questionnaire) with commonly used formats in qualitative work (e.g. interviews).

Data Analysis and Quality Evaluative Criteria

The majority of the investigators used a combination of data analysis methods from quantitative and qualitative paradigms. The most common blends were a type of thematic analysis with or without qualitative software (e.g. NVIVO), and statistical analysis of the numerical data. A few studies analyzed data just using descriptive or inferential statistics, and a couple of others just used a content analysis approach. In most cases the mixed data analyses were reported in separate sections, and in a few studies they were described in another manuscript.

Less than a third of all the mixed methods studies combined quantitative evaluation criteria with qualitative evaluation criteria in the assessment of the study quality and limitations. Each study presented some or all of the quantitative evaluation criteria (e.g. validity, reliability and applicability), but no study applied all of the qualitative criteria (e.g. confirmability, credibility, meaning-in-context, recurrent patterning, saturation, and transferability) to their findings.

For the most part the mixed methods studies were rigorously conducted. Overwhelmingly the philosophical underpinnings were quantitative and deductively ordered, with both qualitative and quantitative data collection and analysis methods. None of the studies reviewed used two distinct methodologies. When the mixed method study was evaluated against quantitative criteria, it was found to be enhanced and rigorously conducted, yet when evaluated against qualitative criteria the study was found to be lacking in rigor.

In general very few studies reported a conceptual framework, also consistent with a deductive theoretical approach. In keeping with a quantitative methodology, the predominant criteria used by the investigators to assess the quality of the study were quantitatively-based. Every research question was narrowly focused on a particular domain of interest, with or without a hunch or hypothesis. Qualitative terms such as “phenomenology interview” and “grounded theory data” were sometimes included in the study, but the spirit of the study remained theoretically driven as a deductive process, and none of the mixed method studies used a clearly identified qualitative method (e.g. ethnography, phenomenology).

Several studies used the concurrent and sequential mixed methods designs described by Morse and Niehaus (2009) and Creswell and Plano Clark (2011). Only a handful of studies appeared to add open-ended questions at the end of a questionnaire as an afterthought. Several quantitative study design methods such as descriptive survey or pre-post tests were identified as the primary mixed method in the study, and these were significantly informed by the qualitative data gathered and enriched the study findings. The qualitative data clearly enhanced the rigor of
the mixed methods study, and seemed to expand understanding of the phenomenon of interest.

The Future: An Evolving Paradigm

Some would propose that mixed methods is evolving from the best of the qualitative and quantitative methodologies and becoming the emerging paradigm of the future. Most of the studies reviewed, however, demonstrated a rigorous quantitative study that used questionnaires and interviews to collect qualitative data to further explain or describe the results of the quantitative analysis. None of the mixed methods studies reviewed used a qualitative methodology. There were no instances where a rigorous methodology for both qualitative and quantitative paradigms was exhibited in a single study. This is not a stellar representation of an emerging paradigm that will replace the methodological paradigms.

It is important to distinguish whether mixed methods versus mixed methodologies would be a more precise term to describe the actual study design. In all the studies, the design is described as a mixed methodology with theoretical and epistemic underpinnings. It may be more accurate to describe the design utilizing a mixed methods approach. Hence, mixed methods is not a methodology, but rather an approach to collecting qualitative and quantitative data; not espousing to a particular research methodology. Mixed or triangulated data may also be a more accurate representation of what is actually being operationalized in these studies.

These authors propose that in most of the studies reviewed, the researchers are conducting quantitative studies along with collecting some specific qualitative data to further describe findings of the quantitative portion of the study. Hence, a more precise description of the methodology would be descriptive quantitative rather than mixed methods. If this is the case, then there is not a new paradigm or methodology emerging; but rather a more comprehensive descriptive/explanatory methodology. It is important to critique all studies that proclaim to use mixed methods for adequacy of the design in relation to the phenomenon under study.

CONCLUSION

Mixed methods studies are gaining credibility in nursing as evidenced by their increasing numbers in the literature. Based on the studies reviewed, the authors suggest that increased precision in the language used to describe the methods is crucial to determine the rigor and strength of the studies. Studies that use a quantitative design along with an open ended questionnaire or interview to give greater depth to the study are not using mixed methodologies, but rather are mixing data collection techniques to enhance a quantitative study. To imply that quantitative and qualitative methodologies are being used within a single study is, in most cases, inaccurate, and potentially diminishes the rigor of the qualitative paradigm. In contrast, this review shows that using qualitative data enhances the rigor or quantitative methodologies.

REFERENCES


