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Review Article

A Systematic Review of Health Care Presimulation Preparation and Briefing Effectiveness

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KEYWORDS
presimulation;
preparation;
briefing;
systematic review;
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Abstract

Background: Although simulation debriefing has been widely explored in the literature, there has been less reflection on presimulation activities. This systematic review examined effectiveness of presimulation preparation and briefing activities for health care professionals and students.

Methods: This review used Joanna Briggs Institute methodology and critical appraisal tools.

Results: Twenty-one studies were included. Most were rated as moderate quality and conducted in the United States with nursing students.

Conclusion: Presimulation preparation and briefing had positive effects on satisfaction and learning outcomes such as knowledge and skill performance. Presimulation activities should be tailored to learner levels of clinical and simulation experience.

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Clinical simulation is increasingly being used in the education of health professionals at both prelicensure and postgraduate levels. Standards of best practice for simulation developed by the International Nursing Association for Clinical Simulation and Learning (INACSL) are updated regularly as the evidence base grows (INACSL, 2016). A clinical simulation consists of three phases: preparation, participation, and debriefing; the preparation phase has two distinct components: presimulation preparation, and presimulation briefing or prebriefing (Tyerman, Luctkar-Flude, Graham, Coffey, & Olsen-Lynch, 2016). Although scenario development and debriefing are widely emphasized in the literature, less research focuses on presimulation phases and their contribution to learning (Chamberlain, 2015; Leigh & Steuben, 2018; Rudolph, Raemer, & Simon, 2014). It is critical to evaluate these components as simulation is increasingly being used for high stakes

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assessment and replacement of clinical hours (Arthur, Kable, & Levett-Jones, 2011; Calhoun, Bhanji, Sherbino, & Hatala, 2016; Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014).

Clinical simulation experiences are associated with high levels of stress and anxiety that can leave learners unable to perform during the simulation and inhibit learning; however, orientation to the simulation environment and scenario has been shown to lessen this anxiety (Gantt, 2013; Nielsen & Harder, 2013). Decreasing anxiety promotes student engagement during simulation and supports critical thinking and reflective practice (Brackney & Priode, 2015; Franklin, Sideras, Gubrud-Howe, & Lee, 2014; Rudolph et al., 2014). However, the optimal doses and types of presimulation activities have yet to be determined (Franklin et al., 2014; Gantt, 2013).

Key Points

- Presimulation preparation and briefing are separate and distinct components of simulation design and facilitation.
- Presimulation preparation and briefing activities can have positive effects on learner satisfaction, knowledge, and skill performance.
- Rigorous studies that focus specifically on presimulation activities are needed to inform best practice recommendations for different groups and levels of learners.

Background

Presimulation preparation activities aim to engage learners and provide them with the requisite knowledge, skills, and attitudes to participate successfully in a clinical simulation (Leigh & Steuben, 2018; Luctkar-Flude, 2019). Traditionally, presimulation preparation activities included lectures, textbook readings, and skills practice (Tyerman et al., 2016). More recently, alternate activities have been developed to enhance presimulation preparation including Web-based modules, mental rehearsal, or creating cognitive aids or care plans (Franklin et al., 2014; Gantt, 2013; Ignacio, Scherpbier, Dolmans, Rethans, & Liaw, 2017; Sharoff, 2015). Self-assessment through quizzes, self-reflections, or competency rubrics may help the learner identify knowledge or skill gaps in advance of the simulation and foster self-regulated learning (Chmil, 2016; Tyerman et al., 2016).

Prebriefing is described as an orientation session held just before a simulation-based learning experience in which instructions or preparatory information is given to participants and includes review of learning objectives, orientation to the learning environment, and overview of learner roles and expectations, to clarify learner expectations and support achievement of desired learning outcomes (Brackney & Priode, 2015; INACSL Standards Committee, 2016; Rudolph et al., 2014). Page-Cutrara (2014) completed a comprehensive review of nursing literature specifically on prebriefing and concluded that prebriefing may be beneficial in developing critical thinking and clinical judgment. Chamberlain (2015) completed a concept analysis of prebriefing in nursing simulation and recommended prebriefing be conducted by faculty educated in use of simulation, to enhance learner engagement and effectiveness of the experience. To expand on existing work on this topic, our review examined presimulation preparation and prebriefing for any health professionals or health professional students.

For the purposes of this review, we will be using the following definitions of key terms:

Presimulation preparation is any course-related content, materials, or activities in any format shared with the learner in advance of a simulation scenario, to optimize learning (Tyerman et al., 2016). Prebriefing or briefing is an interaction between facilitator and learners, just before the simulation experience, in which the facilitator may review scenario learning objectives and roles, provide orientation to the environment, and share other pertinent information relevant to the specific simulation experience (Tyerman et al., 2016).

Objective

The objective of this review was to systematically examine the effectiveness of various presimulation preparation and briefing activities for health care professionals and students. More specifically, the objective was to identify the effect of presimulation preparation and briefing on knowledge, attitudes, self-confidence, self-efficacy, anxiety, and skill performance in health care professionals and students.

Methods

This quantitative systematic review used Joanna Briggs Institute (JBI) methodology and critical appraisal tools. A three-step search strategy was used to locate both published and unpublished studies. Databases searched were as follows: Medline, CINAHL, PsycINFO, ERIC, Web of Science, Cochrane Central Register of Controlled Trials, Dissertation Abstracts, Google, OpenGrey, Grey Literature Report, and Grey Source. No date limit was used. The initial keywords used were as follows: simulation, prebrief$, brief$, prescenario, prescenario, presimulation, presimulation, pretrain$, pre-train$, preparation, orientation, facilitation.

Two independent reviewers reviewed abstracts and titles for relevance and retrieved and assessed full texts for methodological validity before inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute (JBI, 2018). Disagreements at each

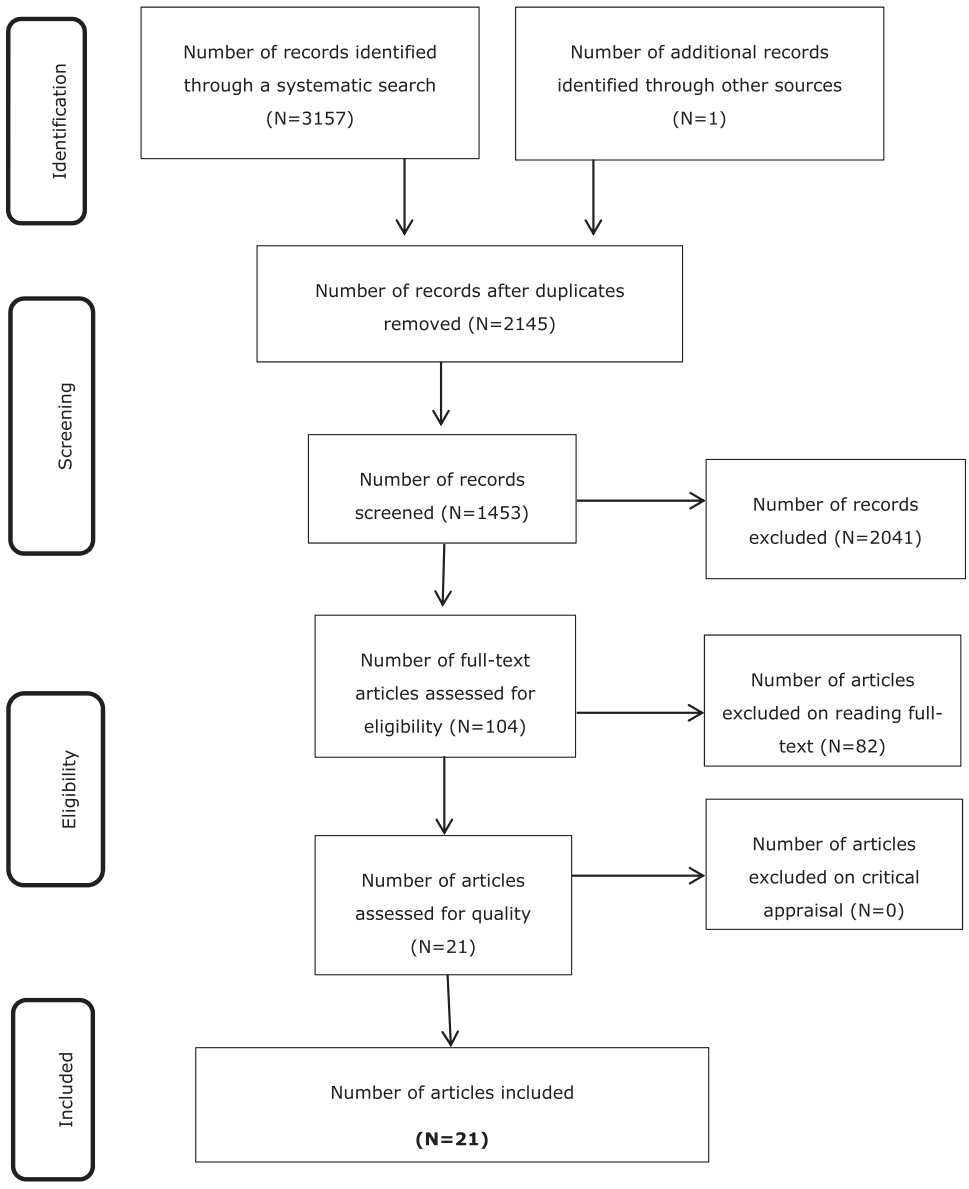

Figure 1 PRISMA flow diagram of search and study selection process. From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic. Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

stage were resolved through discussion or with a third reviewer. Further details about the methods of this review can be found in the review protocol published a priori to completing the review (Tyerman et al., 2016).

Analysis of review findings was guided by the Kirkpatrick's Training Evaluation Model (Kirkpatrick, 1994). Four outcome levels described in the framework are as follows: (a) reaction, (b) learning, (c) behavior, and (d) outcomes (Kirkpatrick, 1994). Outcomes at the reaction or satisfaction level may be classified as affective (whether participants liked the simulation intervention) or instrumental (whether participants found the training useful) (AHRQ, 2014; Kardong-Edgren, 2010). Learning level outcomes may be classified as attitudes (feeling), knowledge (knowing), or skills (doing) (AHRQ, 2014; Kardong-Edgren, 2010). Outcomes for each of the included studies were aligned with the Kirkpatrick's Levels of Evaluation to provide a picture of the level of the evidence supporting the use of various presimulation preparation and prebriefing activities and to identify gaps in the research.

Results

Description of Studies

The search strategy located a total of 3,158 citations (Figure 1). One hundred four articles were retrieved for

consideration, and a final set of 21 studies were included in the review. Publication dates spanned the years 2005 to 2017. Twenty-one studies included evaluations of presimulation preparation and/or briefing activities. Nine of the studies evaluated presimulation preparation alone (Bowyer et al., 2010; Birch et al., 2007; Coram, 2015; Davis Bye, 2014; Drummond et al., 2017; Franklin et al., 2014; Muller et al., 2007; Nevin, Neill, & Mulkerrins, 2014; Pucher et al., 2014), seven studies evaluated presimulation briefing only (Buckley & Gordon, 2011; Chamberlain, 2017; Deckers, 2011; Husebo, Friberg, Soreide, & Rystedt, 2012; Kelly, Hager, & Gallagher, 2014; Page-Cutrara & Turk, 2017; Smith, 2008), and five studies evaluated both presimulation preparation and briefing (Alexander, Bandiera, & Mazurik, 2005; Halaas, Zink, Brooks, & Miller, 2007; Kable, Arthur, Levett-Jones, & Reid-Searl, 2013; Kardong-Edgren, Starkweather, & Ward, 2008; Paige & Morin, 2015).

Ten of the studies used experimental or quasi-experimental study designs. Eleven studies employed nonexperimental observational or descriptive study designs. Eight studies were conducted in the United States, three studies in Australia, two studies in Canada, two studies in the United Kingdom, and one each from Ireland, Germany, France, and Norway. Most study participants were prelicensure students: 13 studies were conducted with nursing students and three with medical students. Five studies were conducted with postlicensure health care professionals: two with medical/surgical residents, one with nurses, and two with interdisciplinary groups.

Methodological Quality

Given the paucity of research in this area, no studies were excluded based on critical appraisal; however, methodological quality of the included studies must be considered when interpreting study findings. Research in this area is typically not randomized. Ten studies reported experimental/quasi-experimental methods involving comparisons between an experimental and control group. Six studies were assessed using the JBI Critical Appraisal Checklist for Randomized Controlled Trials and four using the JBI Checklist for Quasi-Experimental Studies to evaluate overall methodological quality (JBI, 2018). These studies were rated as moderate to high quality with a low to moderate risk of bias. Weaknesses included that none of the studies blinded participants to treatment allocation or described outcomes of those who withdrew.

Two observational studies were assessed using the JBI Checklist for Cohort Studies (JBI, 2018) and were rated low to moderate in quality with a moderate to high risk of bias. Study samples were not representative, and participants were not all at similar points in their programs. Outcomes were not assessed using objective criteria.

The remaining nine descriptive studies were assessed using the JBI Critical Appraisal Checklist for Cross Sectional studies (JBI, 2018). These studies were also rated low to moderate quality with moderate to high risk of bias. None of the studies were based on a random or pseudo-random sample or assessed outcomes using objective criteria. There were no group comparisons, and outcomes of participants who withdrew were not described.

Findings of the Review

Data are presented in tables separating results of evaluations of presimulation preparation from results of evaluations of presimulation briefing, and separating experimental from nonexperimental study designs. Outcomes from each study are further categorized according to Kirkpatrick's Levels of Evaluation (Kirkpatrick, 1994).

Presimulation Preparation

Seven experimental studies (Table 1) compared traditional presimulation preparation activities (e.g., lecture, assigned readings) to alternate ones (e.g., concept mapping, expert modeling videos) (Bowyer et al., 2010; Birch et al., 2007; Coram, 2015; Davis Bye, 2014; Drummond et al., 2017; Franklin et al., 2014; Pucher et al., 2014). All evaluated level 2 learning outcomes using objective tests (knowledge), self-report surveys (attitudes) and/or performance checklists (skills), and one additionally evaluated level 1 outcomes (satisfaction) using a self-report survey. One study found no difference in posttraining skills between learners prepared via an online PowerPoint lecture and a video pretraining session (Drummond et al., 2017); however, all other studies demonstrated some additional benefits offered by alternative presimulation preparation methods over traditional preparation or no preparation. One study demonstrated increased knowledge scores (Davis Bye, 2014) and five demonstrated greater skill performance scores (Bowyer et al., 2010; Birch et al., 2007; Franklin et al., 2014; Pucher et al., 2014) including one measuring clinical judgment (Coram, 2015). Attitudes (self-confidence and anxiety) demonstrated significant improvement in both groups where video expert role modeling was compared to a written assignment; however, self-confidence grew significantly only in the treatment group, and anxiety was reduced only in the control group (Coram, 2015). Attitudes (confidence) did not differ significantly between groups in two other studies (Birch et al., 2007; Pucher et al., 2014); however, at three-month follow-up, learners who received no preparation improved in perceived knowledge and confidence, as well as knowledge and skills performance scores (Birch et al., 2007). The outcome of satisfaction was evaluated in a single study and did not differ between groups (Bowyer et al., 2010).

Seven nonexperimental studies (Table 1) also evaluated presimulation preparation activities (Alexander et al., 2005; Buckley & Gordon, 2011; Halaas et al., 2007; Kable et al., 2013; Kardong-Edgren et al., 2008; Muller et al., 2007; Nevin et al., 2014; Paige & Morin, 2015; Smith, 2008); however, all these evaluated level 1 reaction

Table 1 Findings From Studies Evaluating Presimulation Preparation Activities

Author/Year/ Country	Study Design, Study Quality, and Sample Characteristics	Presimulation Preparation Activities		Kirkpatrick Level of Evaluation	Outcome Measures	Results
		Traditional	Alternate			
Experimental studies						
Drummond et al., 2017	Experimental: RCT Moderate (6/10) N = 82 second-year medical students	Lecture (online PowerPoint)	Video pretraining	Level 2: learning	**Skills:** OSCE checklist (12-item) Cohen's Kappa = 0.87	**Skills:** no difference between groups in skill performance after training. No difference in skill retention at 4 months.
Coram, 2015 U.S.	Experimental: RCT Moderate 6/10 N = 43 novice medical-surgical nursing students: n = 21 control and n = 22 treatment	Seminar written assignment	Video of expert nurse role modeling care of patient	Level 2: learning	**Clinical judgment:** Lasater Clinical Judgment Rubric (LCJR) **Attitudes:** Nursing Anxiety/Self-Confidence with Clinical Decision Making Scale (NASC-CDM) (27 items)	**Clinical judgment:** **NASC-CDM**—treatment group significant improvement in interpreting ($p = .03$) only **LCJR**—significant difference ($p = .000$) between control and treatment group in noticing, interpreting, responding, and reflecting scales **Attitudes:** self-confidence—treatment group showed significant improvement; anxiety—control group showed greater reduction ($p = .00$) although a decrease was noted in both groups ($p = .010$)
Davis Bye, 2014	Quasi-experimental: nonequivalent groups Moderate (4/10) N = 74 junior nursing students	Readings, PowerPoint slides, case study	Concept mapping + group discussion	Level 2: learning	**Knowledge:** multiple choice question test (20 items)	**Knowledge:** posttest scores differed significantly between the alternate preparation group (increased four points) vs the traditional preparation group (decreased 5.6 points)
Franklin et al., 2014	Experimental: RCT High (7/10) N = 20 senior nursing students in integrated practicum course	Reading assignments	Expert modeling videos Voiceover PowerPoints	Level 2: learning	**Skills:** Creighton Simulation Evaluation Instrument (CSEI) (22 items) IRR 84%-87%	**Skill performance:** no significant differences noted in raw improvements in competence among the three groups, but expert modeling (Cohen's d = 0.413) and voiceover PowerPoint methods (Cohen's d = 0.226) resulted in greater improvements in competence, compared with the traditional reading assignment
Pucher et al., 2014	Experimental: RCT High (7/10) N = 29 junior surgical trainees: n = 14 intervention and n = 15 control	Standard (no specific info)	Lectures, videos + discussion	Level 2: learning	**Attitudes:** confidence questionnaire **Skills:** Surgical Ward Care Assessment Tool (SWAT); nontechnical skills score for ward-based care (W-NOTECHS)	**Attitudes:** no differences in confidence between groups ($p > .1$) **Skill performance:** patient assessment (control 63.5 ± 8.1% vs intervention 79.8 ± 11.9%, $p = .002$), management (56.0 ± 19.7% vs 72.2 ± 10.3%, $p = .014$), overall SWAT scores (59.8 ± 17.9% vs 72.4 ± 10.8%, $p = .001$), and nontechnical skills (17.8 ± 2.1 vs 23.3 ± 1.2, $p < .001$) significantly higher in group receiving the alternate preparation

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Table 1 (*continued*)

Author/Year/ Country	Study Design, Study Quality, and Sample Characteristics	Presimulation Preparation Activities		Kirkpatrick Level of Evaluation	Outcome Measures	Results
		Traditional	Alternate			
Bowyer et al., 2010	Quasi-experimental: after only equivalent groups Moderate (4/10) N = 533 third-year medical students: n = 163 group 1 n = 163 group 2 n = 109 group 3 n = 118 group 4	Group 3: lecture + live demo pretraining	Group 1: no pretraining Group 2: video Group 4: video + lecture + demo	Level 1: reaction Level 2: learning	**Satisfaction:** rated usefulness and realism **Skills:** self-assessed ability to have a plan for and to break bad news; SPW assessed skills (21 items)	**Satisfaction:** All groups equally rated experience as useful (mean 4.35/5 ± 0.74) and realistic (4.21 ± 0.77); **self-assessed skill performance:** All groups had significant ($p < .001$) improvement (3.75 ± 0.62; 3.72 ± 0.69) over baseline (2.74 ± 0.79; 2.76 ± 0.76) without degradation at the end of 12 weeks (3.61 ± 0.80; 3.67 ± 0.78); training groups self-rated themselves more capable than those who had no training; **SPW-assessed skill performance:** pretraining groups rated superior to those with no training on several communication skills
Birch et al., 2007	Experimental: RCT Moderate (5/10) N = 6 multiprofessional teams, each with six members (junior and senior obstetric and midwifery team members)	Lecture	No preparation	Level 2: learning	**Knowledge:** quiz **Attitudes:** perceived knowledge and confidence scores **Skills:** observed performance on OSCE	**Attitudes:** Lecture sim groups improved 14 points vs 9 points for no prep groups; no prep sim groups improved further 1 point at 3-month retest vs 5-point decline in the lecture groups **Knowledge and skills:** Lecture groups improved 98 points vs 74 points for the no prep groups; no prep groups improved 25 points at 3 month follow-up vs 4-point decline in lecture groups ($p = .086$)
Nonexperimental studies						
Paige & Morin, 2015	Descriptive: nonexperimental: Q-method Moderate (4/9) N = 45 nursing students, various programs, and sim experience	Unspecified		Level 1: reaction	**Satisfaction:** Q-method ranking	4/45 (9%) of students expect all students to prepare for all sim roles 5/45 (11%) of students were least likely to value presim assignments 5/45 (11%) of students recommended having presim assignments Students holding 4/5 perspectives found presim activities beneficial
Nevin et al., 2014	Descriptive: nonexperimental: posttest Moderate (4/9) N = 87 third-year nursing students		Patient details, roles, web site, videos	Level 1: reaction	**Satisfaction:** Evaluation survey: 15 items; five-point scale	Prepared me for session: 80.5% Agree/Strongly Agree (A/SA); well-structured/easy to follow: 89.6%; web sites useful in preparing for sim: 66.6% A/SA needed more support with prep: 22.9% A/SA

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Table 1 (*continued*)

Author/Year/ Country	Study Design, Study Quality, and Sample Characteristics	Presimulation Preparation Activities		Kirkpatrick Level of Evaluation	Outcome Measures	Results
		Traditional	Alternate			
Kable et al., 2013	Descriptive: nonexperimental: posttest Moderate (4/9) Site 1: N = 60 second-year nursing students Site 2: N = 25 first-year nursing students	Readings, labs, tutorial, and workbooks		Level 1: reaction	**Satisfaction:** postsimulation evaluation survey: 17 items	71% of students felt well prepared theoretically before the sim; first-year students scored significantly higher preparation and orientation scores overall ($p < .001$)
Kardong-Edgren et al., 2008	Descriptive: nonexperimental: repeated measures Moderate (4/9) N = 100 nursing students in first clinical; 84% female, aged 19-48 years (mean 23.6)	Learning modules and skills practice		Level 1: reaction	**Satisfaction:** NLN Simulation Design Scale: 20 items; five-point scale	Scale item related to presimulation preparation (objectives and information) was rated highly.
Halaas et al., 2007	Descriptive: Nonexperimental: posttest Low (2/9) N = 76 third-year medical students		Online video orientation to sim lab	Level 1: reaction	**Satisfaction:** Postsimulation evaluation survey: 10 items; five-point scale	Received adequate info to prepare for sim event (4.17/5) Event improved their confidence (4.14/5)
Muller et al., 2007	Descriptive: nonexperimental: posttest Low (2/9) N = 17: n = 9 physicians; n = 7 EMT; n = 1 nurse		CRM demo, psychological exercises	Level 1: reaction	**Satisfaction:** evaluation survey: 12 items; six-point scale	Demonstration and lecture were rated highly (5/6) Psychological exercises were rated highly (6/6)
Alexander et al., 2005	Descriptive: nonexperimental: posttest Low (2/9) N = 14 emergency medicine residents (PGY 1-5)		Internet activities and discussion forum	Level 1: reaction	**Satisfaction:** Postexercise evaluation survey: 10 items; five-point scale	Clear objectives 3.7/5; realistic objectives 3.9/5 Presim prep not rated as highly as other components of sim: learned something: 4.8/5: enjoyment: 4.9/5

and satisfaction outcomes using self-report measures. Two of these studies evaluated traditional presimulation preparation activities (Kable et al., 2013; Kardong-Edgren et al., 2008), four evaluated alternate presimulation preparation activities (Alexander et al., 2005; Halaas et al., 2007; Muller et al., 2007; Nevin et al., 2014), and one study did not specify (Paige & Morin, 2015). In all cases, the components of presimulation evaluated were rated highly and found to be beneficial. In one of the studies, first-year nursing students scored preparation significantly higher than second-year students (Kable et al., 2013); however, in another study, emergency medicine residents did not rate it as highly as other simulation components (Muller et al., 2007).

Presimulation Briefing

Only three experimental studies (Table 2) evaluated and compared traditional presimulation briefing to an alternate one (Chamberlain, 2017; Husebo et al., 2012; Page-Cutrara & Turk, 2017). The use of prebriefing activities versus no prebriefing resulted in increases in learner perceptions of confidence and learning, and overall simulation effectiveness (Chamberlain, 2017). Alternate preparation (observation of another group's simulation and debriefing) resulted in a small nonsignificant difference in the level 2 learning outcome of skills performance and no significant differences on time-to-completion variables (Husebo et al., 2012). Learners who participated in an alternate prebrief that included a worksheet and facilitated reflection scored significantly higher in clinical judgment than a traditional prebrief group that included orientation activities only (Page-Cutrara & Turk, 2017).

Nine nonexperimental studies (Table 2) also evaluated prebriefing activities (Alexander et al., 2005; Buckley & Gordon, 2011; Deckers, 2011; Halaas et al., 2007; Kable et al., 2013; Kardong-Edgren et al., 2008; Kelly et al., 2014; Paige & Morin, 2015; Smith, 2008). All evaluated the level 1 outcome of satisfaction, and a single study also evaluated the level 2 learning outcome of attitudes (self-confidence) using self-report measures (Smith, 2008). Presimulation briefing was rated highly in four studies (Buckley & Gordon, 2011; Deckers, 2011; Halaas et al., 2007; Kardong-Edgren et al., 2008) and was rated higher than debriefing by most second semester nursing students (Deckers, 2011). Briefing components were also rated as beneficial in two studies in which other components of simulation were rated higher (Alexander et al., 2005; Kelly et al., 2014). In the remaining studies, subsets of nursing students (Paige & Morin, 2015), first-year nursing students (Kable et al., 2013), and less experienced nurses (Buckley & Gordon, 2011) placed greater value on various briefing strategies. The briefing component of objectives had the highest correlation to both satisfaction and self-confidence in a study conducted with junior nursing students, with results most significant for second versus third semester students (Smith, 2008).

Discussion

To facilitate analysis, data from studies included in this review were presented in tables separating results of evaluations of presimulation preparation from results of evaluations of presimulation briefing, and separating experimental study designs from nonexperimental designs. It is worth noting that even when focusing on both types of presimulation activities (preparation and prebriefing), only 21 studies could be found over the period spanning 2005 to 2017 that examined the outcomes associated with these activities. This relative dearth of research literature belies the potential significance of this portion of simulation design. Specifically, this review provides evidence that presimulation preparation activities contribute to improved knowledge, self-confidence, clinical judgment and performance, and lowered anxiety. Differences in self-report scores for novice students suggest that it may be even more important for them to have clear understandable guidelines and expectations before participating in simulation.

Although there is not enough research to determine if one method of preparation is associated with superior learning outcomes to another, there is a consensus that inclusion of alternate methods of presimulation preparation and/or prebriefing leads to better learner outcomes than either traditional approaches or no preparation at all.

Kirkpatrick's Levels of Evaluation

Kirkpatrick's Levels of Evaluation provided a useful framework for categorizing outcomes of presimulation interventions described in the studies. In this review, all the studies focused on outcomes associated with levels 1 or 2 of Kirkpatrick's Framework. These findings are important as understanding learner perceptions of the value of a learning component (level 1), determining whether they acquired the intended skill and knowledge and whether attitudes were changed (level 2), is fundamental to high-quality simulation design. Results of this review demonstrate that for both levels 1 and 2, presimulation activities are associated with benefits to learners. Outcome evaluation at the behavior level (transfer of skills to real clinical settings) and outcomes level (patient care results) are challenging and expensive to conduct (Kardong-Edgren, 2010; Shin, Park, & Kim, 2015). Thus, it was not surprising that outcomes in the studies included in this review were measured at the reaction and learning levels only. In addition, given the relative newness of simulation-based learning in mainstream health sciences education, this finding may represent the evolution of simulation pedagogy and the associated research undertaken to date to develop a robust evidence base. However, as the art and science of simulation pedagogy continue to develop, it will be important to expand research foci to additionally include evaluation at levels 3 and 4 of Kirkpatrick's Framework.

Table 2 Findings From Studies Evaluating Presimulation Briefing Activities

Author/Year/ Country	Study Design, Study Quality, and Sample Characteristics	Presimulation Briefing Activities		Kirkpatrick's Level of Evaluation	Outcome Measures	Results
		Traditional	Alternate			
Experimental studies						
Chamberlain, 2017	Quasi-experimental: after only equivalent groups Moderate 5/10 N = 119 undergraduate nursing students Site A: n = 55 Site B: n = 64	(1) No prebriefing	(2) Prebriefing learning (3) prebriefing orientation only (4) prebriefing learning engagement	Level 2: learning	**Attitudes:** simulation effectiveness, learning, and self-confidence using the Simulation Effectiveness Tool (13 items) Cronbach's α 0.93	**Learning:** Perceptions of learning significantly higher with use of prebriefing activities compared with none ($p = .000$) **Confidence:** Perceptions of overall confidence higher with use of prebriefing activities compared to none ($p = .000$) **Simulation effectiveness:** Perceptions of simulation effectiveness were higher with use of prebriefing activities compared to no prebriefing ($p = .000$)
Page-Cutrara & Turk, 2017	Experimental: RCT Moderate (6/10) N = 76 fourth-year nursing students in medical-surgical course	Traditional prebriefing: orientation to equipment, roles, length of time	Traditional prebrief + prebrief worksheet, facilitated reflection	Level 2: learning Level 1: reflection	**Clinical judgment:** Creighton Competency Evaluation Instrument (CCEI) (23 items) IRR 84%-89% **Attitudes:** Prebriefing Experience Scale (PES) Cronbach's α 0.94	**Clinical Judgment:** significant difference between clinical judgment between groups ($p = .01$) **Attitudes:** Perception of prebriefing phase—no significant difference within and between groups ($p < .001$)
Husebo et al., 2012	Quasi-experimental: after only nonequivalent groups Moderate (4/10) N = 81 nursing students in last semester of 3 years n = 72 female; aged 22—49 years (mean 26 years)	Orientation and review of learning objectives	Addition of observation of another group's sim and debrief	Level 2: learning	**Skills:** Researcher-developed checklist (23 items) IRR = 88%	**Skill performance:** Alternate prep resulted in a small, nonsignificant difference in total points (items 1-19) on the D-CPR checklist and no significant differences on the time-to-completion variables (items 20-24)
Nonexperimental Studies						
Paige & Morin, 2015	Descriptive: Q-method Moderate (4/9) N = 45 nursing students	Unspecified		Level 1: reaction	**Satisfaction:** Q-method ranking	11/45 (24%) of students wanted structure & guidance, wanted orientation & opportunity to practice with manikins, desired specific learning objectives and find it helpful when learning objectives verbally reviewed; 5/45 (11%) least likely to value review of learning objectives

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Table 2 (*continued*)

Author/Year/ Country	Study Design, Study Quality, and Sample Characteristics	Presimulation Briefing Activities		Kirkpatrick's Level of Evaluation	Outcome Measures	Results
		Traditional	Alternate			
Kelly et al., 2014	Observational: posttest Moderate (4/9) N = 150 senior nursing students; 57% 3-year program; 25% 2-year graduate entry (GE); 18% 2-year enrolled (EN) with college experience; 82% female; 68.9% aged 19-25	Briefing and orientation to simulation laboratory		Level 1: reaction	**Satisfaction:** Postsimulation survey: 11 components of simulation; 5-point scale	Briefing/orientation ranked 8/11 components; ranked 9/11 by 3-year recent graduates, 7/11 by 2-year graduate & 1 year technical college entry; Students rated all 11 simulation components useful in applying clinical judgment
Kable et al., 2013	Descriptive: Nonexperimental: posttest Moderate (4/9) Site 1: N = 60 second-year nursing students Site 2: N = 25 first-year nursing students	Site 1: 5-10 minutes orientation Site 2: unclear		Level 1: reaction	**Satisfaction:** Postsimulation evaluation survey: 17 items;	Awareness of learning objectives lowest-scoring pedagogical principle (85%), Orientation & briefing perceived as adequate (84%) of all students & 92% of first-year students ($p = .001$) who rated it higher overall ($p < .001$)
Buckley & Gordon, 2011	Descriptive: nonexperimental: posttest Moderate (4/9) N = 38 RNs in a graduate course; 90% female, mean age 35 years	Orientation to simulator and environment	Team building and communication exercises	Level 1: Reaction	**Satisfaction:** Postsimulation survey	Assertiveness skills training one of most highly rated aspects (80%). Practising patient handover (53%) least rated aspect. Less experienced more likely to rate practising team leader role highly useful
Deckers, 2011	Observational: nonexperimental: posttest Low (2/9) N = 22 second semester nursing students in a 2-year program	Orientation to environment, roles, goals	Concept mapping group activity	Level 1: Reaction	**Satisfaction:** Ranking 5 phases of simulation including preplanning & briefing	Briefing rated as essential for good simulation, and most participants rated briefing higher than debriefing.

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Table 2 (*continued*)

Author/Year/ Country	Study Design, Study Quality, and Sample Characteristics	Presimulation Briefing Activities		Kirkpatrick's Level of Evaluation	Outcome Measures	Results
		Traditional	Alternate			
Kardong-Edgren et al., 2008	Descriptive: Nonexperimental: repeated measures Moderate (4/9) N = 100 nursing students in first clinical course	Review learning objectives and manikin		Level 1: Reaction	**Satisfaction:** NLN Simulation Design Scale: 20 items; 5-point scale	The simulation design scale items related to presimulation briefing (support) were rated highly.
Smith, 2008	Descriptive: nonexperimental: posttest Moderate (5/9) N = 68 junior nursing students; 89.7% female; aged 20-48 years (mean 23.4 years; SD = 5.4)	Orientation to simulator, laboratory, roles & scenario; verbal report & patient chart		Level 1: Reaction Level 2: Learning	**Satisfaction/Attitudes:** NLN Student Satisfaction and Self-Confidence in Learning Scale: 13 items; 5-point scale. Simulation Design Scale: 20 items	Simulation Design Scale scores: Support: M 4.6/5; moderately correlated with satisfaction ($r = 0.511$) & self-confidence ($r = 0.508$) Objectives: M 4.4/5 which had highest correlation to satisfaction ($r = 0.614$) & self-confidence ($r = 0.573$); most significant for second vs third semester students
Halaas et al., 2007	Descriptive: nonexperimental: posttest Low (2/9) N = 76 third-year medical students		Online audio-visual orientation to simulation laboratory & expectations	Level 1: Reaction	**Satisfaction:** Postclinical skills day survey; 5-point scale	The majority (71%) thought the orientation was very helpful (15%) or helpful (56%).
Alexander et al., 2005	Descriptive: nonexperimental: posttest Low (2/9) N = 14 emergency medicine residents	No patient info provided in advance	Mock oral examination questions	Level 1: Reaction	**Satisfaction:** Postexercise evaluation survey: 10 items; 5-point scale	Clear objectives 3.7/5; Realistic objectives 3.9/5; not rated as highly as other components of sim: Learned something: 4.8/5 Enjoyment: 4.9/5

Components of Presimulation Design

Presimulation preparation activities that review knowledge and skills for a specific simulation scenario can help reduce learner anxiety and promote achievement of learning objectives (Elfrink, Kirkpatrick, Nininger, & Schubert, 2010). Of the 21 studies included in this review, 12 focused on presimulation briefing, with nine of those being nonexperimental studies. In addition, 14 studies focused on presimulation preparation, with seven of those being experimental design and seven being nonexperimental or descriptive studies. Only 5 of the 21 studies included in this review comprised both presimulation preparation and prebriefing components. Yet, it is apparent that presimulation preparation and briefing, although separate phases, are conceptually linked as necessary presimulation activities. Although evidence from this review indicates that both presimulation preparation and briefing enhance learner outcomes at levels 1 and 2 of the Kirkpatrick Framework (Kirkpatrick, 1994), these two elements of presimulation activities are not clearly delineated in the literature. In the absence of any widely accepted standardized approach to simulation design that promotes clarity around the necessary elements of presimulation activities that must be developed and evaluated, there is a risk that blurring of these elements and their associated outcomes may occur.

Limitations

Findings from this review should be interpreted in light of several limitations. Few experimental study designs were used, and most studies were single-site studies with relatively small sample sizes. The methodological quality of studies was generally low to moderate, indicating a moderate to high risk of bias, and few studies used objective outcome measures. However, the experimental/quasi-experimental studies were rated as moderate to high quality, indicating a lower risk of bias. Most studies were conducted with prelicensure nursing students, which limits generalizability of findings to other health care professionals and students. The major limitation was that presimulation preparation and briefing were not usually the focus of the studies.

Implications for Practice

The following implications and the key recommendations (outlined in Table 3) are based on an overall level of evidence rated as moderate quality. The recommendations also align with the INACSL Standards of Best Practice: Simulation for Simulation Design and Facilitation (INACSL, 2016). Presimulation preparation and prebriefing activities appear to have a positive effect on learner satisfaction and learning outcomes such as knowledge and skill performance. Results of this review suggest that the level of presimulation preparation and prebriefing activities should be tailored to the level of the learner related to both clinical and simulation experience. For example, presimulation preparation activities that review knowledge and skills for a specific simulation scenario can help reduce learner anxiety and promote achievement of learning objectives (Elfrink et al., 2010; Gantt, 2013; Nielsen & Harder, 2013).

Table 3 Recommendations for Designing and Implementing Presimulation Preparation and Prebriefing Activities

1. Tailor presimulation preparation and briefing activities to level of the learner related to both their clinical and simulation experience
2. Incorporate presimulation preparation activities selected from a wide array of traditional and nontraditional approaches, such as self-assessment, assigned readings, lecture notes, voice-over PowerPoints, interactive online activities, case scenarios, and so on.
3. Use briefing scripts to standardize the information provided to learners

As part of simulation design, each experience should incorporate presimulation preparation selected from a wide array, such as self-assessment, assigned readings, lecture notes, development of a care plan, instructor-generated questions, voiceover PowerPoint presentation, interactive online activities, learning modules, case scenarios, and psychological exercises. The presimulation activities, guided by the learning objectives, prepare the learner with required foundational knowledge to fully immerse in the simulation experience. Acquiring foundational knowledge in advance, applying it during the scenario, and engaging in a debriefing, promotes a deep reflection that supports knowledge development. Standardizing the approach to presimulation preparation will be of benefit not only for research purposes but also when evaluating the participant and the overall simulation experience.

Similarly, standardizing the approach to the briefing will provide consistent information to be shared with each participant. Although the time frame for briefing activities is largely unknown, it should be conducted close enough to the experience so the participant may have good recall of the information and further research may provide clarity as to how to optimize this factor. The briefing should include specific information related to the orientation of the environment, such as the physical space, equipment, and the capabilities of the manikin. To ensure consistent information is shared with each group participating in the simulation experience, the briefing should be scripted and is often provided as a handover report. During the briefing, participant roles are discussed for clear understanding of the expectations for the experience.

Carefully planned presimulation activities and briefing before the simulation experience support participant learning by preparing the participant for the scenario. This preparation fosters confidence and builds competence in the participant, while decreasing performance anxiety (Gantt, 2013). However, it is unreported to what degree the students actually engage in the assigned preparatory work. For this reason, participants may be required to do preparation activities immediately before the briefing.

During this review, it became apparent that there is a need for definition of terms to operationalize presimulation activities that prepare the participant for the simulation experience and the prebriefing or orientation to the environment. Often, terms such as presimulation activity, prebriefing, and briefing are used synonymously, further contributing to ambiguity and obscuring of these separate and distinct components of the simulation experience. These components of the simulation experience, once integrated as separate entities within the simulation, require evaluation as part of the quality improvement process.

Implications for Research

For the science in this area to advance, there is a need for further rigorous studies with experimental and quasi-experimental designs that focus specifically on presimulation preparation and briefing activities to inform recommendations for best practices for different groups and levels of learners. Future studies may also include longitudinal design to elucidate the components of presimulation activities with associated influence on knowledge application and patient outcomes, targeting Kirkpatrick's Levels 3 and 4. Prospective studies may examine theoretical underpinnings and linkages to established frameworks. Using a systematic approach to simulation design with full attention to both presimulation preparation and briefing guided by a theoretical framework such as the NLN Jeffries Theory (Jeffries, Rodgers, & Adamson, 2015) with a focus on presimulation preparation and briefing may improve the rigor of the study. Another void in the literature worthy of future research is the dosing of the presimulation preparation and briefing. Many unanswered questions, such as the appropriate time interval between preparatory materials being assigned, being completed, and learners engaging in the simulation experience, remain. Continuing in this vein, questions to be answered by future research include the most effective method of presimulation preparation and briefing. As a presimulation activity, determining if reading a textbook is less efficacious than actively engaging in an activity such as concept mapping or self-assessment is essential in developing an evidence-based science of simulation pedagogy. In the briefing phase, examining the preferred method of receiving specific information to orientate the participant to the learning environment is equally important.

Qualitative studies may provide additional context for shaping recommendations for future practice. Exploring the perspectives of participants of the presimulation preparatory materials, as well as the briefing or orientation to the environment and the participant's ability to engage in the simulation scenario, would be important future foci.

Conclusion

Findings from this review have significance for practice and research when using simulation for teaching and learning. Presimulation preparation and briefing have positive outcomes on the participant satisfaction and learning outcomes, most evident at Kirkpatrick's Levels 1 and 2. Findings suggest that presimulation preparation and briefing are separate and distinct components of simulation design, each associated with positive learning outcomes. However, there is further work to be done in making both components explicit for teaching-learning and research purposes.

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