



Review

Use of simulation-based learning among perioperative nurses and students: A scoping review

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ABSTRACT

Objectives: Simulation-based learning has been extensively explored, especially in baccalaureate nursing programmes. Recently, simulation-based learning has been introduced in perioperative nursing. The aim of this scoping review is to investigate work published on the use of simulation-based learning in the field of perioperative nursing.

Design and data sources: A scoping review was conducted using the methodological framework of Arksey and O'Malley to identify a broad range of relevant literature, regardless of study design. A comprehensive and systematic search was performed using Medline, CINAHL, Eric, Svemed +, PsychINFO and Embase in May 2016 and then was updated in February 2018. Each database was searched for literature published between 1st January 2005 and 8th February 2018.

Review method: Two authors independently assessed literature eligibility and extracted data to answer our research question 'What is known about the use of simulation-based learning in the field of perioperative nursing?'

Results: Nine articles and one doctoral thesis were included in the review. There appears to be a paucity of research or results-oriented evidence regarding the use of simulation-based learning in the field of perioperative nursing. Different goals of simulation-based learning were reported. It was difficult to confirm whether these goals had been reached as none of the articles included control groups, and no evaluations had been undertaken against Kirkpatrick's level 3 to see changes in participants' behaviours, and level 4, to determine whether the training had a positive impact on, for example, patient outcomes.

Conclusion: Owing to the lack of research and the inadequate descriptions of design and method in simulation-based learning in most of the articles included, there is little evidence in the existing literature to guide practitioners of this learning in the field of perioperative nursing. This indicates a need for further research in this area.

1. Introduction

Perioperative nursing is viewed as a profession that provides advanced care for patients in high-dependency situations and requires complex knowledge and skills to ensure safe outcomes for surgical patients during the perioperative period. The perioperative period is the time immediately before, during, and after an operation (Arakelian

et al., 2017). The role of perioperative nurses may vary between hospitals, and competencies required for perioperative nurses may also vary across countries (Callaghan, 2011; Rothrock et al., 2015). In the present review, the perioperative nursing context is defined as the care provided by specialised trained registered nurses, also described as theatre nurses, scrub nurses, operating room nurses, circulating nurses, and its related education.

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Simulation-based Learning (SBL) integrates learning to perform routine tasks or role-playing communication techniques or involve higher level learning such as analysis and problem solving in problematic scenarios or case settings (Pilcher et al., 2012). Simulation has been defined as ‘a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection’ (Bland et al., 2011, p. 668). SBL intends to mimic real life situations so that participants can explore and develop critical thinking, problem solving, and practical skills in realistic environments, but within the teaching and learning context (Gaba, 2004; Yuan et al., 2012). Different levels of fidelity describe the accuracy or degree of realism in the simulation setting (Seropian et al., 2004). After a simulated scenario, a debriefing session provides opportunities to foster reflective learning that encompasses both reflection-in-action and reflection-on-action abilities (Schön, 1987). Finally, summative feedback is given (Dreifuerst, 2009) by the facilitator and other participants concerning the simulation performance and requirements for future situations (Reed et al., 2013). SBL use has the potential to enhance the professional development of perioperative nurses and students in areas such as critical thinking, clinical judgement, and knowledge.

2. Background

SBL has been extensively explored in baccalaureate nursing programmes and in clinical nursing practise. Systematic reviews show that, as an educational approach, the use of SBL has a positive effect on nursing students' knowledge, critical thinking, and confidence (Cant and Cooper, 2017; Jeppesen et al., 2017). A review by Fisher and King (2013) highlights the ability of students to transfer simulated learning to the clinical environment and to link theory with practice. This review concludes that the use of SBL can expose students to a broader range of experiences in safe environments and can enhance their confidence while also developing critical thinking skills, clinical judgement, and knowledge (Fisher and King, 2013). A meta-analysis of nursing education concluded that SBL is more effective than traditional learning methods (Shin et al., 2015). Another meta-analysis suggested that SBL use may augment the development of higher-level cognitive skills and promote the acquisition of clinical skills (Lee and Oh, 2015).

Several studies have investigated the use of SBL among post-graduate nurses, for example, with anaesthesia nurses, who must focus on acute situations and the intubation of patients (Henrichs et al., 2002; Rujirojindakul et al., 2014). Henrichs et al. (2002) found that SBL participants showed improved critical thinking and decision-making skills, increased confidence, and better clinical preparation. Among paediatric nurses, use of SBL has focused on the recognition and response to patient deterioration (Straka et al., 2012). Straka et al. (2012) found that SBL had a positive impact on novice nurses' critical thinking skills and that all participants recognised that SBL had contributed to an experience of a satisfactory or high degree of confidence during a critical situation.

Research conducted on the use of SBL in the field of perioperative nursing is limited. In order to systematically map the knowledge of SBL in the field of perioperative nursing, a scoping review was performed.

The aim of this scoping review was to investigate work published on the use of simulation-based learning in the field of perioperative nursing.

3. Methods

3.1. Design

For this literature review, we selected an interpretive scoping review methodology based on the framework outlined by Arksey and

O'Malley (2005). In contrast to systematic reviews, which also include assessment of the quality of the research, this framework charts, gathers, and summarises the known literature on a given topic, and aims to identify all existing literature on a topic regardless of its quality (Arksey and O'Malley, 2005). The framework comprises five stages: 1) identifying the research question, 2) identifying relevant literature, 3) selecting literature, 4) charting data, and 5) collating, summarising, and reporting results.

3.2. Identifying the Research Question

The concept, target population, and context were defined to clarify the focus of the scoping review and establish an effective search strategy (Arksey and O'Malley, 2005; Levac et al., 2010). The research question for this scoping review was, ‘What is known about the use of simulation-based learning in the field of perioperative nursing?’

3.3. Identifying Relevant Literature

A systematic search was performed in the databases Medline, CINAHL, Eric, Svemed+, PsychINFO, and Embase in May 2016, and then was updated in February 2018. Each database was searched for literature published between 1st January 2005 and 8th February 2018. The search was built and revised by three of the authors using text words and subject headings that were adapted to each of the databases. Search terms in Medline were: education, nursing, continuing/OR education, nursing, diploma programs/education, nursing, graduate/OR Specialties, Nursing/OR Medical-Surgical Nursing/OR Perioperative Nursing/OR operating room nursing/OR exp. Operating Rooms/OR ((operating* or surg* or theatre* or scrub* or preop* or periop* or medical- surgical) adj3 (nurs* or student*)).tw, kw) AND (exp Simulation Training/OR Manikins/OR exp. Role Playing/OR simulat*. tw, kw. OR role play*. tw, kw. OR manikin*.tw, kw.). Additionally, hand searches were made in the following journals: Clinical Simulation in Nursing, The Association of periOperative Registered Nurses (AORN Journal), Simulation in Healthcare, The Journal of the Society for simulation in Healthcare, Journal of Perioperative Nursing in Australia (ACORN), and The Canadian Operating Room Nursing Journal (CORNJ). Further, the reference lists of the literature obtained in full text were examined for additional material.

3.4. Selecting Literature

Initially, a total of 3885 articles were identified. After duplicates were removed, titles and abstracts of 2888 articles were screened by the first and third author. Based on the inclusion and exclusion criteria (Table 1), 24 articles and one doctoral thesis were read in full text. The first author read the full text of all articles and the doctoral thesis, and two other authors read the full text of twelve articles each, and the doctoral thesis. These three authors discussed the articles' relevance to the research question and whether they met the inclusion criteria. When there was doubt about whether an article met the inclusion criteria, a fourth author conducted an independent assessment. Finally, nine articles and one doctoral thesis were included. The selection process is shown in Fig. 1.

3.5. Charting Data

Arksey and O'Malley (2005) describe data charting as a process where both a narrative and an analytic approach are used to extract data from articles that best address the research aim. This is a technique for synthesising and interpreting data by sifting, charting, and sorting material according to key issues and themes (Arksey and O'Malley, 2005). Summaries of each article and the doctoral thesis were categorised by two authors into authors, publication year, country, aim,

Table 1
Inclusion and exclusion criteria.

Criterion	Inclusion	Exclusion
Types of literature/studies	All relevant quantitative and qualitative studies/literature on the phenomenon	Editorial, short communication and letters
Time period	1st January 2005 until February 8th 2018	Before 1st January 2005 and after February 8th 2018
Types of participants	Perioperative nursing educators, perioperative nurses, perioperative nursing students, nurses and nursing students	All other professions
Phenomenon of interest	Simulation-based learning used for education within the field of perioperative nursing Simulation-based learning used to test/develop instruments to evaluate perioperative nurses' non-technical/technical skills	Simulation-based learning focusing on inter-professional teamwork in general, focusing on all the professions in the team Virtual reality simulation-based learning

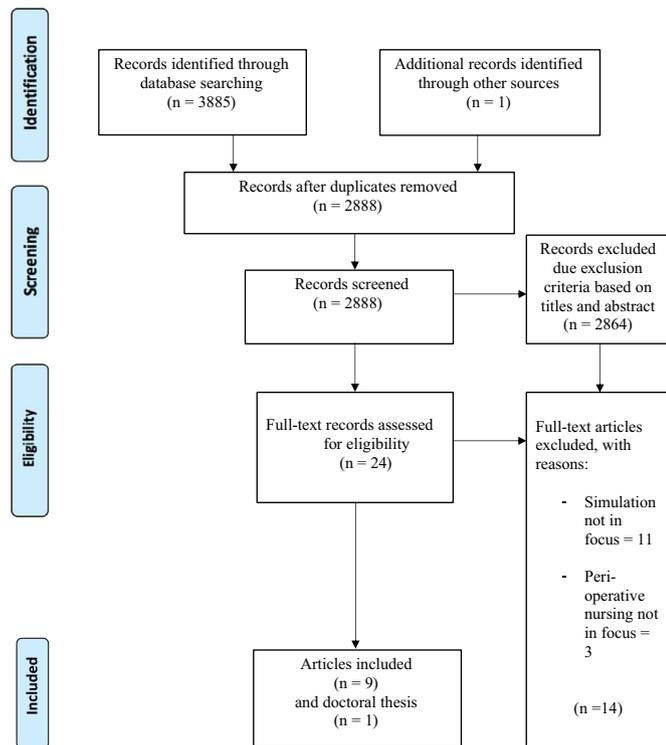


Fig. 1. Summary of the selection of publications.

design/methods, participants/sample size, and outcomes, into a scoping table. [Table 2](#) provides an overview of the included material.

To answer our research question as to what is known about the use of SBL in the field of perioperative nursing, we used an iterative and thematic approach. The literature was organised thematically according to important issues related to SBL.

3.6. Collating, Summarising, and Reporting Results

Among the nine articles and the doctoral thesis there were three articles conducted in the USA, three in Canada (including the doctoral thesis), three in the United Kingdom, and one in Brazil.

Design and methods were described in line with scientific requirements in three of the nine articles ([Mitchell et al., 2012](#); [Sevdalis et al., 2009](#); [Sousa et al., 2015](#)), and in the doctoral thesis ([Clendinneng, 2011](#)). Two of these articles described the testing and development of assessment tools for use in simulation training ([Mitchell et al., 2012](#); [Sevdalis et al., 2009](#)). The third article described a quasi-experimental study that used a pre- and post-test design to quantify (through the increased and improved knowledge and skills of the participants) the effectiveness of an educational intervention that included simulation ([Sousa et al., 2015](#)). Finally, [Clendinneng \(2011\)](#) aimed to better understand the phenomena of simulation and debriefing, and to describe

how nurses in a perioperative nursing education program experience simulation and debriefing.

In six of the articles, design and methods were not described in line with scientific requirements as they were either not described in enough detail or not described at all ([Ball et al., 2015](#); [Bashaw, 2016](#); [Flurry et al., 2012](#); [Granger et al., 2011](#); [Korkiakangas et al., 2015](#); [Whelan et al., 2016](#)). Two of the articles described courses or training programmes which included the use of simulation to introduce nursing students in bachelor programmes to perioperative nursing ([Ball et al., 2015](#); [Bashaw, 2016](#)). One described use of simulation to train registered nurses to take care of microsurgery patients ([Flurry et al., 2012](#)). [Whelan et al. \(2016\)](#) evaluated the effectiveness of a training programme. [Granger et al. \(2011\)](#) discussed a team training simulation, and [Korkiakangas et al. \(2015\)](#) introduced a data-grounded Video Simulation for Interactions in the Operating Theatre (ViSIOT).

4. Results

Through the thematic analysis, four themes evolved from the results of the scoping review concerning the use of SBL in the field of perioperative nursing: 1) the context where SBL was performed, 2) description of debriefing, 3) the purpose for which SBL was used, and 4) reported outcomes of SBL.

4.1. The context Where SBL was Performed

In four of the publications, the SBL was described as being conducted either in the operating room or in the context of an operating room ([Clendinneng, 2011](#); [Flurry et al., 2012](#); [Sevdalis et al., 2009](#); [Sousa et al., 2015](#)). In four publications, the SBL was carried out in special training facilities, such as a simulation laboratory, a learning resource and skills centre or a centre, for the advancement of minimally invasive surgery ([Ball et al., 2015](#); [Bashaw, 2016](#); [Granger et al., 2011](#); [Whelan et al., 2016](#)). Two articles did not describe where the SBL was conducted ([Korkiakangas et al., 2015](#); [Mitchell et al., 2012](#)).

The degree to which equipment was used varied. [Granger et al. \(2011\)](#) described in detail how they developed an abdominal model using a mannequin with a hollow, removable abdomen and a porcine small bowel. Other articles mentioned the equipment in less detail ([Bashaw, 2016](#); [Clendinneng, 2011](#); [Flurry et al., 2012](#)). In the remaining articles, the equipment was not described or even mentioned ([Ball et al., 2015](#); [Korkiakangas et al., 2015](#); [Mitchell et al., 2012](#); [Sevdalis et al., 2009](#); [Sousa et al., 2015](#); [Whelan et al., 2016](#)).

In four articles, the use of SBL was combined with other learning methods, such as lectures, seminars, workshops, clinical experience, and hands-on skills training ([Ball et al., 2015](#); [Flurry et al., 2012](#); [Sousa et al., 2015](#); [Whelan et al., 2016](#)).

4.2. Description of Debriefing

Debriefing was described or mentioned in five of the ten publications ([Ball et al., 2015](#); [Bashaw, 2016](#); [Clendinneng, 2011](#); [Granger](#)

Table 2
Overview of included literature.

Authors and countries	Aim	Design/methods	Participants/sample size	Outcomes
Ball et al. (2015) USA	To evaluate a simulation-based learning elective course in perioperative nursing	Not described in line with scientific requirements. Analysis of data were not described	4 Nursing students	Increased knowledge, confidence levels and improved self-efficacy. Increased interest in perioperative nursing and simulation was rated as the best learning activity in the course
Bashaw (2016) USA	To evaluate simulation-based learning in perioperative education	Not described in line with scientific requirements. Analysis of data were not described	9 Nursing students	Improved efficiency in responding to emergencies. The simulation experience was rated as positive
Clendinning (2011) Canada	To better understand the phenomena of simulation-based learning and debriefing as experienced by perioperative nursing students	A qualitative case study design was used. Qualitative content analysis was performed	9 Female peri-operative nursing students, aged 24–48	Simulation and debriefing were experienced as effective learning strategies for psychomotor skills, procedural skills, process centred patient care and working within an inter-professional team.
Flurry et al. (2012) USA	To create and evaluate a course that teaches nurses microsurgery through simulated patient scenarios	Not described in line with scientific requirements. Data analysis was not described	14 Nurses	A 20% improvement in knowledge scores upon completion of the course. 6-month follow of course participants showed long-term knowledge retention
Granger et al. (2011) Canada	To evaluate simulation-based team training in perioperative nursing students competence development	Not described in line with scientific requirements. Data analysis was not described	Perioperative nursing students. Sample size not apparent	Simulation with debriefing was an effective learning strategy for perioperative training, process centred patient care and working within an inter-professional team
Korkiakangas et al. (2015) UK	To introduce and evaluate a data-grounded simulation model for training social interaction strategies	Not described in line with scientific requirements	Second-year nurses and students. Sample size not apparent	The progress from Scenario 1 to Scenario 2 illustrated movement from unsettled interactions to more settled interactions
Mitchell et al. (2012) Scotland UK	To test the psychometric properties of the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS) behavioral rating system	Participants were introduced in the use of the SPLINTS* system to rate the performance of scrub practitioners seen in seven standardized simulated, surgical video- recorded scenarios. These ratings were used as a benchmark in subsequent analysis.	34 Experienced perioperative nurses; 27 female, 7 males	The reliability of the SPLINTS* system was deemed adequate for assessing scrub practitioners' nontechnical skills in simulated, standardized, video scenarios
Sevdalis et al. (2009) UK	To develop an observation based tool that captures perioperative nurses' technical skills	Observable behaviours were identified for four skills and rated on "1–6" scales. Reliability and validity were assessed in 20 Simulated scenarios	19 Perioperative-nurses; 17 female, 1 male, 1 did not respond	The tool was feasible to use in the context of simulation-based training.
Sousa et al. (2015) Brazil	To evaluate the effectiveness of an educational intervention for malignant hyperthermia	Quasi-experimental design. Pre-intervention tests and post-intervention tests were performed	7 Nurses and 89 nursing technicians	The effectiveness of the educational intervention was evidenced by an increased average of correct answers in the post-intervention knowledge test
Whelan et al. (2016) Canada	To present how to create a structured curriculum of simulation lab training, based on survey results and evaluate its effectiveness	Not described in line with scientific requirements	27 Nurses	Reduced orientation times, an overall improvement in surgical trainee competency, reduced attrition, improved patient safety

* SPLINTS = Scrub Practitioners' List of Intraoperative Non-Technical Skills.

et al., 2011; Korkiakangas et al., 2015). Debriefing sessions were characterized by allowing the participants to reflect on the situation (Granger et al., 2011), by evaluating the participants' reflections on the scenarios, and by responding to their questions (Ball et al., 2015; Bashaw, 2016).

4.3. The Purpose for Which SBL was Used

In two articles, the expressed purpose of the SBL was to increase specific knowledge and skills at the individual level (Ball et al., 2015; Flurry et al., 2012). The goal of the training presented by Ball et al. (2015) was to prepare the participants for the surgical setting, and to further motivate them in becoming perioperative nurses. They focused on different perioperative nursing skills such as scrubbing, gowning and gloving, positioning the surgical patient, skin preparation, handling surgical instruments, sterilization and disinfection, and opening sterile equipment (Ball et al., 2015). Flurry et al. (2012), aimed to augment the nurses' clinical experiences in order that they might learn and retain the knowledge and skills necessary for taking care of microsurgery patients. In two other articles, the purpose of the SBL was to train the participants in the management of rare and serious perioperative incidents such as malignant hyperthermia (Bashaw, 2016; Sousa et al., 2015).

The purpose, as described by Korkiakangas et al. (2015) and Granger et al. (2011), was to train team behaviours such as interaction, communication, and collaboration.

In the study by Clendinneng (2011), the purpose of SBL was to observe how students sequenced their psychomotor skills with other skills, such as teamwork and communication.

Whelan et al. (2016) used SBL to increase perioperative nurses' levels of comfort, and confidence on the job by improving their competence, and transforming them from novices to experts.

Finally, two articles described the use of SBL to develop observational rating tools (Mitchell et al., 2012; Sevdalis et al., 2009). Mitchell et al. (2012) used SBL to test the psychometric properties of the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS) instrument, and Sevdalis et al. (2009) used it in the development of an observational tool to measure perioperative nurses' technical skills.

4.4. Reported Outcomes of the SBL

Nearly all the included articles, and the doctoral thesis reported on subjective experiences and outcome categories. Participants' subjective experiences of SBL were unanimously reported as positive and these were reported on in several of the publications (Ball et al., 2015; Bashaw, 2016; Flurry et al., 2012; Granger et al., 2011; Korkiakangas et al., 2015). Furthermore, two articles reported that the participants perceived that the SBL had contributed to increased confidence levels in relation to performing required skills (Ball et al., 2015; Sousa et al., 2015).

Three articles reported increased levels of knowledge (Ball et al., 2015; Flurry et al., 2012; Sousa et al., 2015), and one described improved efficiency in emergency responses (Bashaw, 2016). Korkiakangas et al. (2015) found that participants were more likely to speak up to prevent situations that could expose a patient to danger.

In Clendinneng's (2011) study, participants reported that they had experienced SBL to be an effective learning strategy. Clendinneng (2011) hypothesized that learning was transferred from the SBL setting to the clinical environment through the post-simulation debriefing.

Finally, Mitchell et al. (2012) were able to show that the SPLINTS system was adequate for assessing scrub practitioners' non-technical skills. Sevdalis et al. (2009), found that the four skills defined as gowning/gloving, setting up instrumentation, draping, and maintaining sterility correlated positively, thus indicating adequate content validity.

5. Discussion

Our scoping review investigated literature published on the use of simulation-based learning in the field of perioperative nursing.

The results suggest a paucity of research into the use of SBL in perioperative nursing. In that SBL is increasingly implemented and used in perioperative nursing, it was surprising to find so few published studies on its use in this field. Perioperative nurses provide advanced care for patients in high-dependency situations (Hamlin et al., 2009) that requires advanced knowledge and skills to ensure safe outcomes. This includes team skills such as leadership, problem solving, communication, and decision-making (Kaldheim and Slettebø, 2016). However, evidence of the use of SBL in preparing to exercise these skills, for example, in perioperative nurse education where professional competence is developed, is limited. Critical thinking and reflection are important aspects of the learning process at all levels of professional development (Schmutz and Eppich, 2017), and studies in other areas show that SBL use enhances and develops nursing students' critical thinking (Cant and Cooper, 2017; Fero et al., 2010; Fisher and King, 2013).

In some studies that investigated the use of SBL for team training in the operating room, perioperative nurses were classified as 'surgical residents' (Briggs et al., 2015; Gettman et al., 2009; Nicksa et al., 2015). These reports on SBL do not emphasise the role of the perioperative nurse, but rather focus on acute situations in the operating room, which would include the roles and tasks of all members of an inter-disciplinary surgical team. Therefore, it is difficult to assess whether these findings are relevant for specific training in perioperative nursing.

The results from studies published on SBL in the baccalaureate nursing programme and in other nursing specialities may to some degree be transferred to the education of perioperative nurses. However, perioperative nursing is a field that is defined by its own specialities, and its students and practitioners need to use SBL to practise their own specific tasks and skills.

5.1. The Lack of Results-oriented Evidence and the Need for Literature in This Field

In six of the articles investigated, the design and method were not in line with scientific requirements. Furthermore, we found different goals for the use of SBL, and therefore it was difficult to confirm whether these goals had been reached (Ball et al., 2015; Bashaw, 2016; Flurry et al., 2012; Granger et al., 2011; Korkiakangas et al., 2015; Whelan et al., 2016). Kirkpatrick's (2009) model for the evaluation of training programmes describes four levels of evaluation. At level 1, participants' reactions to their experience of the training are measured (satisfaction). Level 2 is concerned with analysis of learning and whether the participants have truly benefited from the training (increase in knowledge, skills, or experience). Level 3 focuses on behavioral studies to see if the participants are utilizing what they learned (changes in behaviours); while level 4 focuses on the results, determining whether the training has a positive impact on, for example, patient outcomes (Kirkpatrick, 2009). Six of the articles we examined for this scoping review did not reach Kirkpatrick's levels 1 or 2 because of their inadequate description of a systematic measurement and analysis of learning. Clendinneng's (2011) doctoral thesis reached level 2 because she described an analysis of learning skills. Sousa et al. (2015) used a quasi-experimental design that included pre- and post-intervention tests, and this may have reached Kirkpatrick's level 2 (Kirkpatrick, 2009). None of the articles contained control groups, and no evaluations were undertaken on Kirkpatrick's levels 3 and 4.

In four of the articles, SBL use was combined with other learning methods (Ball et al., 2015; Flurry et al., 2012; Sousa et al., 2015; Whelan et al., 2016), and therefore it was difficult to identify outcomes that were purely due to the use of SBL. However, Ball et al. (2015) used a pre- and post-tests to rate each of the modules in the course, and the

bachelor nursing students rated the SBL experiences as the best learning activities in the course.

5.2. Creation of Simulation in the Perioperative Field

A variety of simulators are used in perioperative SBL, including anatomical models of the human body (Seropian et al., 2004). However, there seems to be a shortage of mannequins developed specifically for perioperative nursing, such as an open abdominal surgery simulator, and educators in perioperative nursing have to create their own custom-made mannequins for their SBL, using various materials and equipment (Granger et al., 2011). The accuracy or degree of realism of a SBL is rated by different levels of fidelity (Seropian et al., 2004), and this concept is usually understood as the degree to which a simulator looks, feels and acts like a human patient. This approach emphasises technological equipment, but empirical studies have shown that the educational effectiveness appears to be independent of levels of fidelity (Hamstra et al., 2014). To simulate perioperative nursing skills and to facilitate reflection during debriefing, a realistic mannequin on which 'surgery' can be performed is needed. It can be challenging for educators to create this level of realism and it is certainly more time and resource consuming than having a mannequin ready for their use. Furthermore, there may not be a tradition of simulating specific perioperative nursing situations. SBL has primarily been used to prepare nursing students to recognize and respond to patient deterioration (Bogossian et al., 2014), and the focus when using SBL in the operating room has often been on acute situations and intubations indicating the historical links of SBL to the area of anaesthesiology.

5.3. The Importance of Debriefing and Connecting it to Learning Goals for Perioperative Nurses

It is evident that debriefing is an important part of the SBL process. It is associated with critical thinking, clinical reasoning, and clinical judgement, which are all elements that are important in the learning process (Dreifuerst, 2009). Therefore, we were surprised that debriefing was only described or mentioned in four of the articles (Ball et al., 2015; Bashaw, 2016; Granger et al., 2011; Korikiakangas et al., 2015) and in the doctoral thesis (Clendinneng, 2011), when it is known that the reflexive learning process that occurs during a debriefing seems to promote the development of metacognitive and nontechnical skills in nursing students (Kirkbakk-Fjær et al., 2016). In SBL, the reflexive process is supported by facilitator-guided strategies during the debriefing that help the students to transfer principles of learning from the simulation to their clinical practice (Johnston et al., 2017).

5.4. Limitations

The use of a methodological framework and a documented method for the literature search adds strength to this study. However, there are limitations, as different terms are used to describe the role of the perioperative nurses, and different countries have different definitions of perioperative nursing (Callaghan, 2011). To identify relevant literature, different terms used to describe the role of perioperative nurses were included in the search strategy. We examined the context of the SBL as described in the identified articles to assess whether the SBL was used for education within the field of perioperative nursing. It is possible that we may have excluded literature where perioperative nurses or nursing students had indeed participated in the SBL. Furthermore, our literature search of publications was performed within language restrictions. Therefore, we may not have been able to identify all of the existing literature.

5.5. Future Research

There seems to be a paucity of research into the use of SBL in the

field of perioperative nursing, and only one of the articles and the doctoral thesis reached the levels described in Kirkpatrick's (2009) model for the evaluation of training programmes. Therefore, future research should focus on exploring SBL as used in the perioperative nursing field to gain knowledge of and insight into perioperative nurses' and perioperative nursing students' experiences and learning in situations involving SBL. There is also a need to focus on the evaluation level aimed at determining whether participants use their new skills when they encounter similar situations in clinical practise.

Preferably, the results should in some way measure the impact of the SBL and include improvement in perioperative nursing technical and non-technical skills with the goal of improving practice and patient safety during the perioperative period.

6. Conclusion

The combination of a lack of evidence and literature with insufficient design and method indicate the need for more research regarding the use of SBL in the field of perioperative nursing. There is a need to increase the use of high-fidelity SBL in perioperative nursing. Knowledge gaps on matters such as effective resource use and specific pedagogic approaches to using perioperative simulations need to be investigated further.

Author Contributions

Hege Kaldheim has participated with the idea, written proposal, data gathering, data analysis and has written and critically reviewed the article.

Ådel Bergland, Mia Alexandra Ølnes, Kristin Hofsvø, Alfhild Dihle, Johan Creutzfeldt, Chao Zhang and Simen Alexander Steindal have participated with data gathering, data analysis and have critically reviewed the article.

All authors have accepted and agreed on/to submit the final manuscript.

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