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Abstract

Background
Debriefing is a critical component of clinical simulation, yet there are limited studies that demonstrate the outcomes of debriefing on learners' clinical judgment.

Method

Using the Lasater Clinical Judgment Rubric, this mixed-method study examined the effects of structured debriefing after 2 clinical simulation experiences on 86 junior-level baccalaureate nursing students' clinical judgment. Debriefing for Meaningful Learning© was the method used for the structured debriefing sessions.

Results

The mean clinical judgment scores of the intervention group were higher and improved more over time compared with the mean scores of those in the control group; however, the differences were not statistically significant.

Conclusions

Data generated from focus group interviews suggest that students perceived the structured debriefing sessions as being learner-focused discussions that provided a holistic approach that included a review of knowledge, technical skills, and their reactions and emotions about the learning experiences.

KeyWords

Debriefing is the process whereby faculty and students reexamine the clinical encounter in order to foster the development of clinical reasoning and judgment skills through reflective learning (Dreifuerst, 2009). For purposes of this study, *clinical judgment* and *clinical reasoning* were used as interchangeable terms since the literature indicates that judgment informs reasoning and reasoning informs judgment (Facione and Facione, 2008, Lasater, 2007, Tanner, 2006). Through a structured dialogue with faculty, debriefing can also foster reflection among students in order to process the experience. (Bremner et al., 2006, Cantrell, 2008, Dreifuerst, 2009, Issenberg et al., 2005, Jeffries, 2007). Cantrell posited that learning becomes meaningful only when all dimensions of performing a skill, including the cognitive mastery and affective components (one's values, past experiences, and motivation), are addressed.

Feedback and reflection are essential determinants of professional development at all levels and are linked to professional nurse competencies (Babenko-Mould, Andrusyszyn, & Goldenberg, 2004). Professional nurse competencies that foster a culture of safety have been the major focus of health care and nursing education since the publication of the Institute of Medicine's *To Err Is Human: Building a Safer Health System* (Kohn, Corrigan, & Donaldson, 2000). This Institute of Medicine report also supports simulation as one method to improve patient safety.

Debriefing enhances students' clinical reasoning and judgment skills through reflective learning (Dreifuerst, 2010). Debriefing has also been suggested as an effective strategy by which to integrate quality and safety initiatives into simulation through a focused reflection and discussion. During debriefing, the process and outcome of the scenario, the application of the scenario to the clinical setting, and relevant teaching points are discussed (Jeffries, 2005). These activities are intended to

foster reflection and to develop reflective practice and metacognition skills among students, while emphasizing the affective domain of learning. Metacognition is the awareness and understanding of one's thinking and cognitive processes. Debriefing, when conducted in a systematic and structured process, can promote this level of reflective learning and cultivate a community of professionals who practice in a culture of safety awareness (Kuiper, Heinrich, Matthias, Graham, & Bell-Kotwell, 2008).

Debriefing is an integral element of simulation (Shinnick, Woo, Horwich, & Steadman, 2011). Debriefing, as a teaching strategy, can facilitate the use of therapeutic communication skills, address students' emotions, and affirm feelings. Despite educators' awareness of the significance of debriefing in clinical simulation, research on debriefing is limited, and strategies to support debriefing have received little attention in the simulation literature (Henneman and Cunningham, 2006, Rudolph et al., 2007, Seropian et al., 2004). Brackenreng (2004) noted that the research on simulation has focused mainly on detailed descriptions of the development and implementation of clinical simulations but has almost ignored debriefing. In a review of 458 studies on simulation, Flanagan, Clavisi, and Nestel (2007) concluded that simulation makes a valuable contribution to learning for students because it provides reproducibility and controllability in an environment with no risk to patients. Yet Flanagan et al. noted that gaps existed in every topic considered in their review and most notably in debriefing. Jeffries (2005) stated that knowing how to debrief students' experiences is equal in importance to knowing how to create scenarios and use the equipment to represent human physiological responses to care. Thus, further empirical evidence is needed to validate the significance and importance of debriefing sessions as part of the simulation learning experience.

Published guidelines and strategies on debriefing have offered some critique of the technical components, discussions of cognitive thinking, and the development of evaluation criteria of student performance through a debriefing session. Important questions remain on how to debrief, when to debrief, what to debrief, and whom to include in debriefing for the best student learning (Dreifuerst, 2009). Dreifuerst (2010) described structure in the debriefing process as an empirical referent for best educational practices and suggested that structured debriefing requires a facilitator to guide students in reflection in order to promote higher-order judgment and reasoning, as well as meaningful learning, through clinical reasoning.

A search of the nursing literature identified six investigations that addressed the topic of structured debriefing in nursing student education, yet only three investigations specifically tested the effect of a structured debriefing session on student learning outcomes. A project that tested a structured debriefing activity was conducted by Kuiper et al. (2008), who used the Outcome Present State-Test (OPT) of clinical reasoning after high-fidelity patient simulation (HPS). The sample comprised 44 undergraduate nursing students enrolled in a 14-week medical–surgical clinical course. These study participants engaged in traditional clinical experiences and rotated through the simulation laboratory for HPS experiences. OPT worksheets were completed after both types of clinical experiences, and the highest-scoring worksheets from the traditional clinical experience were compared with the highest-scoring worksheets completed after participation in HPS. While Kuiper et al. reported that structured debriefing promoted higher-order cognitive skills along with reflective metacognition, no significant differences were reported between the mean scores for the OPT work sheets of the two groups ($t = -1.34$, $p = .19$).

Dreifuerst (2010) conducted an investigation to determine whether the structured debriefing teaching strategy Debriefing for Meaningful Learning© (DML) positively influenced the development of clinical reasoning skills in undergraduate nursing students, compared with usual and customary debriefing. DML was described as a debriefing strategy that uses a consistent process to guide student reflection through the clinical experience. DML uses six components, engage, evaluate, explore, explain, elaborate, and extend, to structure the debriefing process and assist students to actively use reflection-in-action, reflection-on-action, and reflection-beyond-action to develop and understand clinical reasoning and thinking like a nurse (Dreifuerst, 2010).

In that study, Dreifuerst (2010) measured a change in clinical reasoning in 238 students from a Midwestern university school of nursing enrolled in an adult health course that used simulation and different debriefing methods. Participants were assigned to either the experimental or the control group, and DML was compared with customary debriefing by means of scores on the Health Sciences Reasoning Test (HSRT; Facione & Facione, 2006), administered before and after the debriefing experience. The data demonstrated that there was a statistical difference between the groups' total mean HRST test scores. The total mean HRST scores were significantly higher ($p < .05$) in the experimental group, compared with the control group. In addition, statistical significance ($p < .05$) was found in the change in scores between pretest and posttest for those who used the DML, compared with the control. A significant correlation ($R^2 = .84$, $p < .05$), demonstrated through regression analysis, was found between the change in HSRT scores and students' perception of the quality of debriefing and the use of the DML.

Shinnick et al. (2011) investigated the importance of debriefing within the simulation learning experience that used a heart failure scenario. Using a 2-group, repeated-measures design with 162 students from three different schools of nursing, they determined that mean scores from knowledge tests about the care of heart failure patients (nursing interventions and judgment) decreased from the pretest to the first posttest immediately following a simulation experience ($M = -5.63$, $SD = 3.89$; $p = .001$) but dramatically improved after debriefing ($M = 6.75$, $SD = 4.32$; $p = .001$). Based on these results, Shinnick et al. concluded that gains in knowledge were achieved only after the use of a standardized debriefing component of simulation and that debriefing is therefore critical for learning in simulation pedagogy.

This study can add to the growing body of evidence and address the gap in the literature on best practices for debriefing in the development of students' clinical judgment skills. Understanding the debriefing process and different types of debriefing contribute to a body of evidence-based teaching that supports faculty development and mastery of this essential component of simulation (Dreifuerst, 2009). In the debriefing process, students can often learn the most and reframe previous thinking to create new paradigms for handling future situations with similar circumstances. Johnson-Russell and Bailey (2010) noted that if debriefing is carried out in a suboptimal way, students may infer incorrect lessons from the experience. Faculty-led structured debriefing provides an opportunity for an organized experience in which students not only express thoughts and feelings but also explain thinking and decision making, which can promote critical thinking and clinical judgment.

Theoretical Framework

Benner, Tanner, and Chelsea (1996) defined clinical judgment as "the ways in which nurses come to understand the problems, issues or concerns of patients/clients, to attend to salient information and to respond in concerned and involved ways" (p. 2). Tanner, 1998, Tanner, 2006 conducted a comprehensive review of the empirical literature on clinical judgment and developed the four-dimensional Clinical Judgment Model. The Lasater Clinical Judgment Rubric© (LCJR), conceptually based on Tanner's (2006) work, includes four dimensions: noticing, interpreting, responding, and reflecting. The LCJR provides a framework for assessing students' clinical judgment abilities in each of these dimensions. Specifically, the LCJR contains four subscales that are used to evaluate students' behaviors and actions as either *beginning*, *developing*, *accomplished*, or *exemplary* in the dimensions of noticing, interpreting, responding, and reflecting (Lasater, 2007). *Noticing* is defined as nurses' expectations of the situation. *Interpreting* involves making meaning of the available data of a clinical situation, and *responding* is developing an appropriate course of action. The final dimension, *reflecting*, involves reflecting on one's practice, behaviors, and clinical judgment (Tanner, 2006). Comprehensive descriptions of the conceptual basis of LCJR and the psychometric testing of the instrument have been published (Lasater, 2007). Using the LCJR, we explored the influence of debriefing on clinical judgment.

Clinical judgment is a complex skill influenced by clinical decision making, critical thinking, and clinical reasoning. These concepts are multifaceted and interactive. Developing clinical judgment through the integration of decision making, critical thinking, and clinical reasoning is important for student nurses in providing safe patient care (INACSL Board of Directors, 2011). The impact of debriefing on the development of clinical judgment in nursing students is an important concept to study.

Purpose

Our purpose was to empirically test and compare the clinical judgment of students who participated in structured debriefing sessions using DML and of students who received unstructured debriefing. Clinical judgment was measured with the LCJR.

A secondary objective was to explore students' perception of various factors of the structured debriefing strategy that were thought to have an effect on the simulation experience. The following research questions guided this study:

1. Is there a difference in clinical judgment, as measured by the LCJR, between students who received a structured debriefing session (DML) and students who did not receive a structured debriefing session?

2. Do students perceive that the role of the person conducting debriefing, the timing, the length, the method, and the effectiveness of the debriefing affected the benefit of the clinical simulation experience?

Method

Design

This mixed-method study used a quasi-experimental design for the quantitative component of the study and focus group discussions for the qualitative portion of the study. It took place during the first semester of a junior-level medical–surgical nursing course. All junior-level students enrolled in this

clinical course participated in two simulations, the first at midterm and the second at the end of the semester. Figure 1 depicts the overall design of the study. The first simulation involved the postoperative care of an adult patient who was experiencing bleeding and a fluid volume deficit after a total hip replacement. The second simulation was a postoperative patient whose primary diagnosis was fluid volume deficit, electrolyte imbalance, and dehydration related to a small bowel obstruction.

Simulation/Focus Group	Group 1: Intervention Group	Group 2: Group Control
Original 3113 Post-op simulation conducted by 3113 faculty	3113 Post-op simulation Simulation 1	3113 Post-op simulation Simulation 1
	LCJR completed	LCJR completed
	Structured debriefing	Standard (usual form of) debriefing
Small Bowel Obstruction simulation conducted by PHENSA grant team	3113 Small bowel obstruction simulation Simulation 2	3113 Small bowel obstruction simulation Simulation 2
	LCJR completed	LCJR completed
	Structured debriefing	Structured debriefing
Focus Groups	Focus Groups	Focus Groups

Figure 1. Study design.

The intervention for this study was the type of debriefing (structured debriefing vs. the usual unstructured form of debriefing typically done in this course). The outcome variable was students' clinical judgment skills as measured by the LCJR. The structured method of DML, developed by Dreifuerst (2010), was replicated from her study and used for the intervention group. This method guides the debriefing discussion to include prior experiences, educational preparation, reflection, and the current clinical situation in order to guide students' development of the knowledge, skills, and attitudes necessary to be a nurse. According to Dreifuerst, this debriefing method supports development of metacognition, leads to a stronger conceptual understanding and application of the nursing process within the context of patient care, and potentiates meaningful learning through a change in clinical reasoning and clinical judgment.

Students in the control group received the unstructured debriefing that is typically used after the simulation in this course. For the unstructured debriefing, there was no specific format for the faculty to follow, but generally it included a review of what went right, what did not go right, and what to do differently next time. The amount of time spent in debriefing and the nature of the feedback and dialogue between the faculty member and the students varied because they were left to the discretion of the faculty member involved with the simulation experience.

Setting and Sample

This study was conducted at a college of nursing in a midsized university located in the mid-Atlantic region of the country. A convenience sample of 86 junior-level students who were enrolled in a medical–surgical nursing course consented to voluntarily participate in the study following an internal review board–approved process. A total of 90 students were enrolled in the course and were required

to participate in each scenario and debriefing session; however, 1 student chose not to participate in the study, and 3 other students did not complete their second scenario, so their data were excluded from the analysis. The result was a 95% response rate of eligible students participating in the study.

Students were randomly assigned to clinical groups; then the entire clinical groups were placed in either the intervention or the control arm of the study, based on whether the faculty members attended the faculty development session on the use of DML. Six instructors attended the session, and six did not. There were 42 students in the intervention group and 44 students in the control group, for a total sample size of 86. Based on a power analysis with $p < .05$, a power of .80, and a moderate effect size, at least 27 participants were needed in each group (Burns & Grove, 2005).

Data Collection Procedures

Students' clinical judgment abilities were assessed at the conclusion of each simulation experience, prior to the debriefing. The instrument for the assessment was the LCJR. Gubrud-Howe (2008) reported the interrater reliability of the LCJR to be 0.87, and Adamson (2011) reported the internal consistency of the instrument to be 0.97. Following the first simulation, participants in both the control and intervention group had their LCJR completed by course faculty. During the first simulation, members of the research team also completed the LCJR in order to address interrater reliability of the clinical faculty. During this first experience, only the faculty member's rating was used for the study; the second rating was used only to ascertain interrater reliability. By the Pearson product-moment correlation, the interrater reliability was determined to be high ($r = .92$; $p < .01$).

After the second simulation, only members of the research team evaluated students with the LCJR to assess their demonstration of the four components of clinical judgment, noticing, interpreting, responding, and reflecting. Students received a score in each area. The rubric is an observational measure that uses a checklist developed by Lasater (2007) to guide raters in its use. The LCJR rates 11 behaviors: 3 for noticing, 2 for interpreting, 4 for responding, and 2 for reflecting. The rubric scores for clinical judgment skills range from 1 to 4, as follows: 1, *beginning*; 2, *developing*; 3, *accomplished*; and 4, *exemplary*. Total possible scores on the LCJR range from 11 to 44.

This mixed-methods study also used data from focus groups to understand the impact that aspects of the debriefing had on the overall simulation experience. These focus groups were conducted with the students in both arms of the study in order to discuss the type of debriefing method, as well as the timing, length, and role of the person conducting the debriefing, and how all these factors influenced student learning and the overall simulation experience.

All 86 students who participated in the simulations were invited to take part in the focus groups, and 7 students accepted this invitation (8.1%). Two focus groups and an individual one-on-one interview for a student who could not attend the scheduled focus groups were held at the end of the semester. The focus groups consisted of students in both the intervention and control arms of the study and were conducted after the second simulation and the students' final clinical evaluations in order to ensure that students did not feel that their input had any influence on their grade. Two members of the research team were present and conducted the focus group discussions. Neither of these individuals was the clinical faculty member for students in this course.

The focus groups lasted approximately 60 minutes each. Both focus groups were tape-recorded, and each included a note taker in the group. The questions and probes presented to participants in each focus group are listed in Table 1. The audio recordings were secured into an electronic file and transcribed by a professional transcription service. The transcripts from the focus groups discussions were then analyzed. Content analysis was used to identify common themes from the focus groups (Burns & Grove, 2005). Themes from the intervention group (structured debriefing) and control group (usual unstructured debriefing) were analyzed separately.

Table 1. Focus Group Interview Questions and Probes

1. Explain the process for debriefing that you experienced in your clinical simulation.
2. What were some of the positive and negative aspects of the process that were used during the debriefing?
3. What did you learn that you could do differently in the future as a result of the debriefing?
4. As a result of the debriefing that you had after your clinical simulation, can you discuss any changes you will have in your clinical judgments or behaviors in future clinical experiences?
5. Did you feel comfortable expressing your thoughts and feelings during the debriefing?
6. How much opportunity was there for students to express themselves during the debriefing?
7. What kind of feelings did you experience during the debriefing?

Results

The sample was homogeneous for gender, age, and type of program. There were 82 women (95.3%) and only 4 men (4.65%), which is typical of the overall undergraduate student population in this nursing program. The mean age of the participants was 20.5 years, with a very limited range from 20 to 21 years, and 100% of the students were enrolled in a generic, traditional, 4-year baccalaureate nursing program. The Cronbach's α reliability coefficients for the LCJR are reported in Table 2 for the total scale and the four subscales for both groups (N = 86) at each measurement time. They ranged from 0.80 to 0.97 and offer strong evidence for the scales' internal consistency.

Table 2. Lasater Clinical Judgment Scale and Subscale Reliability Estimates

Scale and Subscale	Time 1	Time 2
Total scale	.927	.942
Subscale: responding	.904	.909
Subscale: reflecting	.871	.968
Subscale: noticing	.809	.872
Subscale: interpreting	.800	.811

The LCJR scores of students in the intervention and control groups were compared after the first scenario, which occurred at the midpoint of the semester, and then again after the second scenario, which was at the end of the semester, 4 to 5 weeks later. Means of total scores were analyzed with repeated measures analysis of variance (RM-ANOVA) to assess differences within groups and between groups as well as across time for the intervention and the control group. The means and standard

deviations for total LCJR scale scores are reported in Table 3; overall the results demonstrate Mauchly's test of sphericity, which was calculated for the repeated measures procedure to ensure that the assumption of sphericity was met. Findings were not statistically significant, indicating that the assumption was not violated and sphericity was assumed. The RM-ANOVA did not show any statistically significant differences for overall scale scores, group main effect, $F(1, 84) = 0.009$, $p = .92$, time main effect, $F(1, 84) = 0.33$, $p = .562$; group × time interaction effect, $F(1, 84) = 0.213$, $p = .64$. Figure 2 displays the plot of the group × time interaction. The overall mean scale scores on the LCJR demonstrated that the intervention group was lower at measurement Time 1 but higher at measurement Time 2; however, the Time 1 and Time 2 differences in mean scores were not statistically significant.

Table 3. Descriptive Statistics for Total Lasater Clinical Judgment Scale

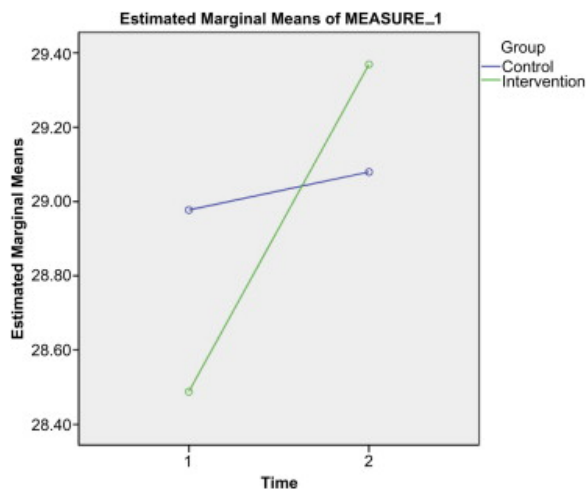| Group	M	SD	N
Simulation time 1			
Control	28.97	7.31	44
Intervention	28.48	5.65	42
Total	28.72	6.52	86
Simulation time 2			
Control	29.07	6.06	44
Intervention	29.36	5.93	42
Total	29.22	5.96	86

Figure 2. Plot of group × time interaction.

A 2 × 2 repeated measures multivariate analysis of variance (MANOVA) was calculated to determine whether statistically significant differences existed on the subscales. Mauchly's test of sphericity was again calculated, and the result was nonsignificant, indicating that the repeated measures assumption was met. The multivariate F test for group was not significant, Wilks's $\Lambda = .90$, $F(1, 81) = 2.02$, $p = .09$, but it was significant for time, Wilks's $\Lambda = .85$, $F(1, 81) = 3.40$, $p = .013$, with a small effect size (partial $\eta^2 = .14$); however, none of the scales had a significant univariate F test for the time factor. Likewise, the interaction MANOVA to test for group × time was not significant, Wilks's $\Lambda = .96$, $F(1, 81) = .71$, $p =$

.58. Despite the lack of significance in the interaction effect, a visual examination of the group × time plots was made between groups to determine whether there was any evidence of interactions that may have been too small to be detected, given the sample size. On visual examination of each plot, there was no evidence of interaction for the *interpreting* and *responding* subscales, since the lines appeared to be roughly parallel. In contrast, the plot for *noticing* suggested some degree of nonparallelism, and the plot for the *reflecting* subscale showed a clear reversal, with the control group higher at measurement Time 1 and the intervention group higher at measurement Time 2.

The findings from the focus group interviews and the interview conducted with one student are reported in Table 4. Overall, students found that debriefing, despite the type, assisted them in becoming more proficient in basic nursing skills and in recognizing the importance of using available lab data and checking the physician's orders. There were differences between the structured debriefing and the usual unstructured form of debriefing. Students perceived DML to foster student-focused learning and assist in recognizing the affective component of learning. In contrast, students experienced the usual unstructured form of debriefing as more instructor-focused, with the feedback highlighting what the students performed incorrectly during the simulation experiences.

Table 4. Qualitative Data Analysis Findings

Structured debriefing themes
Learner-focused discussions
Didn't focus on what was right versus wrong
Mapping of concepts useful for learning
Analysis of scenario could be helpful in future situations
Holistic approach that included reactions and feelings
Liked figuring out the problem and connecting everything
Standard debriefing themes
More instructor focused
Straight feedback (right vs. wrong)
Didn't give the whole picture
Learning occurred, but not as much as the structured method
Overall themes
Learned to evaluate vital signs more fully
Helped to connect lab data to clinical scenario
Learned the importance in checking physician orders

Discussion

In this study, the data revealed no statistically significant differences between the control and intervention groups in overall scale scores or in subscale scores on the LCJR at either measurement time. Lack of statistical significance may have been due to the low observed power operating in the analysis, which was confirmed through computed power analyses at the completion of the study. This low observed power may be a reflection of an inadequate sample size or a low effect size for the intervention. Having either or both of these conditions existing in the analyses could have prevented

detection of significant differences between the groups. Likewise, the overall mean scale scores on the LCJR demonstrated that the intervention group was lower at time Time 1 but higher at Time 2. This interaction at Time 1 and Time 2 was not statistically significant; again, a larger sample size or more powerful effect size for the intervention may have yielded statistically significance differences.

These findings differ from those of Dreifuerst (2010), who used DML with the same study design among undergraduate students. Dreifuerst's study, however, differed from this research in that a change in clinical reasoning was measured in students using a different instrument, the HSRT, not the LCJR used in this study. Further, the sample size in Dreifuerst's study was significantly larger (N = 238) compared with the sample size of 86 students in this study. The HSRT instrument measuring a change in clinical reasoning scores may be a more sensitive measure than the LCJR instrument for detecting change related to debriefing. The large sample size in Dreifuerst's study may have provided more observed power to detect differences between the intervention and control groups.

Shinnick et al. (2011) also found a significant difference between the experimental group, which had debriefing after a simulation experience, and the control, which did not have debriefing. In that study, involving 162 prelicensure nursing students, knowledge and judgment related to the care of a simulated patient with heart failure decreased in both groups after they engaged in simulation and increased significantly on the second postsimulation test in the experimental group. These researchers noted that their findings support the belief that "learning does not occur primarily or exclusively in the hands-on portion of the [simulation] experience, and the debriefing component is the most valuable in producing gains in knowledge." They went on to note that "adequate attention to both the debriefing technique and the time spent performing debriefing [is] essential for learning to occur" (p. e109).

The findings generated from this study are consistent with the findings reported by Kuiper et al. (2008), who measured undergraduate students' clinical reasoning following HPS using a subjective instrument. The investigation by Kuiper et al. also had a small sample size (N = 44), which may have been inadequate to detect differences between the groups.

In contrast to the empirical data in this study, the findings generated from the focus group interviews support the qualitative findings of previous investigations, which have consistently concluded that structured debriefing fosters reflection and meaningful learning among students. In a study to describe students' level of performance in clinical judgment in simulation, Lasater (2007) conducted focus group interviews among undergraduate nursing student participants to learn about their experiences in simulation. Lasater reported that students voiced a strong desire for more direct, definitive feedback about their clinical performance in simulation, including what the patient outcomes could be if the judgments they exercised were followed in reality, as well as what they might have done differently.

This need for critical self-reflection as a crucial element in the learning process has been recognized by other researchers (Brackenreng, 2004, Hertel and Mills, 2002, Issenberg et al., 2005, Jeffries and Rizzolo, 2006, Kolb, 1984, Schon, 1983). As reported in the findings by Cantrell (2008), students voiced their need for direction and assistance during debriefing sessions to help them decompress, and they emphasized the importance of debriefing in helping them to integrate the experience and their performance into their knowledge base. Cantrell (2008) further noted that these students' comments

support other social science researchers' beliefs that debriefing is a teaching strategy that is important to clinical learning, especially when it is part of a simulation experience.

Limitations

There are several limitations to this study. The most notable limitation was the inadequate observed power for the statistical analyses. An a priori power analysis suggested that a minimum total of 54 participants, or 27 participants in each group, was needed. The actual sample size of the study was 86 participants, with 42 students in the intervention group and 44 students in the control group. Despite having an adequate number of study participants, the low power may have been a result of assuming a moderate effect size for the intervention, which decreased the estimated sample size. Perhaps if a more conservative effect size had been selected, requiring a larger sample size, statistically significant differences would have been found.

A second limitation of this study was that the LCJR assessing students' clinical judgment abilities was completed, after the first scenario, by the students' clinical faculty member. After the second scenario, the LCJR was completed for each student by the research team. Since the research team was aware of which students were in which group for the first scenario, the research team did not rate the students after the first simulation. However, for the second simulation, the researchers had no knowledge of whether a student was in the intervention or the control group. This strategy was used to eliminate possible bias on the part of the research team and clinical faculty. Although potential bias was eliminated in the study, and there was adequate interrater reliability for the first scenario, having two different sets of raters after the first and second simulations may have influenced the LCJR scores. In addition, the limited range in possible scores for each subscale and for overall total scores may have limited the possibility of discriminating between the groups on the outcome variable of clinical judgment.

A third limitation of the study is the homogeneity of the sample in terms of gender, age, and type of program of study. This could have skewed the results despite the fact that the demographics of the sample did accurately reflect the student population at the recruitment site. As a result, the homogeneity was unavoidable. The young mean age of the sample, 20.5 years, may have been a limitation in regard to their developmental stage of maturing executive cognitive skills, such that any type of debriefing, structured or unstructured, may not have had a significant metacognitive benefit for students and discrimination between the two types of debriefing would be limited for this age group. However, reflective debriefing is an accepted component of simulation and has been demonstrated to significantly affect learning from the experience for undergraduate nursing students, so the extent of this limitation on the study results is unclear.

A fourth limitation is the variation of the usual unstructured debriefing used in the control arm of the study and the possibility of unidentified contamination of the intervention into the control. After the first scenario in the control arm, the students' faculty member debriefed them in the usual, unstructured manner. Although the clinical faculty who debriefed students in the control group had no exposure to the DML training sessions, the faculty could have unintentionally included some elements of this structured debriefing for students in the control group. If this occurred during the study, it could

have influenced the LCJR scores in the control group for the second simulation experience and caused them to be more similar than intended.

There is also a possible interaction of a history and maturation effect operating between measurement times. All students had an additional 4 to 5 weeks' exposure to clinical practice and theoretical concepts before the second scenario was conducted, and students' clinical judgment could have been affected by factors rather than or in addition to the type of debriefing they received.

A fifth limitation is the study design. Students' clinical judgment abilities could be more accurately measured by a longitudinal study design over several semesters or longer. This study measured students' performance only twice during a single clinical course within one academic semester.

The final limitation of the study is study participants' low participation in the focus groups. Low numbers may have limited the responses during the discussion and may not have provided enough rich, descriptive data for the qualitative analysis. This limitation might have affected the conclusions.

Implications for Nursing Education

Simulation-based, student-focused learning in clinical education for prelicensure and advanced practice nursing students has been supported by the National League for Nursing, 2003, National League for Nursing, 2005, the National Council of State Boards of Nursing (2010), and leaders in nursing education (Dreifuerst, 2009, Dreifuerst, 2010, Jeffries, 2005, Stanley and Dougherty, 2010). The implications of this study's qualitative findings for nursing education include the significance of debriefing in promoting students' integration of the cognitive, psychomotor, and affective domains of learning (Goldenberg et al., 2005, Nehring et al., 2001). The qualitative findings generated from the study highlight the essential nature of structured debriefing and its value for student-focused learning. Nursing educators need to acquire and refine their knowledge and skills about the techniques and attributes of structured debriefing.

Implications for Future Research

Based on the findings of this study and its noted limitations, future research investigations regarding the effect of structured debriefing on learning outcomes, especially clinical judgment abilities, require larger sample sizes with longitudinal designs. Replication of this study with a more diverse group of students at different points in a nursing curriculum is indicated. Additional research on the sensitivity of the LCJR to measure students' clinical judgment abilities may also be warranted, since no differences were detected between the intervention and control group in this study. Research investigations to capture the subtle but impactful gains students experience from structured debriefing in terms of their perceived self-confidence with specific skills and clinical practice overall need to be developed and conducted.

Conclusions

This study tested the influence of a structured debriefing process, DML, on undergraduate students' clinical judgment skills. Differences between the groups' means for overall scale scores and subscales on the LCJR were not statically significant. This lack of statistically significant differences may have been the result of inadequate statistical power or other limitations operating in the study design.

Qualitative findings did, however, indicate that students perceived more benefit in their overall learning and synthesis of clinical knowledge and skills from the structured debriefing sessions compared with the usual form of unstructured debriefing sessions. Additional research investigations conducted with rigorous designs are needed to provide further empirical evidence of the quantifiable and perceptual effectiveness of structured debriefing on students' learning outcomes. Despite not generating a statistically significant difference, this study reports important information about the influence of structured debriefing on students' learning in a clinical simulation teaching experience.

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