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# Using simulations to advance clinical reasoning

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## 1. Introduction

Educational simulations can help nursing students enhance clinical reasoning skills, gain experience through practice, improve self-confidence and gradually develop their own vision for what constitutes excellent care. Thinking like an expert nurse requires a form of engaged moral reasoning that is informed by generalized knowledge and rational processes, and enhanced through expert guidance and coaching (Tanner, 2006). Clinical simulations offer the opportunity to practice care in a realistic environment without the risk of actual patient harm. Human-patient simulations are popular among progressive nursing programs as a way to increase students' confidence in real-time decision making and critical thinking (Alinier, Hunt, Gordon, & Harwood, 2006; Labrague, McEnroe-Petitte, Fronda, & Obeidat, 2018; Sommers, 2018; Thompson & Stapley, 2011).

## 2. Background

A number of recent studies support the premise that nursing students find exposure to clinical settings beneficial in increasing their patient assessment and decision-making skills (Leigh, 2008; Macauley, 2017; Oermann, Yarbrough, Saewert, Ard, & Charasika, 2009). Progress has been slower to validate that simulated clinical exposure can offer similar outcomes (Jeffries, 2007; Lasater, 2007; Reinhardt, Mullins, De Blieck, & Schultz, 2012; Sommers, 2018; Wilkinson, 2018).

The enhanced simulation experiences provide faculty the opportunity to assess student learning prior to engaging in clinical experiences with actual patients. This study offers an evaluation of human-patient simulation as an effective means of augmenting critical thinking and increasing confidence in decision-making among undergraduate Bachelor of Science in Nursing students at a university in New Mexico. Faculty considered the use of simulation modules for informing nursing program evaluation and development when actual clinical experiences are unavailable (Macintyre, Murray, Teel, & Karshmer, 2009).

## 3. Literature review

Phaneuf (2008) defined clinical judgment as “the conclusion or enlightened opinion at which a nurse arrives following a process of observation, reflection and analysis of observable or available information or data,” simulated or real (Phaneuf, 2008).

### 3.1. Assessing student learning prior to clinical experience

Historically, Henry, Kramer, Schecter, and Summers (2000) identified that previous clinical experience made an impact on nursing students. Previous work experience as a nursing assistant during their nursing education can have both positive and negative results. Some students develop good practice in the work environment utilizing what they have learned in school, while others adopt practice habits that are in contrast to what they learned in their nursing program (Henry et al., 2000). Bloomfield and Jones (2013) studied use of *E*-learning techniques by pre-nursing college students. While not all students benefit from this style of learning, some students can acquire valuable information prior to beginning their nursing studies (Bloomfield & Jones, 2013). Whiffin, Baker, Henshaw, Nichols, and Pyer (2018) found that Certified Nursing Assistants (CNA) aspiring to attend a pre-licensure program of nursing, benefited from their previous exposure to patient care (Whiffin et al., 2018).

### 3.2. Evaluation of human patient simulation for augmenting critical thinking and increasing confidence in decision making

Darcy Mahoney, Hancock, Iorianni-Cimbak, and Curley (2013) completed a multi-site study of both traditional and non-traditional BSN students in simulation activities. They found that simulation experiences not only met a high percentage (80%) of the objectives for the simulation experience, but also revealed that students had positive thoughts of the experience. The findings in their study indicated increased exposure to high-fidelity, human-patient simulations produced the likelihood of a synergistic effect in actual clinical practice (Darcy Mahoney et al., 2013). This study supports Benner's call for educational reform in nursing to encourage clinical reasoning founded on practice experience and decision making rather than only on critical thinking (Benner, Sutphen, Leonard, & Day, 2010; Macauley, 2017; Macauley, Brudvig, Kadakia, & Bonneville, 2017).

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Simulation experiences are not only popular among students but also increase nursing students' confidence levels in critical thinking and performance in the clinical milieu. Thompson and Stapley (2011) performed a systematic review of the literature finding that interventions to improve clinical judgment and decision making among the compared studies, did not provide a "road-map" to the best pedagogical approach. They encourage nurse educators to pay attention to course design and interventions used to support development of clinical judgment and format decision making (Thompson & Stapley, 2011). Dillard et al. (2009) explored the use of the Lasater Clinical Judgment Rubric with both faculty and students to assess the development of clinical judgment in simulation scenarios and transference of clinical judgment from simulation to clinical settings. These authors found significant support for simulation but cautioned that more research is needed (Dillard et al., 2009). Further studies have addressed critical thinking and clinical judgment during simulation. Cazzell and Anderson (2016) studied both critical thinking and clinical judgment using a Structured Clinical Evaluation (OSCE) design during a simulated clinical experience. The authors found statistically significant indicators of clinical judgment strengths related to gender, ethnicity, health science reasoning, and analysis. They encourage nurse educators to be more innovative in creating assignments that incorporate predictors of clinical judgment (Cazzell & Anderson, 2016).

### 3.3. Addressing the use of sim modalities to inform nursing program evaluation and development when actual experiences are not available

Nevin, Neill, and Mulkerrins (2014) explored a simulated skills package developed by nurse educators. They employed a problem-based approach with nursing students in a simulation setting. While the students found the simulations educational, useful and stimulating, concerns with the "pre-briefing" preparation for the scenario and the limited structure for debriefing following the scenario were noted as points that could improve the experiences (Nevin et al., 2014). Lane, Corcoran, Weare, and Perry (2017) created an on-line clinical experience for LPN-BSN students in a mental health course due to limited clinical sites. Their online simulated clinical approach supported students' learning of mental health content in a unique format (Lane et al., 2017). Role playing is another technique that has shown excellent learning outcomes in simulation and has been used to answer the concerns of limited clinical placement sites (Redden, 2015).

## 4. Theoretical framework

Elevating skill sets honed in the academic setting to a level of proficiency commensurate with professional clinical reasoning and judgment is, according to Benner et al. (2010), a significantly more complex process. Time and experience form the essential amalgam to bond the interrelated mental processes in the minds of practicing nurses (Benner et al., 2010). Students and entry level nursing graduates strive to be safe and competent. Competence involves decision-making and having the confidence to trust that those decisions are of high quality and patient-safe (Dowding et al., 2012).

The four aspects of Tanner's (2006) Clinical Judgment Model are noticing, interpreting, responding and reflecting. Informed decision-making fits within both the interpreting and responding phases of Tanner's (2006) model and is essential for positive outcomes. These two phases were assessed to measure perceived confidence and decision-making in a simulation setting for pre-licensure nursing students (Lamartina & Ward-Smith, 2014; Romeo, 2010; Tutticci, Lewis, & Coyer, 2016).

Tanner (2006) tempered this accurate, somewhat abstract definition of decision making and confidence by adding that clinical judgment cannot fully develop until a nurse has been in practice for a period of time. The length of time needed for this to occur at an optimum level, according to both Tanner (2006) and Phaneuf (2008), depends largely upon the individual nurse. Given the premise that optimum judgment occurs when the individual incorporates various types of knowledge beyond the nursing curriculum, the nurse can fine-tune their powers of observation with recall of predefined clinical states to reach appropriate conclusions that successfully serve each patient.

## 5. Methods

### 5.1. Setting

The setting for this study was a university, traditional four year BSN program where the last two years of the program (four semesters) are nursing courses. The program is located in the southwest region of the United States. The institutional review board (IRB) approved the study as part of the quality improvement initiative for the nursing program.

### 5.2. Sample

A convenience sample of undergraduate nursing students ($n = 218$), enrolled in the four semesters of the nursing program (fifth, sixth, seventh and eighth semesters) consented to participate in the study. This sample included all students in the nursing program (no exclusions), although a student could choose not to fill out all or part of the survey.

### 5.3. Protocol

The simulation initiative was implemented in two phases. Phase One offered simulation education and training to nursing faculty within the region ($n = 25$) during a summer break from academic courses. The Institute concentrated on simulation techniques, scenario development, and debriefing (DeBlieck & Mullins, 2010). The Institute's program objectives were to: 1) describe the purpose of simulation; 2) describe ways to integrate simulation with didactic courses; 3) provide examples of the processes of preparation, simulation, and debriefing; 4) complete and present a group-developed scenario, record the group scenario as a simulation, and participate in group debriefing; and 5) provide examples of how electronic documentation recording can be used as a documentation method for simulation learning for clinical experiences (DeBlieck & Mullins, 2010).

Phase Two, which is the focus of this report, concentrated on the how the host school enhanced their student simulation experiences in clinical courses across their curriculum. The implementation of simulation exercises/experiences were developed from the Institute and then implemented in student courses over four semesters. Faculty were assigned time to develop and test the integration of simulation experiences into their respective clinical courses.

Simulation developed supported skill building exercises using task-trainers for activities such as IV insertion, indwelling urinary catheter placement, and/or central line dressing changes. Therapeutic communication was addressed by creating script guidelines for students to role-play mental health situations in environments that mirrored a home setting, a hospital setting, and a clinic setting. The simulation scenarios that utilized high-fidelity mannequins centered on open gallbladder surgery, gastrointestinal bleeding (ulcer) problems, post-partum hemorrhage, etc. Other examples of simulation activities included virtual clinical excursions (VCE), utilization of The Neighborhood® through VCE, combining psychiatric simulation with medical-surgical simulation reviews, and the use of Neehr Perfect electronic medical record software for documentation.

### 5.4. Tool

Assessment using participant satisfaction as well as effectiveness of the simulation learning environment was used to assess the efficacy of simulation. Evaluation of simulation was accomplished using the Computer-aided Engineering (CAE) Healthcare, Inc. Simulation

Effectiveness Tool (SET) (formerly the METI™ instrument) (METI, 2010) to compare time spent in simulation with corresponding levels of confidence in clinical reasoning skills as self-reported by all levels of the participants (Kramer & Son, 2016). Based on guidance from the literature, the program used the SET (the METI™ instrument) (METI, 2010). The tool is a one-page questionnaire measured in a three-point ordinal Likert Scale with 0 = Do Not Agree, 1 = Somewhat Agree, 2 = Strongly Agree, and NA = Not Applicable. The thirteen questions from the SET tool used are:

1. The instructor's questions helped me to think critically.
2. I feel better prepared to care for a real patient.
3. I developed a better understanding of the pathophysiology of the conditions in the simulated care experience (SCE).
4. I developed a better understanding of the medications that were in the SCE.
5. I feel more confident in my decision-making skills.
6. I am more confident in determining what to tell the healthcare provider.
7. My assessment skills improved.
8. I feel more confident that I will be able to recognize changes in my real patient's condition.
9. I am able to better predict what changes may occur with my real patients.
10. Completing the SCE helped me understand classroom information better.
11. I was challenged in my thinking and decision-making skills.
12. I learned as much from observing my peers as I did when I was actively involved in caring for the simulated patient.
13. Debriefing and group discussion were valuable.

Elfrink-Cordi, Leighton, Ryan-Wenger, Doyle, and Ravert (2012) reviewed, evaluated, and published a history and development of the CAE SET in 2012. Using a multi-phased pilot to investigate the tool, they first studied a single nursing program before expanding into a multi-site, national study. The sample from the single site was ($N$ = 161) and the follow-up ($N$ = 645). They evaluated the reliability of the SET as "a measure of the effectiveness of a simulated clinical experience." The initial tool used in the single site included 20 questions. After analysis from the pilot, the questionnaire was reduced to 13 questions. Two subscales were identified in the 13 questions with Cronbach's alpha of 0.88 for confidence and 0.87 for learning. The Cronbach's alpha for the multi-site follow-up was calculated at 0.93, indicating the 13-question version of the tool was reliable and had potential to be very useful when measuring the effectiveness of simulation experiences (Elfrink-Cordi et al., 2012).

In this study, the SET survey tool was used to assess the student's confidence and perception of decision-making ability, which are developmental components of clinical reasoning and clinical judgment (Benner et al., 2010; Tanner, 2006). The first simulation exposures, after implementation of the program emphasis on simulation experiences, consisted of three clinical courses with intense simulation components (fifth and sixth semesters) in 2009. These courses were Principles of Nursing Care (fifth semester), and Care of the Adult Patient 1 and Psychiatric Nursing Care (both in sixth semester). Parent/Child Nursing Care (seventh semester) and Care of the Complex Patient (eighth semester) had simulation exposure but not as intense as the fifth and sixth semesters. Surveys were collected at the end of each semester for a total of four consecutive semesters. The scores for each cohort were followed to enable comparison of cohorts as students progressed through the nursing program.

Students completed post-simulation surveys (SET) (Elfrink-Cordi et al., 2012; Leighton, Ravert, Mudra, & Macintosh, 2015) at the end of the semester. These course activities were designed to assess changes in their clinical reasoning and judgment confidence levels as supported in the Clinical Judgment Model (Tanner, 2006). Faculty evaluated the amount of time and preparation required to implement the simulation protocol in their internal course evaluations at the end of the semester.

The implementation of increased simulation experiences was centered on students in their fifth and sixth semesters of the nursing program. Students who were already in their seventh and eighth semesters had less exposure to simulation activities and were used as the control group for the study.

**Table 1**
Cohorts by semester level crosstabulation count.

| | | Semester level | | | | Total surveys |
|---|---|---|---|---|---|---|
| | | 5th | 6th | 7th | 8th | |
| Cohort semester group | Cohort 1 | 23 | 33 | 33 | 20 | 109 |
| | Cohort 2 | 0 | 28 | 40 | 15 | 83 |
| | Cohort 3 | 0 | 0 | 22 | 36 | 58 |
| | Cohort 4 | 0 | 0 | 0 | 0 | 0 |
| | Cohort 5 | 38 | 19 | 46 | 0 | 103 |
| | Cohort 6 | 32 | 37 | 0 | 0 | 69 |
| | Cohort 7 | 26 | 0 | 0 | 0 | 26 |
| Total | | 119 | 117 | 141 | 71 | 448 |

## 6. Results

### 6.1. Sample

A convenience sample of 218 undergraduate nursing students was surveyed using the SET survey tool to compare students who had more exposure to simulation with those who had less exposure. The survey purpose and study plan were explained to each semester cohort at end of their clinical course before the SET was completed. The students were given the opportunity to complete the SET and while they were encouraged to participate, students could choose not to complete the SET. A total of 448 surveys were completed and evaluated (Table 1).

Assessment of both the intensity and length of exposure to simulation experiences was completed. The students with less exposure were considered the control groups, owing to their limited time in simulations prior to program change (Cohorts 3 & 4) and the evaluated groups were the intervention groups (Cohorts 1, 2, 5, 6, & 7). Cohort 4 did not participate in the survey or simulation (Table 2).

The age range of the participants was 19 to 54 (M = 27), student gender was 81.22% females and 18.78% male. Ethnicity of the student population was 7.61% Asian, 3.05% Black, 38.07% Hispanic, 0.05% Middle Eastern, 3.55% Native American, 1.02% Unknown/Other, and 46.19% White/Non-Hispanic.

### 6.2. Statistical analysis

Chi-square tests were used to assess the association between clinical reasoning skills and the intensity and length of exposure to simulation experiences using the IBM SPSS Statistical program 2018. Demographic data analysis utilized an EXCEL database.

### 6.3. Analysis

Overall, a significantly higher proportion of students exposed to simulation time in their courses were found to report stronger clinical reasoning skills [in all but four questions], as made evident in their self-reported increased levels of confidence in caring for a real patient ($\chi^2$ = 6.54, $p$ = 0.038), understanding of pathophysiology ($\chi^2$ = 8.99, $p$ = 0.011), understanding of medication, recognizing changes in real patient's condition ($\chi^2$ = 10.38, $p$ = 0.007), predicting what changes may occur with real patients ($\chi^2$ = 7.13, $p$ = 0.028), and subsequent decision-making ($\chi^2$ = 7.59, $p$ = 0.022) (Table 3). A significantly higher proportion of these students also reported the simulated care experience as clarifying classroom information better ($\chi^2$ = 10.024,

**Table 2**
Exposure to intense simulation.

| Exposure to intense simulation in 5th and 6th semester courses | 3 courses during 5th and 6th semesters | 2 courses during 6th semester | 1 course during 5th semester | None |
|---|---|---|---|---|
| Cohort | 1, 5, 6 | 2 | 7 | 3, 4 |

p = 0.007) and being challenged in thinking and decision-making skills ($\chi^2 = 10.471$, $p = 0.005$). There were no statistically significant associations found ($p > 0.05$) in assessment skill improvement, determination of what to tell the healthcare provider, additional learning from peers, perceived value of debriefing and group discussion. Further analysis across a different length and level of intensity of exposure to simulation showed no significant association with self-reported confidence and decision-making (Table 4). Analysis of responses immediately after the conclusion of simulation courses (sixth semester for cohort 1,2,5,6 and fifth semester for cohort 7) revealed that a significantly higher proportion of students receiving two courses during sixth semester felt better prepared to care for a real patient ($p = 0.036$), developed a better understanding of the pathophysiology of the conditions in the simulation ($p = 0.003$), and felt challenged in thinking and decision-making skills ($p = 0.027$) (Charts 1 through 5). A comparison of two cohorts (1 and 2) who completed the survey two semesters after completing the simulations also showed no significant differences across all 13 items of the SET survey tool ($p > 0.10$ for all). These results suggest that some exposure to simulated clinical experiences significantly enhances students' perceived confidence and decision-making skills. However, neither a short-term nor a long-term impact of increasing length and intensity (three courses over two semesters) is significantly greater compared to two courses during the sixth semester. The students' confidence with decision-making reflects

**Table 3**
Analysis of self-reported confidence and decision-making skills.

| | Control N (%) | Intervention N (%) | Chi-square | P |
|---|---|---|---|---|
| I feel better prepared to care for a real patient | | | 6.542 | 0.038 |
| Not agree | 8 (13.8%) | 27 (6.9%) | | |
| Some agree | 28 (48.3%) | 153 (39.2%) | | |
| Strongly agree | 22 (37.9%) | 210 (53.8%) | | |
| I developed a better understanding of the pathophysiology of the conditions in the SCE | | | 8.986 | 0.011 |
| Not agree | 7 (12.1%) | 32 (8.2%) | | |
| Some agree | 32 (55.2%) | 148 (37.9%) | | |
| Strongly agree | 19 (32.8%) | 210 (53.8%) | | |
| I developed a better understanding of the medications that were used in the SCE | | | 10.337 | 0.006 |
| Not agree | 3 (5.2%) | 37 (9.5%) | | |
| Some agree | 36 (62.1%) | 155 (39.7%) | | |
| Strongly agree | 19 (32.8%) | 20 (50.8%) | | |
| I feel more confident in my decision-making skills | | | 7.592 | 0.022 |
| Not agree | 4 (6.9%) | 20 (5.1%) | | |
| Some agree | 34 (58.6%) | 160 (41%) | | |
| Strongly agree | 20 (34.5%) | 210 (53.8%) | | |
| I am more confident in determining what to tell the healthcare provider | | | 1.198 | 0.549 |
| Not agree | 8 (13.8%) | 39 (10%) | | |
| Some agree | 28 (48.3%) | 179 (45.9%) | | |
| Strongly agree | 22 (37.9%) | 172 (44.1%) | | |
| My assessment skills improved | | | 3 | 0.223 |
| Not agree | 2 (3.4%) | 31 (7.9%) | | |
| Some agree | 22 (37.9%) | 112 (28.7%) | | |
| Strongly agree | 34 (58.6%) | 247 (63.3%) | | |
| I feel more confident that I will be able to recognize changes in my real patient's condition | | | 8.863 | 0.012 |
| Not agree | 9 (15.5%) | 24 (6.2%) | | |
| Some agree | 29 (50%) | 172 (44.1%) | | |
| Strongly agree | 20 (34.5%) | 194 (49.7%) | | |
| I am able to better predict what changes may occur with my real patients | | | 7.128 | 0.028 |
| Not agree | 9 (15.5%) | 25 (6.4%) | | |
| Some agree | 29 (50%) | 185 (47.4%) | | |
| Strongly agree | 20 (34.5%) | 180 (46.2%) | | |
| Completing the SCE helped me understand classroom information better | | | 10.024 | 0.007 |
| Not agree | 5 (8.6%) | 30 (7.7%) | | |
| Some agree | 32 (55.2%) | 135 (34.6%) | | |
| Strongly agree | 21 (36.2%) | 225 (57.7%) | | |
| I was challenged in my thinking and decision-making skills | | | 10.471 | 0.005 |
| Not agree | 7 (12.1%) | 19 (4.9%) | | |
| Some agree | 26 (44.8%) | 124 (31.8%) | | |
| Strongly agree | 25 (43.1%) | 247 (63.3%) | | |
| I learned as much from observing my peers as I did when I was actively involved caring for the simulated patient | | | 2.39 | 0.303 |
| Not agree | 5 (8.6%) | 25 (6.4%) | | |
| Some agree | 23 (39.7%) | 122 (31.3%) | | |
| Strongly agree | 30 (51.7%) | 243 (62.3%) | | |
| Debriefing and group discussion were valuable | | | 1.875 | 0.392 |
| Not agree | 5 (8.6%) | 27 (6.9%) | | |
| Some agree | 22 (37.9%) | 118 (30.3%) | | |
| Strongly agree | 31 (53.4%) | 245 (62.8%) | | |

"SCE" – Simulated care experience.

**Table 4**
Analysis of self-reported confidence and decision-making skills across different levels and intensity of Simulated Clinical Experience (SCE).

| | Courses during 5th semester | 2 Courses during 6th semester | 3 Courses during 5th and 6th semester | P* |
|---|---|---|---|---|
| | N (%) | N (%) | N (%) | |
| I feel better prepared to care for a real patient | | | | 0.036 |
| | 0 (0%) | 0 (0%) | 3 (3.4%) | |
| | 10 (38.5%) | 2 (7.1%) | 25 (28.1%) | |
| | 16 (61.5%) | 26 (92.9%) | 61 (68.5%) | |
| I developed a better understanding of the pathophysiology of the conditions in the SCE | | | | 0.003 |
| | 3 (11.5%) | 1 (3.6%) | 3 (3.4%) | |
| | 9 (34.6%) | 1 (3.6%) | 28 (31.5%) | |
| | 14 (53.8%) | 26 (92.9%) | 58 (65.2%) | |
| I developed a better understanding of the medications that were used in the SCE | | | | 0.126 |
| | 3 (11.5%) | 1 (3.6%) | 2 (2.2%) | |
| | 10 (38.5%) | 6 (21.4%) | 32 (36%) | |
| | 13 (50%) | 21 (75%) | 55 (61.8%) | |
| I feel more confident in my decision-making skills | | | | 0.281 |
| | 0 (0%) | 0 (0%) | 3 (3.4%) | |
| | 12 (46.2%) | 6 (21.4%) | 29 (32.6%) | |
| | 14 (53.8%) | 22 (78.6%) | 57 (64%) | |
| I am more confident in determining what to tell the healthcare provider | | | | 0.743 |
| | 3 (11.5%) | 1 (3.6%) | 6 (6.7%) | |
| | 11 (42.3%) | 11 (39.3%) | 32 (36%) | |
| | 12 (46.2%) | 16 (57.1%) | 51 (57.3%) | |
| My assessment skills improved | | | | 0.953 |
| | 1 (3.8%) | 1 (3.6%) | 6 (6.7%) | |
| | 5 (19.2%) | 4 (14.3%) | 17 (19.1%) | |
| | 20 (76.9%) | 23 (82.1%) | 66 (74.2%) | |
| I feel more confident that I will be able to recognize changes in my real patient's condition | | | | 0.14 |
| | 3 (11.5%) | 0 (0%) | 5 (5.6%) | |
| | 11 (42.3%) | 7 (25%) | 35 (39.3%) | |
| | 12 (46.2%) | 21 (75%) | 49 (55.1%) | |
| I am able to better predict what changes may occur with my real patients | | | | 0.822 |
| | 2 (7.7%) | 1 (3.6%) | 6 (6.7%) | |
| | 10 (38.5%) | 8 (28.6%) | 34 (38.2%) | |
| | 14 (53.8%) | 19 (67.9%) | 49 (55.1%) | |
| Completing the SCE helped me understand classroom information better | | | | 0.081 |
| | 0 (0%) | 0 (0%) | 3 (3.4%) | |
| | 10 (38.5%) | 3 (10.7%) | 28 (31.5%) | |
| | 16 (61.5%) | 25 (89.3%) | 58 (65.2%) | |
| I was challenged in my thinking and decision-making skills | | | | 0.027 |
| | 0 (0%) | 1 (3.6%) | 2 (2.2%) | |
| | 9 (34.6%) | 1 (3.6%) | 21 (23.6%) | |
| | 17 (65.4%) | 26 (92.9%) | 66 (74.2%) | |
| I learned as much from observing my peers as I did when I was actively involved caring for the simulated patient | | | | 0.484 |
| | 0 (0%) | 2 (7.1%) | 4 (4.5%) | |
| | 8 (30.8%) | 6 (21.4%) | 16 (18%) | |
| | 18 (69.2%) | 20 (71.4%) | 69 (77.5%) | |
| Debriefing and group discussion were valuable | | | | 0.648 |
| | 0 (0%) | 0 (0%) | 4 (4.5%) | |
| | 9 (34.6%) | 8 (28.6%) | 21 (23.6%) | |
| | 17 (65.4%) | 20 (71.4%) | 64 (71.9%) | |

* *P*-value from Fisher's exact tests.

their capacity for clinical reasoning.

## 7. Discussion

The outcomes from this program have shown a significant improvement in students' clinical reasoning skills, as indicated by self-reported increases in their levels of confidence to engage in clinical reasoning and decision-making in high-fidelity, human-patient simulation exercises. The exercises developed from the Simulation Institute were implemented in Phase Two with additional time and resources given to faculty for including simulation into the curriculum. The program also increased faculty collaboration and innovation in teaching as seen by student outcomes assessments. The surveys demonstrated clearly a direct correlation between the amount of clinical practice in simulation students received and their self-reported levels of confidence in their abilities to model advanced clinical reasoning through decision-making (Benner, 2015). The study supports the findings of Hart, who assessed the effectiveness of focused simulated patient deterioration to develop student skills as first responders (Hart et al., 2014).

High-fidelity, human-patient simulation has emerged as a way of assisting and augmenting clinical experiences (Bradley & Postlethwaite, 2003). Studies have shown that the confidence required for successful clinical performance has a significant impact on students' perceptions of overall success, thus leading to better retention and completion rates for nursing programs (Cato, Lasater, & Peeples, 2009; Elfrink, Kirkpatrick, Nininger, & Schubert, 2010; Goldenberg, Andrusyszyn, & Iwasiw, 2005; Weaver, 2014).

Simulation also has the potential for informing nursing program evaluation and development while enhancing the faculty ability to

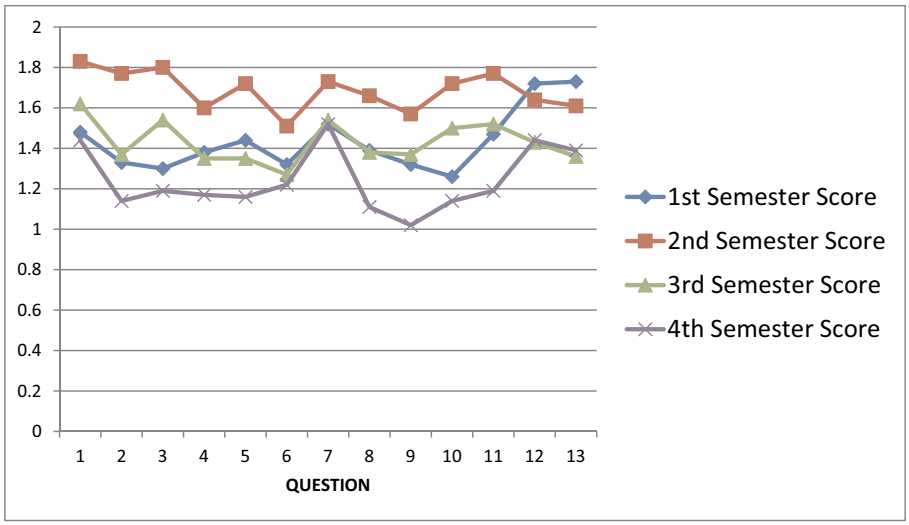


**Chart 1.** SET survey after first semester of evaluation collection.

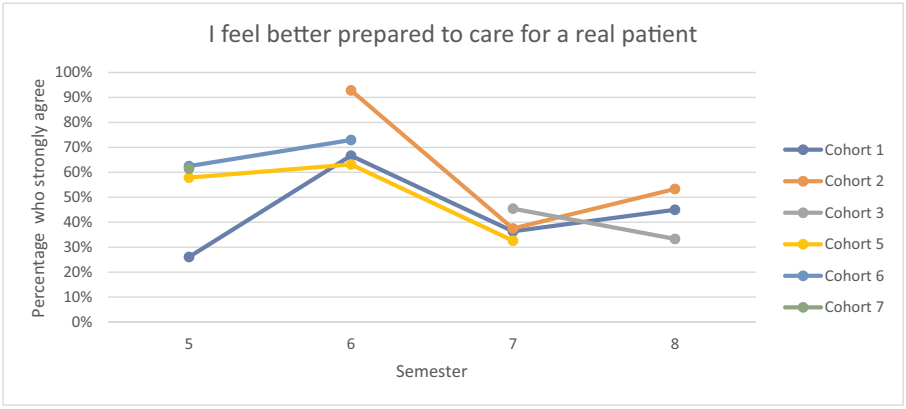


**Chart 2.** SET Question 2.

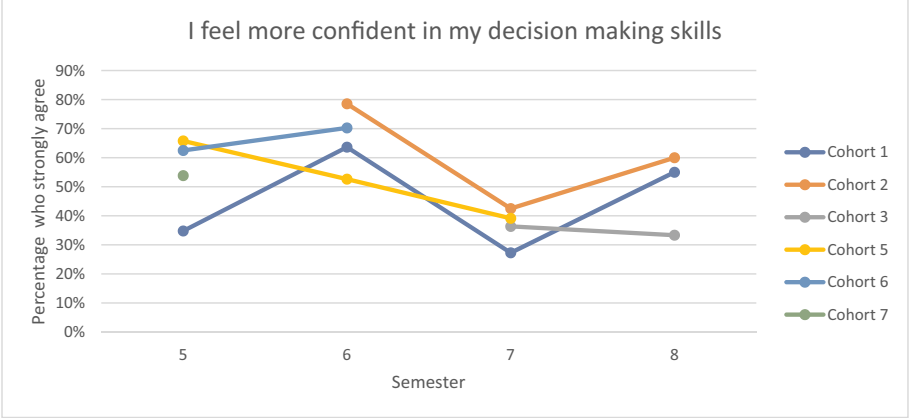


**Chart 3.** SET Question 5.

provide better, more focused clinical learning experiences (Burbach, Barnason, & Thompson, 2015; Chamberlain, 2017; Laschinger et al., 2008; Leigh, 2008; Redden, 2015). Discussed less in nursing education circles has been what Benner et al. (2010) called "clinical imagination". These authors believe this key component in educational experiences helps develop nurses' aptitudes for cultivating the multi-functioning senses necessary to practice exceptional nursing. "Nurses use a related way of thinking about patients when they use clinical imagination to conjure up possibilities, resources, and constraints in the patient and family situations" (Benner et al., 2010). Often referred to in other fields as 'thinking outside of the box,' this mental process of diagnostic profiling of symptoms in patients requires nurses to engage in multi-outcome scenario planning from scientific, creative, and formal criteria-based critical assessment, not unlike the higher-level thinking processes used by doctors, lawyers and engineers (Benner et al., 2010; Thompson, 2010).

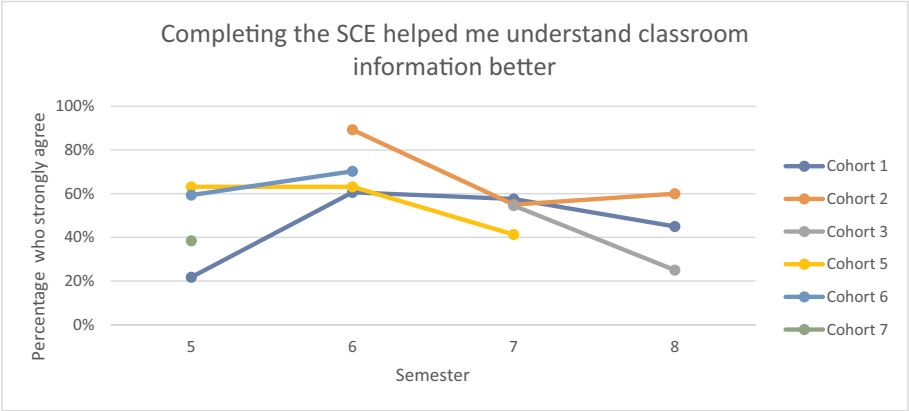


**Chart 4.** SET Question 10.

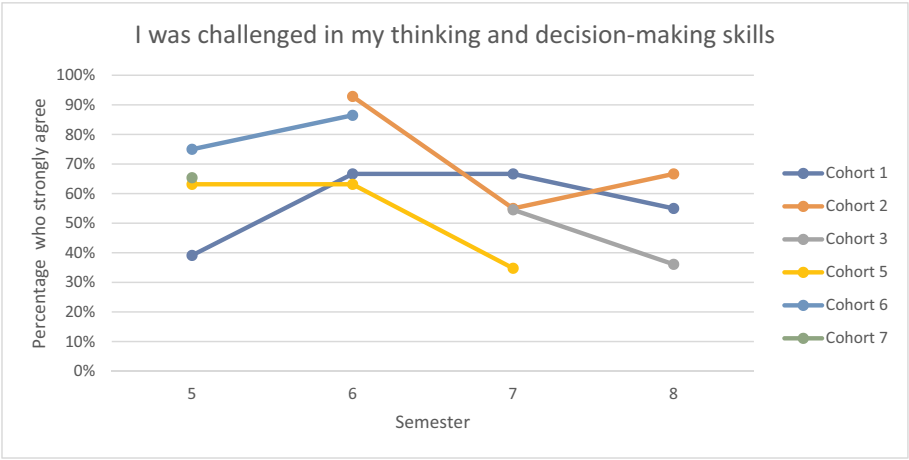


**Chart 5.** SET Question 11.

Although instruction in nursing programs tend to use models for contextualizing information, as in the use of frameworks of thinking to expose nursing students to problem-solving processes, the authors of *Educating nurses: A call for radical transformation* caution educators to remember that using these instructional models is not a substitute for actual thinking. Electronic and hands-on simulation of clinical processes and patient-centered scenarios, therefore, continues to represent the best alternative to actual live clinical setting experiences for students enrolled in nursing programs. This is particularly significant for nursing programs located in rural settings with stressed medical delivery infrastructure.

Nursing education programs located in rural settings are particularly dependent upon simulation as an alternative method of exposure to real patient care experience, given the fact there are fewer hospitals with less healthcare resources where students can observe and interact with patients (Fitzgerald, Kantrowitz-Gordon, Katz, & Hirsch, 2012). There are limited opportunities for clinical practice in the community and the chronic nursing faculty shortages are also key factors driving the emergence of alternate clinical teaching methods at many nursing schools (Hyland & Hawkins, 2009; Schiavenato, 2009).

## 8. Conclusion

The SET simulation effectiveness tool evaluates a student's perception of simulation effectiveness. On reflection, using Tanner's (2006) Clinical Judgment Model and the questions in the SET, simulation effectiveness appears to be a connected force for confidence and decision-making as part of clinical judgment and clinical reasoning (Benner, 2011; Benner et al., 2010; Cato et al., 2009; Dillard et al., 2009; Glynn, 2012). This study found that SET scores improved significantly when simulation time was increased. The increased scores show that students perceive they learned more of what they need to know to think like a nurse (Tanner, 2006). More focused research is needed in simulation incorporating health information technology tools such as electronic health records for documentation.

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