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Evidence based practice and critical thinking in nursing education and practice: A scoping review of literature

Katowa-Mukwato Patricia[1]*, Chitundu Kabwe[2], Monde Mercy Wamunyima[3], Maimbolwa M Margaret[4] and Jere Linda Dianna[5]

[1]Department of Basic and Clinical Nursing Sciences, Schoo l of Nursing Sciences, University of Zambia, Lusaka, Zambia.
[2]Department of Mental Health and Psychiatric Nursing, School of Nursing Sciences, University of Zambia, Lusaka, Zambia.
[3]Medical Library, School of Medicine, University of Zambia, Lusaka, Zambia.
[4]Department of Midwifery, Women and Child Health, School of Nursing Sciences, University of Zambia, Lusaka, Zambia.
[5]Department of Community and Mental Health, Kamuzu College of Nursing, University of University of Malawi, Zomba, Malawi.

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Evidence-Based Practice (EBP) in health is important for patient safety and quality care while Critical Thinking (CT) is a vital prerequisite to evidence based nursing. Despite their importance, in some settings neither EBP nor CT is taught assessed or implemented. This scoping review examined literature related to teaching, learning, assessment and implementation of EBP and application of CT by nursing students and graduates. Arksey and O'Malley framework was used to conduct the scoping review. PubMed, CINAHL, EMBASE and Joanna Briggs Institute for EBP data bases were searched for studies conducted between 2000 and 2020. Inclusion criteria were adapted from the -Population, Intervention, Professionals and Patients, Outcomes, Health Care settings (PIPOH) framework. Search terms included; evidence based practice, nursing education, nursing practice, critical thinking, methods, barriers, facilitators to teaching, learning, assessing and implementing EBP and CT. A total of 2,303 articles were retried, eventually 37 met the inclusion criteria. Use of non-traditional instructional methods for teaching EBP and CT were documented including Problem Based Learning, concept mapping, simulation, think aloud, critical incidence technique, debates and role-plays, reflective journaling, article analysis, nursing journal clubs and multidisciplinary clinical rounds. Validated tools for assessing EBP and CT Skills included; California Critical Thinking Skills Test, Upton and Upton 2006 EBP questionnaire and Yoon's 2004 Critical Thinking Disposition Inventory. Teaching, assessing EBP and applying CT skills is challenging. Therefore innovative teaching methods are required to promote learning while successful implementation require strategies to minimize detractors and sustain enablers of the process.

Key words: Evidence-Based Practice nursing, critical thinking, teaching, learning, assessment and implementation.

INTRODUCTION

Evidence-Based Practice (EBP) in health is important for patient safety and quality care (Melnyk et al, 2012; Melnyk et al., 2014; Horntvedt et al., 2018). According to literature, there are better outcomes for patients who

receive evidence based care compared to those who do not (Manjula et al., 2018). It is therefore important that EBP competencies be incorporated into all levels of training programs to establish EBP as foundation of practice (Melnyk et al., 2018). For Bachelors Nursing Students, using the available best evidence is important in patients' care, while knowledge of the linkage between research evidence and practice is pre-requisite to implementing EBP (Institute of Medicine, 2010; Aglen, 2016; Fiset et al., 2017). Since the establishment of Evidence Based Medicine at McMasters University in the 1980s, several authors have defined and redefined EBP with most agreeing that it is "the conscientious, explicit and judicious use of current best evidence in conjunction with clinical expertise and patient values to facilitate clinical decision making" (Sackett et al., 1996, 2000; Titler et al., 2001, 2006; Hughes, 2008; Melnyk and Fineout-Overholt, 2011; Melnyk et al., 2014). On the other hand, Critical Thinking (CT) is a "mental process of active and skilful perception, analysis, synthesis and evaluation of information collected through observation, experience and communication that leads to a decision for action" (Papathanasiou et al., 2014).

Both EBP and CT are a component of one key domain of the International Council of Nurses (ICN) Core Competences for Registered Nurses (ICN, 2009). In addition, CT has been lauded as a vital prerequisite and a key element essential to evidence based nursing practice (Profetto-McGrath, 2005; Canada, 2016). Profetto-McGrath (2005) further states that development of CT prepares nurses with the necessary skills to promote EBP. CT is therefore an essential mental process for ensuring, efficient and skilful nursing interventions (Papathanasiou, 2014). According to Leufer and Cleary-Holdforth (2009), the importance of EBP has been recognized as far as the mid-19th century; conversely, its implementation has undoubtedly received "Lip service" in most settings. Regarding CT, it is frequently referenced in literature, as regards its importance in daily clinical nursing and midwifery practice (Tajvidi et al., 2014), however, in many settings, neither the concept of CT nor the process of developing the skills is formally taught either during training or in practice.

Literature alerts us that teaching EBP can be challenging and that creative teaching methods are required in order to promote student learning (Liou et al., 2013; McCurry and Martins, 2010; Sin and Bliquez, 2017). Based on the 5As of the EBP process, Melnyk and Fineout-Overhold, (2005) and Sin and Bliquez (2017) proposed four steps that could be used to teaching EBP to undergraduate nursing students. These were asking a question, acquiring evidence, appraising evidence and applying evidence. The approach utilized small group teaching method and clinical scenarios as a way to enhance student knowledge and competency of EBP. Other authors (Larsen et al., 2019; Davidson and Candy, 2016; Whalen and Zentz, 2015; Reicherter et al., 2013; Dawley et al., 2011; Brown and McCrorie, 2015) have suggested interactive methods suitable for teaching both EBP and CT skills. These include research courses and workshops, concept mapping, journal clubs, clinical simulations, collaboration with clinical practice, use of dedicated education units and use of IT Technology.

Strategies and methods to develop and maintain CT include reflective journals and critiques (Craft, 2005), role modelling and questioning (Dickerson, 2005), Journal clubs (Seymour et al., 2003) and Problem Based Learning (PBL) with real life scenarios (Williams, 2004). Others reported in literature are concept mapping, clinical rounds, debates and simulation (Staib, 2003; Profetto-Mc Grath, 2005; Karabacak and Atay, 2011; Orique and McCarthy, 2015). Despite the established and documented methods for teaching, learning and assessing EBP and CT, at the University of Zambia School of Nursing Sciences (UNZA-SON) where the scoping review was conducted, the two concepts: EBP and CT are not taught in the undergraduate curricula, while in the MSc programmes EBP is taught using traditional lecture methods, while CT skills are not taught at all. Therefore the main objective of the scoping review was to identify methods for teaching, learning, assessment and factors influencing implementation of EBP and application CT Skills among Nursing Students and Graduates. The review was part of a major post-doctoral study whose aim was to building capacity for EBP and CT among nursing students and graduates of the University of Zambia. The other aspects and processes of the doctoral project are beyond the scope of this paper and are therefore reported elsewhere.

Rationale for the review

EBP transforms nursing from routine tasks and care decisions based on traditions to practices which have been subjected to critical appraisal and validated by research evidence (Gagan and Hewitt-Taylor, 2004; Sams et al., 2004). In addition, EBP allows for individualized, effective, streamlined and dynamic nursing care (Youngblut and Brooten, 2001). On the other hand, without EBP, care provision is prone to and is provided based on out-of-date procedures and guidelines. Nurses may be relying on concepts learned in nursing school several years prior as well as old clinical habits, or nursing traditions to guide care provision (Keller, 2018). Given the value attached to EBP and CT in addition to

*Corresponding author. E-mail: patriciakatowamukwato@gmail.com. Tel: +260977564486.

the gap in the teaching and application of the two at UNZA-SON, it was imperative that a scoping review of literature be conducted to obtain scientific evidence on the existing level of capacity of students and graduates of the School of Nursing. This was intended to set a benchmark or yardstick for developing mechanism for incorporating teaching, assessment and subsequently implementation of EBP and application of CT skills in Nursing and Midwifery education and practice in the Zambian context.

MATERIALS AND METHODS

Arksey and O'Malley framework was used to conduct a scoping review of literature (Arksey and O'Malley, 2005). Considering the broad nature of the question that was being addressed; what are the methods for teaching, learning, assessment and factors influencing implementation of EBP and application CT Skills among nursing students and graduates? A scoping review as opposed to a systematic review was more applicable. As asserted by Arksey and O'Malley (2005), systematic reviews are more suitable for well-defined questions and research designs while scoping reviews are appropriate for answering broader questions and allow for inclusion of studies of wide-ranging designs. In applying the Arksey and O'Malley Framework, the review was conducted through a five step approach: (1) identification of the research question; (2) identification of relevant studies; (3) selection of the studies; (4) charting of data; (5) collating, summarizing and reporting results. The sixth step of consultation was not undertaken as the reported scoping review was part of a large Post-Doctoral study, whose other results will be reported elsewhere.

A number of electronic data based were searched for the review. These included CINAHL, PubMed, EMBASE and Joanna Briggs Institute EBP Data Base. Determination of the inclusion criteria was adapted from the Population, Intervention, Professionals and Patients, Outcomes, Health Care settings (PIPOH) framework according to Fervers et al. (2006). The population considered in the scoping review was undergraduate nursing students and graduate nurses. Interventions were any teaching, learning and assessment methods, and barriers or facilitators to implementation of EBP or application of CT. Professionals were graduate nurses, outcomes were implementation of EBP and application of CT skills while the health care setting was any clinical area where nurses implement EBP and apply CT skills.

Search terms included evidence based practice, nursing education, nursing practice, critical thinking skills in nursing education and practice, methods, barriers, facilitators to teaching, learning, assessing and implementing EBP and CT. Others included nursing education and EBP and CT, EBP and CT in nursing practice. Data bases were searched for studies conducted between 2000 and 2020.

Only studies written in English were included. A librarian was involved in designing and implementation of the search strategy, while the researcher with one research assistant screened the articles and documented the review findings.

RESULTS

From the databases searched 2,303 articles were retried. Out of the 2,303, 97 were excluded as duplicates. For the remaining 2,206, 1,267 were excluded for not meeting the inclusion criteria. Records screened for full abstracts were 939, out of which 886 were excluded. Eventually 66 full articles were assessed and 29 were excluded for the following reasons; 9 not addressing nursing students or practicing nurses, 1 full English text not available, 12 none research article, and 7 not focusing on EBP or CT. Figure 1 gives a summary of the scoping review process.

DISCUSSION

The scoping review was designed to answer the question: what are the methods for teaching, learning, assessment and factors influencing implementation of EBP and application CT skills among nursing students and graduates? The review question was answered through the data from four databases: CINAHL, PubMed, EMBASE and Joanna Briggs Institute EBP Data Base, and desk search of some key articles identified through Google Scholar. Globally, there is a plethora of literature related to EBP and CT among nursing students and practicing nurses.

From global literature, several teaching and learning methodologies for EBP and CT have been documented in literature. These include Problem Based Learning (PBL), concept mapping, simulation, think aloud, critical incidence technique, videos, debates and role-plays, reflective journaling and article analysis, reflection and documentation, reading and writing assignments, group work and presentations (Simpson and Courtney, 2008, Karabacak and Atay, 2012; Goodstone et al., 2013; Ticha and Fakuda, 2015; Zori, 2016; Charania et al., 2017). Others are use of clinical events (cases or case studies), nursing rounds, and interdisciplinary rounds, dedicated education units, experiential learning and clinical experience, writing answerable clinical questions and conducting literature searches (Chen and Lin, 2003; Vnenchak et al., 2019; Weathers, 2019).

From the Zambian context where the current review was conducted, there is still scarcity of such literature as the search yielded only three articles. Two articles did not specifically focus on EBP but on use of research information by nurses in clinical practice and on challenges faced by nurses in searching for and accessing research information at a University Teaching Hospital in Zambia (Monde et al., 2017a, b). Although not specifically on EBP or CT, the two were considered and included in the scoping review as they provided contextual information related to the Zambia setting. The 3rd article which was directly related to the review and focused on the process, lessons and implication of implementing Evidence Based Practice Nursing at the University Teaching Hospitals-Adults Hospital in Lusaka, Zambia (Katowa-Mukwato et al., 2020). This review may therefore provide an impetus to nursing educators in Zambia to consider incorporation of EBP and CT in the nursing curriculum and provide for innovative teaching methods that have need for this document to promote

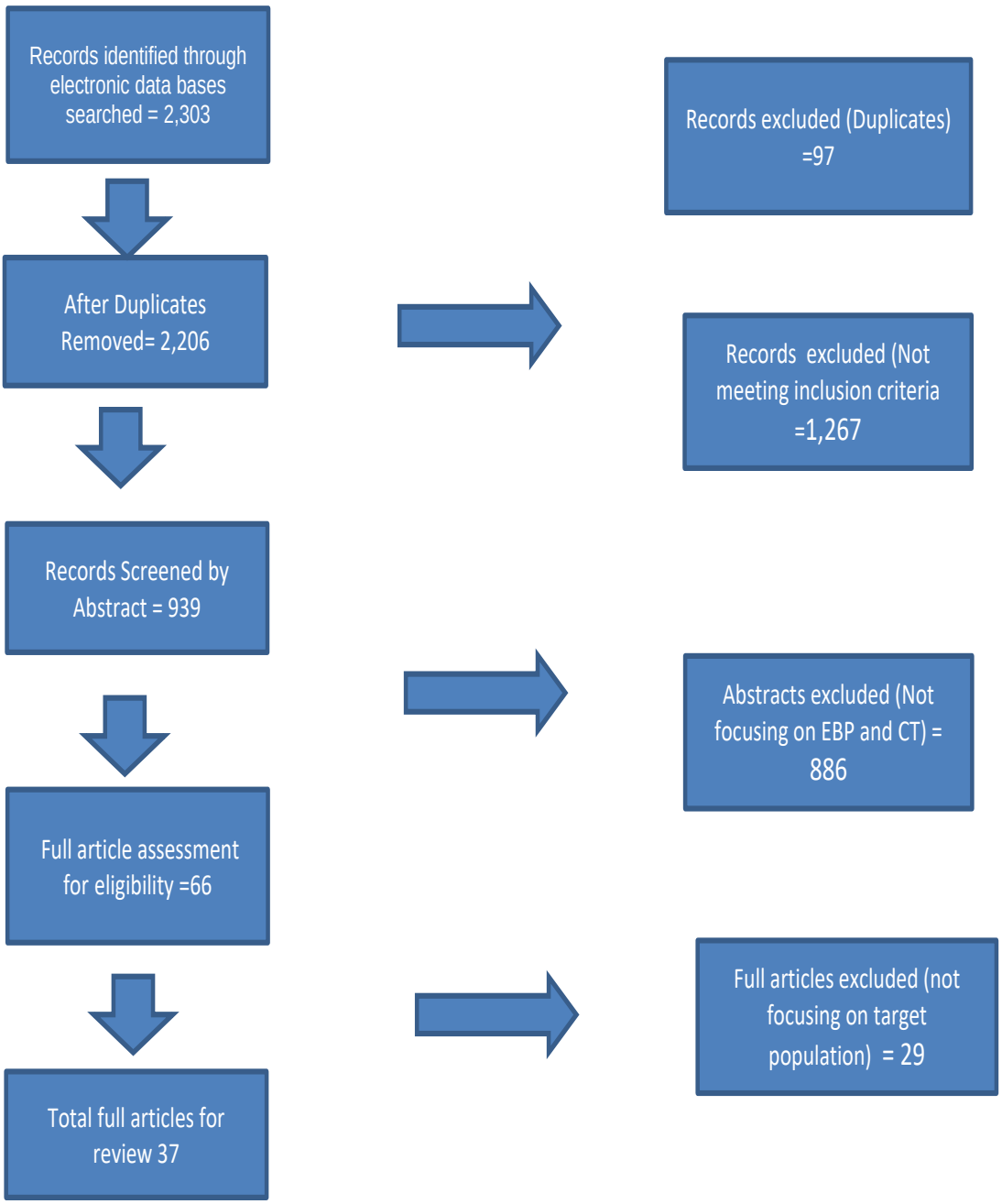

Figure 1. Flow Diagram of processing and selection of studies for the scoping review.
Source: Authors

learning.

The main curricula content to ensure students and graduates are competent in EBP and CT, include history of EBP and CT, role of EBP in clinical care, EBP models, formulating answerable clinical questions, searching relevant literature, appraising literature, evaluating qualitative and quantitative research, identifying best practices, implementing best practices, evaluating and re-starting the circle (Simpson and Courtney, 2008, Ramos-Morcillo et al., 2015; Kim et al., 2019) (Table 1). This is in addition to the generic research methodology competencies. While content for promoting CT skills include questioning skills, problem solving skills, intellectual eagerness/ curiosity, health scepticism which should be taught via simulation, debate, role play small group activity, interdisciplinary round participation, case studies and presentations during staff rounds, nursing journal clubs (Profetto-Mc Grath, 2005; Karabacak and Atay, 2011). In order to promote CT skills, scholars such as Goodstone (2013) and Orique and McCarthy (2015)

Table 1. Scoping review findings.

Authors	Date	Title of study	Country	Sample	Theoretical framework	Design & data collection	Intervention	Key findings and conclusion
Part 1: Teaching and Learning of EBP, and CT Knowledge, Attitude and Skills by Nursing Students								
Orique and McCarthy	2015	Critical Thinking and the Use of Nontraditional Instructional Methodologies	United States of America	49	None Described	1. A quasi-experimental study with a pre-test–post-test design 2. Holistic Critical Thinking Scoring Rubric (HCTSR) by Facione and Facione (1994)	Students were taught the nursing process and care plan using lecture and group discussion, and later using Problem Based Learning (PBL) and Concept Mapping (CM) individually and integrated.	Mean and Standard Deviation for critical thinking at phase 4 (integration of CM and PBL) was significantly higher (M at 3.714, SD at 0.456) from a maximum possible score of 4, compared with phase 3 (CM only, M at 2.939, SD at 0.242) compared with phase 2 (PBL only, M at 2.306, SD at 0.466) and phase 1 (Baseline M at 1.449, SD at 0.503). Utilization of non-traditional instructional (Concept Mapping and PBL) in undergraduate nursing curricula can improve CT
Karabacak and Atay	2012	Care plans using concept maps and their effects on the critical thinking dispositions of nursing students	Turkey	80	None described	1. Pre-test and post-test control design 2. California Critical Thinking Disposition Inventory	Training in Preparation of Concept Maps and Care-Plans	No statistical difference was observed in the total and sub-scale pre-test scores for CT Disposition between the experimental and control group (220+- 17.7 in the experimental, and 221+- 19) for the control group. Significant differences were observed in the total and sub-scale post-test scores between the experimental group and control group students, 225 +- 19.2 in the control group and 247 +-16.4 in the experimental group. Concept mapping strategy improves critical thinking skills of nursing students.
Vnenchak et al.	2019	Dedicated Education Unit Improving Critical Thinking and Anxiety	United States	17	None described	1. Longitudinal quasi-experimental, within- subjects, repeated-measures longitudinal design 2. Health Education System Inc. (HESI) critical thinking test, the Nurse Anxiety and Self-Confidence with Clinical Decision-Making Scale (NASC-CDM), the General Perceived Self-Efficacy Scale (GSES) Casey-Fink Graduate Nurse Experience Survey	Use of Dedicated Education Unit (DEU) Model as a collaborative teaching strategy.	Critical Thinking Score improved from 831.8 ± 44.2 at Baseline to 912.9+- 42.2, P<0.001 at Graduation. The DEU provided an environment for students and clinical nurse professional growth. It improved CT, confidence in clinical decision-making, self-efficacy, and reduced anxiety.
Charania et al.	2017	Designing Assignments to Establish a Foundation for Evidence-Based Practice in an Undergraduate Clinical Nursing Course: Teaching Strategies for Implementing EBP Evidence Review	United States	64	None Described	1. EBP Project. 2. Faculty Evaluation of Assignments to examine the number and type of references used in student written papers	Faculty designed assignment that required use of Evidence Based literature	The percentage of students using at least one journal article increased from 75% (48) to 100% (64) from the first to the 5th reflection during the project time. Use of written assignments during clinical placement promoted students' search of the literature as antecedent towards the first step of the EBP process
Blum	2018	Does Podcast Use Enhance Critical Thinking in Nursing Education?	United States of America	38	None Described	1. Comparative interventional pre-test -post-test design Pilot Study 2. Health Sciences Reasoning Test	Use of Education podcast intervention technology to Enhance Critical Thinking	No statistical significant difference was observed between Health Sciences Reasoning Test pre-test and post-test scores, number of times the podcast was

Table 1. Cont'd

								viewed, and specified demographic factors. Likert scale findings, however indicated that students liked the method of learning The results suggest that podcast viewing did not improve CT abilities.
Simpson and Courtney	2008	Implementation and evaluation of critical thinking strategies, to enhance CT Skills in Middle Eastern Nurses	Australia	20	None described	1. CT Enhancement Education Programme 2. Direct Participant Observation and Focus Group discussions	Developing and implementation of questioning, debate, role play and small group strategies, modified classroom siting arrangement from Military to "U" arrangement to enhance interaction and critical thinking	Positive change was observed in students' behaviour, interaction and participation. The implemented CT programme transformed students from being passive or rote learners to having questioning minds.
Goodstone et al.	2013	Effect of Simulation on Development of CT in Associate Degree Nursing Student	United States	42	None described	1. Two group quasi-experimental pre and post-test design 2. Health Studies Reasoning Test (HSRT)	Use of High Fidelity Patient Simulated (HFPS) Scenarios for the experimental group and case study activities for the control group.	Both groups demonstrated an increase in CT skills; however, no statistically significant difference was observed between the High Fidelity Simulated Patients and case study groups. Results reviewed that both high and low fidelity simulations are associated with increases in CT score
Chen and Lin	2003	Effects of a Nursing Literature Reading Course on Promoting Critical Thinking in Two-Year Nursing Program Students	Taiwan	170	American Philosophical Association (APA)	1. Quasi-experimental design (Student taking the course versus students not taking the course) 2. A tool for measuring article critique skills test before and after the course.	A 32-hour course in which students experienced the processes of literature searching, reading and writing. Three assignments were designed for the course: (1) compiling a literature reference list according to the key search words (2) present literature critique report of a current nursing journal articles (3) write a literature article summary.	At the end of the course, scores on the critique test in both groups were significantly higher than before the course ($p < 0.001$). However, the experimental group recorded, significantly higher scores than the control group ($p < 0.001$). Content analysis of students' self-evaluation of their learning experience, revealed Changes in thinking pattern and learning attitude, a feeling of growth and achievement. Results revealed positive effect of reading and writing assignments on CT ability
Serfass and Wonder	2018	You're Teaching EBP to BSN Students: But Are They Learning?	United States	334	None Described	1. Multisite, cross-sectional, descriptive study. 2. Seven-item demographic questionnaire and the BP Knowledge Assessment in Nursing (EKAN) tool	None	Mean EKAN scores were 9.32 (SD = 2.22) for 2nd year students (Junior), 11.28 (SD = 2.38) 3rd years and 11.17 (SD = 1.77) for 4th years (Senior). There were no statistically significant differences in mean EKAN sum scores between junior and senior students at either campus ($p > .655$). Results showed stagnation of EBP knowledge development after junior year.
Kim et al.	2019	Effects of EBP education program using multifaceted interventions: a quasi-experimental study with undergraduate nursing students	Korea	44	None Described	. Quasi experimental design with pre-test, intervention, and post-test measurements 2. Evidence Based Practice Evaluation Competence Questionnaire (EBP-1 COQ) was used to measure EBP knowledge and attitude. Cognitive	A 20 hour program, administered to fourth year students over 4 weeks period. The program comprised of a five-step EBP process; asking clinical questions, searching for evidence, critical appraisal of	The program significantly improved all outcomes for EBP. Experimental group had significantly higher scores than the control group from baseline to immediately and 6 weeks after. EBP knowledge ($F=19.99$, $P<0.001$, attitude ($F=24.05$, $P<0.001$), Competencies ($F=51.47$, $p<0.001$), future use of EBP ($F=7.30$, $p= 0.001$) and CT skills ($F = 17.07$, $p < 0.001$).

Table 1. Cont'd.

						Skills of Evidence-Based Practice was used to measure EBP Skills while future use of EBP was measured using a modified Future Use of EBP subscale. CT skills were measure using the Critical Thinking Disposition Scale for Nursing Students.	evidence, implementation and step evaluation.	The EBP education program effectively improved the knowledge, skills, attitudes, competencies, and future use of EBP among students.
Simpson et al.	2017	Enhancing CT Via a Clinical Scholar Approach	United States of America	92	None Described	1. A two-group, repeated-measures control trial 2. California Critical Thinking Dispositions Inventory (CCTDI)	Students were allocated to either of the two treatment groups, clinical scholar (CS) or CS + System Engineering (SE). The CS groups received no additional guidance or support for the EBP. The CS + SE groups attended a 3-hour seminar about SE and the group had access to an industrial engineering graduate student for mentorship	Significant increases were found in both groups in the total CCTDI score (p = .02) and in the CCTDI truth (p = .0002) and confidence (p = .001) subscales. Students' search for information was significantly different between the control and experimental group (p = 0.03). Intentional integration of an evidence-based, systems perspective supports development of nurses CT Skills
Smith-Strøm et al.	2006	Evaluation of Evidence-Based Methods Used to Teach Nursing Students to Critically Appraise Evidence	Norway	68	None described	1. No specific design indicated 2. A 5-point Likert scale questionnaire.	A 4-week course to educate students on three of the five EBP steps. Two scientific articles with different designs were given to students to learn how to critically appraise evidence.	Majority of students (71%) agreed, that lecture, group work, interactive plenary discussions were effective in teaching critical appraisal of scientific articles. 57% of students totally agreed that the manual was effective in guiding critical appraisal. The EBP teaching methods used in the course seemed to be a good combination for increasing students' understanding of EBP.
Hung et al.	2019	Evidence-Based Practice Curriculum Development for Undergraduate Nursing Students: The Preliminary Results of an Action Research Study in Taiwan	Taiwan	3 external EBP educati on experts	None described	1. Action research (AR) 2. Focus group interviews, external course reviews, and EBP Attitude Questionnaire	Development, implementation and evaluation of an undergraduate EBP curriculum	Participating Teachers recommended that EBP education be conducted along with instructions in relevant background knowledge of EBP. Post-test scores were high after receiving the EBP education, an indication of more positive attitude toward EBP after the course before ($p < .004$).
Kin et al.	2009	Evidence-based practice-focused interactive teaching strategy: a controlled study	United States of America	208	Diffusion of innovation Model by Rogers 2003 and self-efficacy theory by Bandura 1997	Aquasi-experimental, controlled, pre and post-test study Knowledge, Attitudes and Behaviors Questionnaire for Evidence Based Practice	EBP focused interactive teaching (E-FIT) strategy. The experimental group received the E-FIT strategy intervention which involved a 2-hour introductory lesson on the basic EBP principles and processes and description of the clinically integrated EBP group project. The project involved identification of a nursing practice problem,	Th experimental group recorded higher post-test EBP knowledge (mean difference = 0.25; P = 0.001) and EBP Use (mean difference = 0.26; P =0.015). No statistically significant differences in Attitudes and use of EBP was noted (mean difference – 0.12; P = 0.398 and mean difference = 0.13; P = 0.255 respectively) The interactive teaching strategy was effective in improving EBP knowledge and use of EBP among nursing students but not attitudes toward or future use of EBP.

Table 1. Cont'd.

							synthesis of evidence, planning EBP implementation and disseminate the proposed changes to nurses at the clinical sites. The control group (n = 120) received standard teaching	
de Cordova et al.	2008	Implementing EBP with student nurses and clinicians: Uniting the strengths	United States of America	40	Straus, glasziou richardson & haynes 2005 EBP conceptual framework	1. EBP Collaborative Framework Project involving clinical nurses and students. 2. Not described	Both clinicians and students attended a course on assessing and evaluating Clinical Evidence	Changes were noted between students' grades before and after the intervention. Changes were also noted in the clinician's knowledge of EBP and their behaviour as mentors
Oh et al.	2010	Integrating EBP into RN-to-BSN Clinical Nursing Education	Korea	74	None Described	1. A one-group pre and post-test design. 2. Structured questionnaires with scales of; efficacy toward EBP and barriers of research utilization	EBP clinical practicum Lectures, individual mentoring on EBP, small group, and wrap-up conferences	Prior to the clinical practicum, the overall individual scores for EBP efficacy among students ranged from 2.09 to 2.54, on a 5 point Likert scale with an overall mean score of 2.30, After the practicum, scores increased to a mean of 3.05, with ranges from 2.82 to 3.31. The overall mean score for the barrier to research utilization was 2.02 (SD = 0.39) before the practicum. After completion of the clinical practicum, the mean barrier score decreased to 1.67 (SD = 0.37). findings highlighted the effectiveness of EBP education among RN-to-BSN students.
Dale et al.	2019	Nursing Journal Clubs (NJC) for teaching EBP and Critical Appraisal Skills	United States of America	One final year nursing class	None Described	1. EBP Project using Nursing Journal Clubs 2. Qualitative Course Evaluation form	Structured weekly Nursing journal clubs for discussing research articles for students to gain critical appraisal skills	NJC benefited students in thinking outside the box when reading research articles. NJCs were effectively used as a teaching strategy for students learning critical appraisal of research.
Kesten et al.	2019	Perceived EBP Competency Acquisition in Graduate Nursing Students: Impact of Intentional Course Design	United States of America	544	Star Model of Knowledge Transformation by Stevens, (2004)	1. A retrospective pre–post cohort design. 2. National consensus-based EBP competencies (Stevens, 2009) were used to develop an assessment tool to measure students' perceptions of their ability to perform each competency before and after the 13-week course.	A 13 weeks EBP course that involved the five steps of EBP cycle, which ended with proposing an organizational or individual practice change and strategies for implementation.	Findings indicated improved scores for all of the study years which were statistically significant ($p \leq .014$). The total pre-course mean score was 74.09 ± 18.35 compared with a total post course mean score of 104.04 ± 14.18. Findings support the use of intentional course design based on a recognized EBP model
Weathers	2019	A Creative Teaching Method for Research and Evidence-Based Practice	Ireland	61	None Described	1. In-Class EBP Project 2. Project specific scoring sheet assessed seven domains on a scale of 0 to 4.	Research and EBP Nursing Course where students were taught the importance of research and EBP	Lowest group score was 16 and 26 as highest out of 28. One group reported the strategy as an opportunity to be creative, demonstrate understanding outside the usual didactic lecture, and to work as a team. Teaching EBP to nursing students can be challenging. Innovation is required to ensure that students recognize the importance of EBP and are equipped with the knowledge, skills, and attitudes required to implement it.
Zori	2016	Teaching Critical Thinking Using Reflective	United States of	71	None Described	1. Descriptive Qualitative Study using content analysis		

Table 1. Cont'd

		Journaling in a Nursing Fellowship Program	America			2. California Critical Thinking Disposition Inventory (CCTDI) Scale	A 1-hour class which defined CT and presented the seven CT dispositions; inquisitiveness, analyticity, truth seeking, systematicity, CT maturity, open-mindedness and CT self-confidence	Purposeful use of CT dispositions can guide individual learning and help reduce negative patient outcomes.
Wane and Lotz	2013	Simulated Clinical Environment as a Platform for Refining Critical Thinking in Nursing Students:	United States of America	12	None described	1. CT Faculty Partnership approach Pilot Project 2. Debriefing session	Folder of information was provided with sample scenarios and didactic information and evidence-based practice tutorial. Students were expected to develop and run their own scenario	Students verbally articulated the complexity of accounting for pertinent laboratory values and diagnostic testing Students appreciation the amount of detail required to critically analyze a medical situation. The teaching method provides a strategy to facilitate CT and clinical judgment skills.
Mena-Tudela	2018	Effectiveness of an Evidence-Based Practice educational intervention with second-year nursing students	Spain	120	None Described	1. Quasi-experimental before-and-after study 2. EBP Competence Questionnaire	The intervention consists of two hours of EBP theory and two hours of computer lab sessions. The first session focused on defining terms related to EBP and students to employ critical thinking in the use of research tools. The second was a practical exercise on information literacy.	The mean scores of the Evidence-Based Practice Competence Questionnaire were 79.83 as baseline measurement, 84.53 for the intermediate measurement, and 84 for the final measurement, with a statistically significant difference among the three measurements ($p<0.001$). There were statistically significant differences in Attitudes ($p = 0.034$) and Knowledge ($p <0.001$) but not in Skills ($p = 0.137$). The intervention enhances EBP competence among second-year nursing students.
Ticha and Fakude	2015	Reflections on clinical practice whilst developing a portfolio of evidence: Perceptions of undergraduate nursing students in the Western Cape, South Africa	South Africa	21	None described	1. Qualitative exploratory Design 2. Focus Group Discussion	None	Themes which emerged included Challenges related to collecting evidence for Portfolio of Evidence including Racism and Discrimination. Portfolio of Evidence was a good teaching and learning strategy. The skills, experience and knowledge acquired boosted participants' self-esteem, confidence and critical thinking.
Part 2: Implementation of EPB and Application of CT Skills by Nursing Students								
Wilde-Larsson et al.	2018	Critical thinking, research utilization and barriers among nursing students in Scandinavia and Indonesia	Norway Sweden, Indonesia	498	None	1. A descriptive, comparative, cross-sectional and longitudinal cohort study 2. CT Questionnaire (CTQ), Research Utilization Questionnaire (RUQ), the Barrier Scale	None	Indonesian participants scored significantly lower than the Norwegian (4 of 10 comparisons) and the Swedish samples (7 of 10) on the CTQ and RUQ. Scandinavian sample reported fewer barriers than the Indonesian sample. Teachers must support nursing students to strengthen their CT ability.
Lam and Schubert	2019	Evidence-Based Practice Competence in Nursing	United States of America	118 in the survey	None described			

Table 1. Cont'd

		Students: An Exploratory Study		and 12 in the interview				
						1. Sequential, mixed-methods design 2. A quantitative survey questionnaire 3. Individual, semi-structured interviews exploring the factors impacting understanding of EBP and information-seeking behaviors in each clinical course and setting.	None	Participants had difficulties distinguishing between EBP and research. Participants were able to identify experiences that fostered attainment of EBP competencies but less able to describe higher-order activities such as integrating evidence in planning for EBP changes. Findings suggested that nurse educators don not only need to model EBP competence but also guide students in the application it's application
Part 3: Assessing EBP and CT Skills of Nursing Students								
Ahn and Yeom start here		2014	Moral sensitivity and critical thinking disposition of nursing students in Korea	South Korea	142	None Described	1. Cross Sectional Correlational Study 2. Moral Sensitivity Questionnaire (Korean-Version-K-MSQ) and CT Disposition Questionnaire (CTDQ)	None	Mean score was 2.83 out of 7 minimum 1.96 and maximum 3.89 on the K-MSQ and 3.70 out of 5 on the CTDQ minimum 3.25 and 4.33 maximum. Results indicated the need for incorporation of strategies that enhance moral sensitivity for nursing students in Korea
Wonder and Spurlock		2019	A National Study Across Levels of Nursing Education: Can Nurses and Nursing Students Accurately Estimate Their Knowledge of Evidence-Based Practice?	United States of America	674	None Described	Cross-sectional correlational design	None	Participants scored highest on EBPQ attitude (M = 5.46, SD = 1.12) followed by EBP Knowledge/Skills (M = 5.03, SD = 0.95) while practice/use score were lowest (M = 4.27, SD = 1.74). EBPQ scores were positively associated with the highest earned nursing degree. Having dedicated EBP training was also associated with scores across domains.
Shirazi and Heidari		2019	Relationship Between CT Skills and Learning Styles and Academic Achievement of Nursing Students	Iran	139	None Described	1. Cross sectional Study 2. A three-component questionnaire; demographic characteristics, Kolb's Learning Style Standard and the California Critical Thinking Skills Questionnaire.	None	Mean score for CT skills was 6.75 +- 2.16, out of a maximum possible score of 34. The highest score was on evaluation and lowest on analysis subscale. The most common learning style was "Diverging". The highest mean academic achievement was earned by those students who adopted the "accommodating" learning style . There was no relationship between CT and academic achievement but a significant relationship was found between learning style and academic achievement ($p < .001$). Findings revealed unacceptably low CT skills.
Part 4: Relationship between EBP & CT Skills								
Kim et al.		2018	Korean Nursing Students' Acquisition of Evidence	South Korea	266	None described	1. Not Described 2. Evidence Based Practice	None	Mean EBPQ total score was 4.69 +- 0.64 from a total 7 Point Likert Scale. Knowledge of EBP had the highest

Table 1. Cont'd

		-Based Practice and Critical Thinking Skills			Questionnaire (EBPQ) and Critical Thinking Predisposition (CTD) tool		mean score (4.71 +- 0.77), followed by practice of EBP (4.71 +- 0.77,) and attitudes towards EBP (4.58 +- 1.20). Mean CTD total score was 3.56 +- 0.32 from a total 5 point Likert Scale. Among the seven EBP subcategories, objectivity scored highest at (3.97 +- 0.46, followed by, intellectual fairness (3.97 +-0.45), while systematicity was the lowest at (3.25 +- 0.58). EBPQ total score was significantly correlated with CTD total score. EBPQ attitude had a significant correlation with CTD total score. Furthermore, EBPQ knowledge significantly correlated with the total CTD score. Results pointed out to the need to have a curricula that is EBP oriented in order to improve EBP, knowledge, attitude CTD.
Part 5: Use of EBP and Application of CT Skills by Practicing Nurses							
Jordan et al.	2015	Barriers to implementing evidence-based practice in a private intensive care unit in the Eastern Cape	South Africa	75	Non-described	1. A positivistic, quantitative, exploratory research design 2. A Study specific questionnaire that measure demographic characteristics, and individual and organizational barriers on a 5-point Likert Scale ranging from (1) strongly disagree to (5) strongly agree.	None	Identified barriers at individual level included lack of familiarity with EBP (only 54% could correctly define EBP. Another barrier was inability to synthesise the literature eg 60% of respondents indicated that information related to intensive care was too overwhelming. Organisational barriers including lack of authority to facilitate EBP implementation as agree by 58% of respondents. In order to enhance care delivery in ICUs, nurse managers need to acknowledge and manage individual and organisational barriers towards implementation of EBP.
Monde et al.	2017	Nurses and Use of Research Information in Clinical Practice: a Case Study of the University Teaching Hospital in Zambia	Zambia	77	None Described	1. Case study 2. Investigator designed Questionnaire	None	95% of the nurses stated that they utilize research information in clinical practice. Regarding frequency of use of research information, only 12.28% used research information very often. Results revealed that nurses were prompted to seek information because of emergency of new diseases or technologies.
Monde et al.	2017	Challenges Of Accessing And Seeking Research Information: Its Impact On Nurses At The University Teaching Hospital In Zambia	Zambia	77	None Described	1. Case study 2. Study specific Questionnaire	None	Common challenges faced by nurses were; lack of access to information resources as mention by (70%), poor Information Communication and Communication (ICT) infrastructure (60%), lack of support from hospital administration (62%), inadequate time to read (60%), not being aware of available information resources (54%) and poor information sharing culture (56%) were amongst the top challenges faced by the nurses when accessing and seeking information to use in clinical practice. T

Table 1. Cont'd

Malik et al.	2014	Perceived knowledge, skills, attitude and contextual factors affecting evidence-based practice among nurse educators, clinical coaches and nurse specialists	Australia	135	None described	1. Descriptive Survey 2. Study specific EBP Questionnaire with a 5 point Likert scale that measured self-perceived knowledge, skills and attitude.	None	Mean score for self-perceived knowledge of EBP was 2.98. Almost half (47%) perceived themselves has having 'good' knowledge, 25% as 'fair" and 24% 'very good'. Overall, 40.7% rated themselves as 'beginner', 36% as 'quite skilled' and 23% as 'competent' towards critical appraisal skills. Attitudes towards EBP had the highest mean of 4.34 (SD = 0.536). Factors that hindered change were; resistance to change, busy schedule, lack of time to refine research reports and lack of resources. Nurse Educators, Clinical Coaches and Nurse Specialist, had positive attitudes, but lacked knowledge and skills, therefore they relied heavily on personal experience, organizational policies and protocols as sources of knowledge.
Wangensteen et al.	2010	Critical thinking dispositions among newly graduated nurses	Sweden	2675	Non described	1. Cross-sectional descriptive study 2. A study-specific questionnaire for background data and a 6-point Likert scale CCTDI with total scores range between 70 and 420	None	Mean value for CCTDI score was 300.3 indicating a positive inclination towards CT. Nearly 80% of the respondents reported a positive disposition towards CT. The highest mean score was on the inquisitiveness subscale and the lowest on the truth-seeking subscale. Results pointed out to the need for Nurse leaders and teachers to nurture critical thinking among newly graduated nurses and students.
Varnell et al.	2007	Effect of an Educational Intervention on Attitudes Toward and Implementation of EBP	United States of America	57	Transtheoretical model of organisational change.	1. A quasi-experimental design with Pre-Post-test survey. 2. EBP barriers (EBPB) and EBP implementation (EBPI) scales	8-week program to develop EBP champions. Programme was organized into a 2-hour class per week for participants.	Participants with advanced degrees, who were currently in school had worked in advanced roles were more likely to report implementing EBP while prior exposure to EBP, educational level, enrollment in school, and advanced roles were no longer significantly correlated with scores on the EBPB or EBPI at the end of the intervention. Paired *t* tests indicated a significant difference in means for both the EBPB ($p < 0.01$) and EBPI ($p < 0.01$). Results pointed out to the role of administrative support and collaboration between academia and service in the success of EBP interventions.
Ramos-Morcillo et al.	2015	Effectiveness of a Brief, Basic Evidence-Based Practice Course for Clinical Nurses	Spain	109	The Theory of Planned Behavior by Ajzen, 1991.	1. Two group quasi-experiment with an intervention and comparison group. 2. A 19-item 7-point Likert scale self-administered EBPQ questionnaire (Upton and Upton, 2006).	Intervention group attended the EBP course, while the comparison group attended a different course. The evaluation was administered at (time 01) and mid-point (time 02) and end-point (time 03).	Knowledge and skills of participants significantly differed, between the groups and over time in intervention group. Post hoc analysis of differences with the Bonferroni test revealed a greater effect on the intervention group versus the comparison group both at 02 (p = 0.002) and 03 (p = 0.005) A basic educational intervention on EBP can produce improvements in the knowledge and skills of clinical nurses.

Table 1. Cont'd

Brooke et al.	2016	Implementation of EPB by nurses working in community settings and strategies to mentor student nurses to develop evidence-based practice: A qualitative study	United Kingdom	33	Non described	1. An exploratory qualitative 2. Focus Group Discussion	None	Major themes that emerged; "our practice is evidence-based' and "Time is a barrier and facilitator in mentoring students in community settings" Nurses need to develop the ability to incorporate patients' needs and wishes within evidence-based care
Katowa-Mukwato et al.	2020	Implementing Evidence Based Practice nursing using the PDSA model: Process, lessons and implications	Zambia	12 Nurses	Plan Do Study Act (PDSA) Model.	1. EBP Implementation Pilot Project using the PDSA Model. 2. Pre-and post-Implementation study specific Audit Questionnaire	Five -Phase-Approach 1. Pre Implementation Audit of Nursing Care 2. Stakeholder Consensus workshop 3. Rapid Review of Literature 4. Implementation of Four EB-Practice "Hacks" divided into 12 areas of focus 5. Post Implementation Audit of Nursing Care	Target for improvement were met in eight out of 12 areas of implementation. Targets for awareness of rights and responsibilities by patients, explaining the patient's condition to at least one relative, completing nursing care plans and regular multi-disciplinary team meetings were not met. Met targets were in; display of patients' rights, educational materials hand washing guidelines, orientation and mentorship for junior nurses and students, use of task allocation, and use of hand washing soap and use of decontamination buckets. Concluded that there are both enablers and detractors to implementing EBP. Enables include support of senior nurses who act as champions and availability of mentors, while detractors included fixation to status quo.

support the utilization of non-traditional instructional including Concept Mapping, PBL and simulation methodologies in undergraduate nursing curricula. As stated earlier, other authors (Larsen et al., 2019; Davidson and Candy, 2016; Whalen and Zentz, 2015; Reicherter et al., 2013; Dawley et al., 2011; Brown and McCrorie, 2015) have suggested interactive methods suitable for teaching both EBP and CT skills. These include research courses and workshops, concept mapping, journal clubs, clinical simulations, collaboration with clinical practice, use of dedicated education units and use of IT Technology.

With regards to assessing EBP and CT skills, there are a number of validated tools; commonly the Upton and Upton 2006 EBP Questionnaire (Upton and Upton, 2006), the California Critical Thinking Skills Test (CCTST) of 1994. It is from these two tools that several scholars have modified notably the Yoon's 2004 Critical Thinking Disposition Inventory YCTDI (Yoon, 2004). Whereas the CCTST is a general tool testing CT skills of Post-Secondary education candidates, YCTDI was originally developed specifically for Korean Nursing, but it is now validated and recommended for testing CT skills of nursing students.

Regarding implementation of EBP and application of CT skills by nurses, the reviewed literature, indicated varying levels of EBP and CT application from different clinical setting. Additionally, a number of challenges faced in implementing EBP were revealed. The challenges range from cost implication of funding EBP, organizational culture that do not support EBP, workplace resistance "That is the way we have always done it", lack of knowledge and skills in EBP and CT by nurses, misunderstanding that EBP takes too much time, to inadequate mentors for EBP (Willis, 2012). Another major barrier is the over-emphasis on conduct of research by education institutions against none or limited emphasis on translation and utilization of research findings (Melnyk and Fineout-Overholt, 2015; Melnyk et al., 2012a, b, 2016).

Katowa-Mukwato et al. (2020) observed that there are both enablers and detractors to implementing EBP. The observed detractor included comfort with status quo. The comfort with status quo resulted in resistance to any justification and call to change, as some nurses remained doing what they have been doing which was described as being "encased" in the comfort zone. Such category of nurses was seen as detractors of the process. This observation corroborates with what others have reported that

status quo is a barriers to EBP implementation (Wallis, 2012). Wallis (2012) affirmed that getting past workplace resistance and the phrase, “That is the way we have always done it” pauses as a major constraints to EBP implementation.

Limitation of the review

Considering the Zambia context within which the scoping review was conducted, EBP and CT as key elements in health care have not received their due value either in Nursing Education or Practice as such the desk review did not come across any policy documents or expert opinion regarding the two concept. This meant that as opposed to the general recommendation the policy documents and expert opinion may be part of a scoping review; it was not the case for this review. Consequently, only research papers were included.

Conclusion

Teaching and assessing EBP and applying CT skills have been reported to be challenging and therefore innovative teaching methods are required to promote learning while successful implementation require strategies to minimize detractors and sustain enablers of the process. Although there is a plethora of literature at global level on different methods for teaching, learning, assessment and implementation of EBP and CT in Nursing Education and Practice, from the Zambian context literature is very scarce. The two concepts are not taught in the undergraduate curricula, while in the MSc programmes EBP is taught using traditional lecture methods, while CT skills are not taught at all. This review may therefore provide an impetus to nursing educators in Zambia to consider incorporation of EBP and CT in the nursing curriculum and provide for innovative teaching methods that have need of this document to promote learning.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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