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Review Article

Simulation to Replace Clinical Hours in Nursing: A Meta-narrative Review

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KEYWORDS

nurs*;
student;
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replace

Abstract

Background: Continually increasing numbers of undergraduate nursing students on clinical placement have led to industry partners feeling stretched and fatigued. This can lead to inadequate supervision and education for the students. Substituting a percentage of the required clinical hours with simulation provides students the experience they crave and industry partners a chance to slow down.

Method: A metanarrative review method was used as outlined by the RAMESSES guidelines.

Results: A total of 104 articles were screened and 12 included in the final sample. Studies conducted in the United States and United Kingdom showed that a percentage replacement of clinical placement hours with clinical simulation shows no significant difference to student outcomes in relation to clinical skills and knowledge, and student confidence.

Conclusion: The total number of clinical placement hours required by each university for studies is unclear. Higher numbers of clinical placement hours are seen in the United Kingdom, and a diverse spread of clinical hours in the United States, which impacts how the findings can be applied to Australia. Simulation can be used as an adjunct to clinical placement hours, yet regulations need to be defined around the simulation modality used, how many hours of simulation compared with clinical practice is sufficient to maintain proficiency of students, and the assessment or measurement tool used to ensure quality.

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Simulation provides key skills and knowledge for students enrolled in undergraduate healthcare education (Bambini, Washburn & Perkins 2009; Jeffries, 2005; Schlairet, 2010). When simulation is integrated with

clinical placements, students practice key clinical behaviours and concepts in a safe environment, which encourages transferability of learning to actual care situations facilitated in clinical practice (Bogossian et al., 2018; Dow, 2012a; Harder, 2010). The increasing number of undergraduate nursing students on clinical placement is putting

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pressure on healthcare providers to teach, supervise, and nurture these students towards professional proficiency (Richardson, 2014). Associated challenges are the large costs of providing each placement, the decreasing numbers of willing and appropriately prepared preceptors, disparities

Key Points

- Replacing part of the required clinical practice hours in undergraduate nursing education with simulation, has shown to be equivalent with traditional clinical practice in regards to skills, knowledge and confidence.
- These results have been shown in several studies through the United States and United Kingdom.
- Unstated variations in practice hours required by countries, make transferability of results to Australia difficult requiring further studies to be conducted in Australia.

in learning experiences and teaching practices, and the lack of student access to electronic patient records (Harder, 2015; Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014b; Nehring, 2008). In conducting this meta-narrative review, the literature was searched for evidence for replacing part of the clinical placement hours required by nursing students with simulation.

Background

With advancing technology, education of healthcare professionals must evolve (Nehring, 2008). Traditionally, nursing students are required to undertake a minimum number of clinical hours during their undergraduate degree in a variety of settings, which complements their theory-based

learning (ANMAC, 2012). The number of clinical practice hours is set by the appropriate governing body; for example, the Nursing and Midwifery Board of Australia (NMBA) specifies a minimum of 800 clinical hours are required by undergraduate nursing students to be eligible to register for practice (Miller & Cooper, 2016; NMBA, 2016). This number varies greatly between countries, for example, the United Kingdom requires 2,300 hours of clinical placement with 300 of these hours already dedicated to simulation (Miller & Cooper, 2016). In the United States, the number of clinical hours varies greatly state by state, with no minimum outlined by regulatory boards (Hungerford, Blanchard, Bragg, Coates, & Kim, 2019). The required clinical hours combines with the theory to facilitate well-rounded knowledge, skills, and attitude to enter the profession. Owing to the increasing number of students enrolling in undergraduate nursing programs, there is an increasing demand on industry partners to provide quality clinical placement experiences to multiple students at one time, year-round (Meyer, Connors, Hou, & Gajewski, 2011; Quail, Brundage, Spitalnick, Allen, &

Beilby, 2016; Thomas & Mraz, 2017; Tuzer, Dinc, & Elcin, 2016). Clinical preceptors report increasing fatigue while industry partners are stressed because of ongoing large cohorts, and as a result, student's growth and development may be hindered (Bogossian et al., 2018; Burns & Northcutt, 2009; Richardson & Claman, 2014). To ensure ongoing positive relationships with industry as well as improving student experience, an alternative to clinical settings or clinical placement hours which ensures student aptitude and understanding must be found.

Substituting a percentage of clinical placement hours with simulation has been touted as an alternative, which still ensures quality graduates (Bogossian et al., 2018; DeBourgh & Prion, 2011; Hayden et al., 2014b; Jin & Pok-Ja, 2015; Meyer et al., 2011). Tertiary institutions have already incorporated simulation into their teaching at various levels including: part-task trainers, role playing, and/or low- to high-fidelity manikins. Simulation has flourished in the diverse ways; it impacts student learning, including increasingly more technologically advanced inclusions (Bogossian et al., 2018; Hayden et al., 2014b; Medley & Horne, 2005). The literature supports simulation as a key tool to clinical education in terms of positive outcomes for students and learning (Aebersold & Tschannen, 2013). There is a large volume of research that discusses the benefits of simulation in nursing education including providing a safe environment, providing some control over the situations, providing rare or difficult to experience clinical practices, and allowing for repetitive practice (Dow, 2012b; Lee & Oh, 2015; Richardson & Claman, 2014; Thomas & Mraz, 2017).

Although the definition of simulation categories is varied among the literature, the most common definition relates to the degree of realism of the simulation, with high-fidelity simulation (HFS) providing the most realistic simulation through the use of high-technology manikins, actors, and standardised patients (Meakim et al., 2011). Owing to the lack of consistent definition, there is a growing body of research emerging that simulation complexity needs to be relabelled to transfer of learning, learner engagement, and suspension of disbelief (Hamstra, Brydges, Hatala, Zendejas, & Cook, 2014). Although these new terms may be soon seen more in the literature, the terms low fidelity and high fidelity continue to be frequently used in past studies and will be a focus of this review. Despite the sophistication of simulation methods, the research into the use of simulation as a replacement for a portion of clinical practice in undergraduate nursing education is still in its early days.

Aim

The aim of the review was to explore the literature published with the notion of replacing part of the required clinical placement hours with simulation in undergraduate nursing education and the feasibility to use this practice in

Australia owing to increasing numbers of nursing students and decreasing appropriate placement sites available.

Methods

A meta-narrative design using the RAMESES realist synthesis approach was chosen for the review (Wong, Greenhalgh, Westhorp, Buckingham, & Pawson, 2013). A meta-narrative approach was chosen to expand the potential insights into the research question and ensure a thorough and comprehensive review was achieved (Wong et al., 2013). Realist synthesis emphasises understanding causation, which allows for complex social problems that involve human decisions and actions (Wong et al., 2013). This method best suited this review question owing to the nature of the human experience in clinical practice and the variations in the studies found. The approach is recommended where literature is methodologically diverse and where focussing on any one methodological paradigm alone would weaken the richness of the findings (Pawson, 2002).

The following databases were used to conduct the search: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, and PubMed. Three search engines were also used, including Google Scholar, Scopus, and Web of Science. Once the final sample was determined, a manual search of the reference lists was conducted to ensure no potentially eligible papers were overlooked. The authors conducted independent review of the search terms to verify results. No other papers for inclusion were found. The authors also conducted analysis of the included articles to ensure rigour in inclusion criteria. The authors discussed any concerns this process raised, and they reviewed articles as required.

A combination of search terms used includes

- nurs*, healthcare, simulation, student, clinical practice, skills development, standards of practice and competency standards.
- Search phrases used include nurs* student AND simulation AND (clinical practice OR clinical placement); replacing clinical placement with simulation for nursing students; Simulation AND (clinical practice) OR (clinical placement) AND health.

Inclusion and exclusion criteria were applied to the initial sample of articles (see Table 1 for inclusion and

exclusion criteria). Titles and abstracts were reviewed to determine applicability to the review aims. Papers not fitting the criteria were excluded. Detailed reviews of the paper were then conducted by the researchers independently. Researchers then met to discuss individual findings and arrive at a consensus on the final sample. Appendix A examines each article in detail.

Key Data Extracted From Sample

Data extracted from the final sample (Appendix A) includes each article's bibliographic data, method, sample size, type of simulation used, total number of clinical hours required for the degree programs, and the proportion of total hours substituted for simulation. The last three variables are essential for comparing studies and in determining transferability to the Australian context, if at all possible. The methodological and sample size data aid appraisal of the quality of the articles themselves.

Data Analysis Process

The extracted data were reviewed for heterogeneity and homogeneity to draw conclusions towards the review question. The researchers discussed at length the key elements identified including the strengths of the evidence, descriptions of terms used, explanations of programs each paper used, and the strength and limitations towards the review question in line with realist principles (Wong et al., 2013). The final included data provided detailed information around the strengths and limitations of each paper and the relevance to the review questions.

Findings

The search returned a total of 22,371 studies of which 12 articles were included in this review (Figure). Of these, five (n = 5) were quantitative studies (Beddingfield, Davis, Gilmore, & Jenkins, 2011; Curl, Smith, Chisholm, McGee, & Das, 2016; Hayden et al., 2014b; Parker, McNeill, & Howard, 2015; Schlairet & Pollock, 2010); two (n = 2) were qualitative studies (Au, Lo, Cheong, Wang, & Van, 2016; Baillie & Curzio, 2009); four (n = 4) were mixed method studies (Brien,

Table 1 Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • 2007-2018 (inclusive) • Undergraduate/baccalaureate nursing student • English language • Studies that looked at simulation as a replacement to clinical placement hours 	<ul style="list-style-type: none"> • Postgraduate or higher-level nursing studies • Allied health and/or medicine • Studies that looked at simulation as preparation for clinical or an adjunct to clinical placement • Studies that looked at comparisons of simulation and traditional teaching methods, i.e., class room learning for specific clinical skills

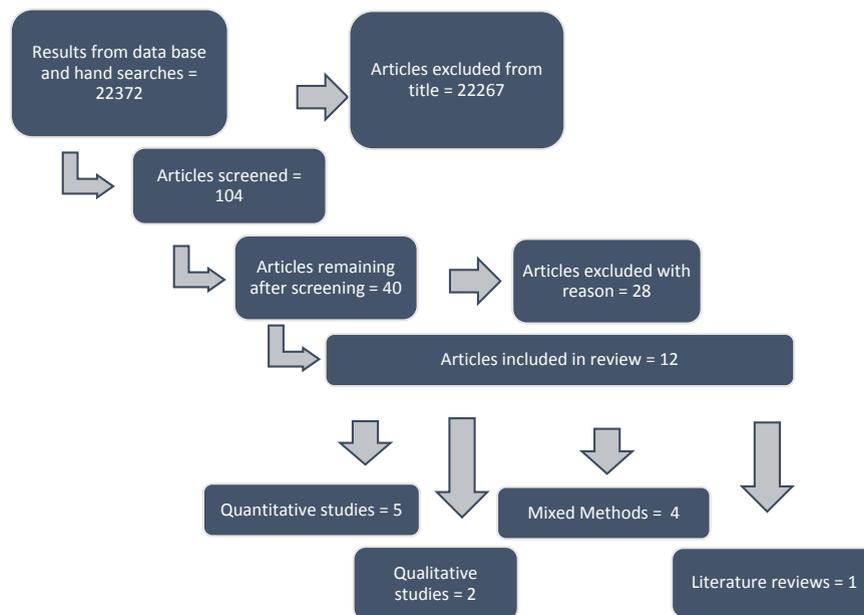


Figure Summary of search results.

Charette, & Goudreau, 2017; Meyer et al., 2011; Soccio, 2017; Williams, French, & Brown, 2009); and one ($n = 1$) was a systematic review (Larue, Pepin, & Allard, 2015). Papers were drawn from the International literature with original research conducted in the United Kingdom, USA, and Australia. Dates of publication ranged from 2009 to 2017 with no studies found from 2018 or 2019.

Quality Assessment

The quality of the articles in the review varied substantially. In particular, definitions of simulation and clinical practice, together with diverse ranges in required hours of clinical placement, made comparability between articles difficult. The simulation modality varied, from HFS and actors, (Au et al., 2016; Beddingfield et al., 2011; Curl et al., 2016; Hayden et al., 2014b; Parker et al., 2015; Schlairet & Pollock, 2010; Soccio, 2017), to low-fidelity models and role-playing (Baillie & Curzio, 2009) to video sessions (Williams et al., 2009). The type of simulation can impact the student's engagement of the sessions and the reliability and transferability to clinical practice. The studies using quantitative assessment methods incorporating standardised assessment tools provided the best evidence for the review in relation to skills and knowledge outcomes. Although the qualitative studies provided insights into the experiences of students, they contributed less to answering the overall question of the review.

How the data were presented in papers varied. Five studies discussed simulation replacement in terms of percentage of clinical hours (10%, 25%, 50%) rather than

number of hours (Curl et al., 2016; Hayden et al., 2014b; Larue et al., 2015; Meyer et al., 2011; Soccio, 2017). Appraisal was therefore difficult given the variation in total clinical hours required between nations and, within nations, between courses. In addition, owing to the lack of clearly stated clinical hours and/or simulation hours, the notion to carry the findings across a degree rather than a specific unit becomes close to unfeasible given the available evidence.

As each country has different regulations regarding hours required to qualify for registration, the use of percentages limits transferability of results (Bogossian et al., 2018). Parker et al. (2015) and Meyer et al. (2011) did discuss number of hours for clinical practice and simulation in their study but this was limited to the one course not overall degree requirements. Other papers discussed the percentage of hours students were involved in simulation but not the overall hours of clinical practice this related to (Curl et al., 2016; Hayden et al., 2014b).

Approaches to Simulation

The heterogeneity of the methods and approaches to simulation versus clinical placement used in the included papers limits transferability, such that 25% replacement of 500 hours is very different to 25% replacement of 1,000 hours. Owing to the differences around registration requirements and educational institutions requirements, further exploration into this is required.

The measurement tools used for each study also limited transferability. Although some commonalities were seen in studies (Table 2), each had a different focus and therefore

Table 2 Definitions/Explanations of Measurement Tools

Measurement Tool/Instrument	Explanation of Tool/Instrument	Articles Using This Tool/Instrument
NCLEX (USA)	The NCLEX examination, also known as the National Council Licensure Examination, is a standardized examination that each state board of nursing in the USA uses to determine whether a candidate is prepared for entry-level nursing practice. (https://www.allnursingschools.com/articles/nclex-exam/)	Hayden et al. (2014b) Curl et al. (2016) Schlairet and Pollock (2010)
CCEI (USA)	Creighton Competency Evaluation Instrument is an instrument that would gauge the effectiveness of clinical learning in simulation environments. It focuses on 22 general nursing behaviours divided into four categories (Hayden et al., 2014a). (https://nursing.creighton.edu/academics/competency-evaluation-instrument)	Hayden et al. (2014b)
ATI (USA)	ATI (Assessment Technologies Institute) is the name of the test maker and stands for. The ATI TEAS (Test of Essential Academic Skills)® was developed to evaluate the academic readiness of applicants to health science programs, such as nursing programs. (https://www.kaptest.com/study/teas/whats-tested-on-the-ati-teas/)	Hayden et al. (2014b) Soccio (2017) Curl et al. (2016) Schlairet and Pollock (2010)
Pre and post test	Looking at cognitive skills and knowledge	Beddingfield et al. (2011) Curl et al. (2016) Meyer et al. (2011)
Evaluation tool	Looking at preparation, therapeutic skills, student-client communication, clinical judgement, interprofessional communication, and documentation	
Questionnaire-based instrument	Self-reported questionnaire based on student experience or perceptions	Parker et al. (2015) Au et al. (2016) Baillie and Curzio (2009) Brien et al. (2017) Williams et al. (2009)

used different measurement tools. The measurement tools outlined in Table 2 varied from state board examinations to questionnaires. The use of certified and standardised exams or testing proved stronger evidence in relation to the review question. This point is important as not all jurisdictions, such as Australia, have preregistration board examinations.

Larue et al. (2015) was the only systematic review found. This paper investigated two questions: simulation as preparation and simulation as substitution for clinical placement. For the purposes of this review, the authors focused solely on the results for simulation as substitution for clinical practice. The results from this portion of the systematic review show increased student self-confidence resulting from the simulation, which can positively impact clinical performance (Harder, 2010). However, the results of this subset of the review by Larue et al. (2015) demonstrated no effect on clinical

competency. The studies included in the systematic review showed no significant differences between clinical experience and simulation when simulation replaces up to 50% of clinical hours.

The studies included in this meta-narrative review found that there was no significant difference in learning or student outcomes between simulation and clinical practice, when a percentage of clinical placement hours was replaced with simulation. Studies focused on either effect on skills and knowledge (Beddingfield et al., 2011; Curl et al., 2016; Hayden et al., 2014b; Larue et al., 2015; Schlairet & Pollock, 2010; Soccio, 2017) or effect on self-confidence (Au et al., 2016; Baillie & Curzio, 2009; Brien et al., 2017; Parker et al., 2015; Williams et al., 2009) with the results showing comparable student engagement, educational outcomes, and student proficiency with both simulation and traditional clinical practice, even when a percentage of clinical hours is replaced with simulation.

Discussion

Current literature examining the use of simulation in undergraduate nursing education discusses its benefits. The use of simulation provides many aspects of training which real patients cannot. These include repetition, specific diseases and scenarios, and more importantly allowing students to make mistakes in a controlled environment without fear of patient harm (Dow, 2012a; Lee & Oh, 2015; Richardson & Claman, 2014; Thomas & Mraz, 2017). Given these benefits, a debate is emerging in the profession concerning the next step in simulation-based training in nursing. The aim of this study was to explore replacing a part of undergraduate nursing clinical placement hours with simulation in Australia. Across the world, there have been several studies that have already looked at the use of simulation to replace part of clinical practice in a variety of health professions with great success. However, more work needs to be done before any conclusions can be determined as to its efficacy.

The definition of traditional clinical practice and simulation remains unclear. Although some studies define their use of simulation and traditional clinical practice, this has a wide variety of definitions and interpretations and makes comparison difficult (Larue et al., 2015). The type of simulation used needs to take into account the level of the student, the concepts being taught, and the theoretical knowledge required (INASCL Standards Committee, 2016; Weller, Nestel, Marshall, Brooks, & Conn, 2012).

Similarly, the assumption that clinical practice is the “gold standard” for student experience and education remains evident in the literature (Harder, 2015). Yet, there is little evidence of effective standards as to what constitutes clinical practice, the hours required for registration, or the ways clinical practice is assessed. This is born out further by Harder (2015), who states that research into learning in traditional clinical practice is minimal compared to the research into simulation benefits.

Clinical practice is increasingly facing added pressure in an already stretched system. It is, in part, related to the increasing number of students and the limited resources clinicians have to adequately engage and mentor students (Fitzgerald, Denning, & Vaughan, 2017; Richardson & Claman, 2014). This is where simulation may provide rich opportunities to extend clinical learning in relation to clinical practice more broadly.

In considering such a proposal, the way in which simulation is defined and used to replace clinical practice requires regulation to ensure all tertiary institutions are providing clinical education to the same standard, ensuring quality graduates at the end of their undergraduate degree (Jeffries, 2005). The differences in the studies included in this review highlight this need as the use of HFS proved to be more popular among the studies (Au et al., 2016; Beddingfield et al., 2011; Brien et al., 2017; Curl et al.,

2016; Hayden et al., 2014b; Schlairet & Pollock, 2010); however, the use of medium-fidelity and standardised patients provided similar results in relation to student proficiency and self-confidence (Hayden et al., 2014b; Meyer et al., 2011; Parker et al., 2015; Soccio, 2017). The variation to this is the study by Williams et al. (2009) that focused solely on the use of digital videos as a means to reduce the clinical burden, and although the results looked favourably on the use of videos to help prepare students for clinical practice, the study concluded this modality of simulation could not be used as a replacement for clinical placement hours. The question around simulation modality leads to important questions around how simulation needs to be implemented and the costs, including time, resources, and people, associated with this, all of which require further exploration (INASCL Standards Committee, 2017; Larue et al., 2015).

The proficiency of students must remain high and be measured in an appropriate manner (Larue et al., 2015). This review highlights the variability of tools used in measuring outcomes, and owing to these differences, comparisons were harder to achieve. However, this allowed for contrasting results and made usability of results across countries more realistic. The studies that focused on quantitative methods proved to be stronger when addressing the review question. Although qualitative findings provide insights into the phenomena being studied and, as such, are valuable in healthcare research, their design is not orientated towards validating the use of simulation as a substitute for clinical practice (Al-Busaidi, 2008). Any consideration as to the potential of simulation to replace any part of clinical placement hours requires consistent, generalisable, and valid outcome measures.

Regulating what nursing concepts may be replaced with simulation, for example, communication, or physical assessments, is one hypothesized idea to combat these issues (Beddingfield et al., 2011; Brien et al., 2017; Soccio, 2017). The use of standardised testing for the behaviours and concepts learnt in simulation is another hypothesized idea and needs to be addressed at both local and national levels. High-stakes testing is used in countries such as the United States through the NCLEX™ examination (Hunsicker & Chitwood, 2018). In Australia, there is no set examination required before registration, more so, the design of the curriculum is such that students cannot progress unless they meet capstone requirements inherent in the unit and/or course. If simulation were to replace a percentage of required clinical placement hours in Australia, the regulation board would need to set tight requirements around how students progress through the units and how this will affect each course in relation to simulation versus clinical practice.

As demonstrated in this review, the number of hours that simulation replaces has not been well defined in the literature. Most studies discuss the percentage of clinical

practice hours that has been replaced by simulation; however, no study discussed the actual or total hours completed by the profession in that country during their undergraduate study, limiting the transferability of the findings; “When considering substitution as a percentage of clinical hours, one must know the current number of clinical hours in a program ...” (Hayden, 2010, p. 55). With vast differences in required clinical placement hours across the world, a 25% or 50% replacement looks different from one jurisdiction to the next. This is important when comparing findings with the Australian context where pre-registration students are required to complete a minimum of 800 hours of clinical practice (ANMF, 2018). The United Kingdom requires 2,300 hours of clinical placement with 300 dedicated to simulation (Miller & Cooper, 2016). South Africa has the highest clinical placement hours of 2,800 (Miller & Cooper, 2016). In the United States, the required clinical placement hours are not well defined and there is no minimum requirements set (Hungerford et al., 2019). The decision on number of clinical hours included in a course is a state-by-state, institution-by-institution decision, making it very difficult to compare courses and translate into Australian practice. Even within Australia, there are great differences between tertiary institutions on the number of clinical hours incorporated in undergraduate nursing education; however, the minimum is 800 hours required for registration (Bogossian et al., 2018). The reasoning for these differences can be numerous, including the high cost of placements per student. This cost becomes a major factor when looking at placing students in the clinical area for more time (Miller & Cooper, 2016).

If we apply the findings by Hayden et al. (2014a,b) to Australia and replace 50% of clinical practice with simulation, the students will only be in a clinical area for a minimum of 400 hours or 10 weeks full-time equivalent. This would not allow students enough time to consolidate learnings in a practical aspect, prepare for the workforce, and acclimatise to the healthcare environment (Larue et al., 2015). Regulation around minimum number of clinical practice hours required needs to be explored further to ensure quality graduates are entering the workforce and patient care is not affected.

The study by Hayden et al. (2014a,b) is becoming the most cited study concerning this question; however, one study, in one country, is not enough to validate a practice change across the world. Further work is needed to prevent compromising the effectiveness of education (Harder, 2015). This includes having regulations around number of hours that can be replaced, the simulation modality used, the facilitators training, the costs involved, and the debriefing sessions required (Larue et al., 2015).

Limitations and Strengths

The limitations of this meta-narrative review include the limited number of studies conducted in Australia, which

highlights the gap in the literature. The review could not use a systematic review design due to the methodological heterogeneity of the sample. As such, the findings highlight the trends in the literature rather than seeking to prescribe changes. The strength of the study lies in the breadth of the review providing an opportunity to examine varying contexts for evidence to guide further research. The limitations of the meta-narrative approach include the resources required to conduct the review. Owing to the nature of the approach, it can be unclear when saturation has been reached and as such conclusions can be harder to draw. The structure provided by using RAMSES guideline by Wong et al. (2013) does not eliminate the researcher's interpretative judgement adding to the limitations of the approach. The strength of the meta-narrative review, however, addresses the variations in methodologies used throughout the literature and allowed for conclusions to be drawn from multiple sources. Owing to the nature of the review question, this method of review provided the best approach to the human impact and influence.

Conclusion

The use of simulation to replace part of clinical practice is being more actively proposed as a valid and useful tool when considering alternatives to the traditional clinical practice for nursing education. As this review has shown, the use of simulation to replace part clinical hours in several countries has been used with some success, albeit with limited generalisability, and shows little difference to student outcomes. Simulation provides a potential alternative to clinical placement hours that will allow students to practice skills, make conceptual connections, and improve their proficiency. The idea of implementing the findings and replacing up to 50% of clinical hours with simulation in Australia still needs further exploration; however, the results from this meta-narrative review look favourable in terms of the potential, but a need to increase clinical placement hours may be required to ensure student proficiency and readiness for the workforce.

Implications for Research and/or Practice

This review has highlighted a need for continued research into the area of replacing clinical hours with quality simulation in nursing in Australia. For this to occur, governing bodies would need to recognise simulation in contribution to clinical placement hours and tertiary institutions need to develop programs to compliment the simulation and adequately train students. This would also require further study into a consistent definition and quality of simulation, understanding of how simulation would integrate into undergraduate studies, and the number of hours of simulation versus number of hours of clinical placement experience required for proficient students.

Supplementary Data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ecns.2019.07.003>.

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