Introduction

Clinical reasoning is a key requisite for registered nurses to provide safe and quality patient care (Liou et al., 2016). The use of simulation has been acknowledged as well-suited for fostering nursing students' development of clinical reasoning (Hege et al., 2017). Within simulation groups, not every student is able to be allocated a hands-on role during the simulation scenario. Observers receive the same pre-brief and debrief but are located externally to the simulation and do not participate actively in patient care (O'Regan, et al., 2016). Despite the lack of hands-on participation, evidence suggests that observers may vicariously learn by watching others (Bandura, 1986; Collins et al., 2017) if supported by appropriate instructional means (Leigh et al., 2017). One such approach is use of an observer tool, implemented to assist the observer to cognitively immerse in their role. Such instructional tools contain directions regarding specific learning outcomes, behaviours or activities to consider, points for peer feedback, or provide a checklist to complete. Recently, the use of an observer tool has gained momentum (Leigh et al., 2017; O'Regan et al., 2016); unfortunately, there remains a lack of robust evidence regarding the effectiveness of these kind of tools to meet learning outcomes and objectives (O'Regan et al., 2016). This pilot study aimed to evaluate if using a simulation observation tool (i.e., a worksheet with clinical reasoning scaffolds - the Clinical Reasoning Observer Worksheet [CROW]), would enhance observers' active learning behaviours; and, increase perceptions of clinical reasoning related to a simulated episode of patient care.

Background

Learning is influenced by intrinsic or extrinsic motivation (Bandura, 1986) which in turn stimulates an individual's attentiveness and focus. In simulation, active participants are commonly motivated by the goal of wishing to avoid harm the simulated patient. However, simulation observers may lack a similar goal, due to their lack of active participation in specific learning outcomes (Stegmann et al., 2012). The use of an observer tool to engage observers

during simulation has been found to positively motivate learners (O'Regan et al., 2016). Observers who had an understanding and clarity of the responsibilities of their role, inclusive of an expectation to contribute to the debriefing, were satisfied with their simulated experience; and this is illustrative of intrinsic motivation, with the directed experience being practical, concrete and immediately useable (Tricomi & DePasque, 2016). Observer tools identified in the literature include activity guidelines (Hober & Bonnel, 2014), checklists (Kaplan et al., 2014), checklist with feedback (Stegmann et al., 2012) and prompts to focus on specific tasks (Thidemann & Soderhamn, 2013). These studies compared active participants and observers and reported equivalent (Kaplan et al., 2012; Thidemann & Soderhamn, 2013 & Bell et al., 2014) or superior learning outcomes (Stegmann et al., 2012). Norman (2018) found there were no differences in knowledge, confidence, or collaboration between groups who used an observation guide directing student attention to aspects of the simulation scenario versus those without a guide. While no differences were found in learning outcomes, consistent with O'Regan et al. (2016) findings, there was a reported increase in satisfaction in those whose learning was directed with an observer worksheet.

The Clinical Reasoning Cycle (Levett-Jones et al., 2010; Theobald & Ramsbotham, 2019) has also been used as a key framework underpinning learning activity in nursing education. The Clinical Reasoning Cycle is a process by which health professionals assess the patient; process information to form an understanding of a patient's problem or situation; plan and implement interventions; and evaluate outcomes and learn from the process to solve problems and address patient's needs (Levett-Jones et al., 2010). In this study, to assist in the consolidation of the clinical reasoning process to patient care, a simulated scenario was undertaken by students, whereby approximately 50% of students were allocated to a simulation observation role. Anecdotal evidence from simulation facilitators was that observers' contribution to debriefing by providing information linking the clinical reasoning cycle to the

care provided, was minimal. Therefore, the purpose of this study was to examine the use of the clinical reasoning observer worksheet (CROW) by observers'; and, examine simulation facilitators' perceptions of student abilities toward applying clinical reasoning during simulation.

Methods

This pilot study was undertaken to examine the feasibility of the research design for a future larger study. This study reports on preliminary evidence of the efficacy of recruitment procedures, instrumentation and student's perceived learning outcomes, and simulation facilitators' perceptions of clinical reasoning uptake.

Setting

This study was conducted in a large metropolitan university in Brisbane, Queensland, Australia. Students were enrolled to undertake one simulation class per semester, which was a standard learning activity in the university nursing program. Approval for the study was obtained from the University's Human Research Ethics Committee.

Sample

This study used a convenience sample of second year undergraduate Bachelor of Nursing students ($N = 233$) and the simulation facilitators who taught the simulation classes ($N = 7$). As per standard university process, students registered into a simulation session according to their availability. After registrations closed, researchers randomised simulation sessions using a computer-generated program. Participants were not advised of allocation to a control or intervention group. There were 30 sessions in total; 15 were allocated as control and 15 as intervention groups. All groups were comprised of between six to eight students. Simulation facilitators were either full-time academic faculty members or casually employed faculty who were all registered nurses. Simulation facilitators were orientated to the simulation scenario and objectives. If new to facilitation of simulation, the facilitator observed a more experienced

simulation facilitator prior to participation in this study. No formal simulation training was required prior to facilitating a session. Further, all simulation facilitators received a teaching resource which provided instruction on how to prebrief and debrief students. Pendleton's model (1984) for reflection was the preferred scaffold method for the debrief.

Intervention and Control

Intervention group.

The intervention was the implementation of the CROW, an observer worksheet which was researcher adapted from the well-known Clinical Reasoning Cycle (Levett-Jones et al., 2010; Theobald & Ramsbotham, 2019).The worksheet listed steps of the clinical reasoning process: *assess, plan, implement, evaluate* (APIE), with specific cueing questions relating to the clinical reasoning cycle. This format provided a structured framework of cues to prompt active engagement in the observer role; and, appraisal of participants' simulation care behaviour and the clinical reasoning process. Each step was colour coded to match the corresponding aspects of the clinical reasoning cycle diagram (Levett-Jones et al., 2010) (Figure 1.) Observers were directed to focus and keep notes on participants' practice during the simulation, while using the clinical reasoning cycle to assist in structuring notes for feedback during debriefing.

Figure 1. Clinical Reasoning Observer Worksheet (CROW)

Clinical reasoning cycle	**How did the simulation participants address the key points in the scenario?** **Make notes below.**
• Consider person and context • Collect cues/information • Process information	**Assess** What data did participants collect? Was it holistic? How was data collected? Suitable framework used? Any recommendations for further assessment data collection?

• Identify problems/issues • Establish goals	**Plan** What are normal/abnormal findings from data collected? What do you think the patient problems are? What are your priorities for action? Same as observed? Why?
• Take action / intervene	**Implement** What interventions did the participants implement? Were the interventions relevant to the scenario? Do you agree with the interventions undertaken? What other interventions could have been done? Provide a rationale?
• Evaluate outcomes • Reflect on process and new learning	**Evaluate** How did the patient's condition change? Were the interventions effective? How did you know this? What could be improved in future similar situations? Any recommendations to improve future team communication?

Control group.

The standard observer worksheet was divided into three sections with questions inquiring: (a) what patient assessment was performed in the simulation; (b) how the participants recognised, prioritised, and treated chest pain; and, (c) how the participant communicated important information. In both control and intervention groups, the simulation scenario was the same. Observers of both groups were directed to observe participants' actions and keep notes on the whole episode of care, with the aim to use worksheet notes to structure feedback during debriefing.

Instruments

Participant demographic data collected in this study included: gender, age, grade point average (GPA), course status full time or part time student status, course enrolled, and previous tertiary study and simulation role (i.e., observer or participant).

Nurses Clinical Reasoning Scale.

The Nurses Clinical Reasoning Scale (Liou et al., 2016) is a 15-item instrument and individual items are based on the conceptual definition of the Clinical Reasoning Cycle process of *look, collect, process, decide, plan, act, evaluate and reflect*. Scoring for each item ranged from *1=strongly disagree* to *5=strongly agree* on five equal intervals with a neutral mid-point. Total score for the instrument ranged from 15-75; a higher score indicated a higher level of clinical reasoning ability. Cronbach's alpha for the instrument was reported as 0.9 (Liou et al., 2016). The instrument also contained one open-ended question and sought to elicit comments regarding the overall simulation experience. Study authors sought and received permission to use the Nurses Clinical Reasoning Scale (Liou et al., 2016) in this study.

The Clinical Reasoning Facilitator Survey (CRFS).

The CRFS was a researcher developed tool adapted from Lasater's Clinical Judgment Rubric (Lasater, 2007) and Clinical Reasoning Cycle (Levett-Jones et al., 2010) and simulation facilitators were asked to respond to three open-ended questions which sought comment on how the students performed.

Procedure – student.

The simulation scenario used in this study involved a patient who underwent percutaneous coronary intervention and subsequently developed chest pain. To ensure consistent physiologic changes and responses to interventions during the simulation, the scenario was pre-programmed into the simulation software, and the manikin responses were standardised. The scenario reflected the cardiovascular related theoretical content that had been

delivered to students in the week prior to simulation. During the simulation, students were expected to demonstrate patient assessment, management of the patient's chest pain, and effective communication with the patient and other members of the healthcare team.

On arrival to their allocated simulation class, all students who agreed to participate received an envelope which contained a hard copy of the pre-test survey and post-test survey. Students completed the hard copy pre-test survey which comprised of demographic questions and the NCRS prior to progressing to the pre-brief room. At the commencement of the simulation, students' self- allocated to either role of a simulation *observer* or an active *participant*. Once roles were allocated, the simulation facilitator delivered a scripted orientation and pre-briefing to all students. The pre-brief lasted approximately 10 minutes and included information on the patient history, an overview of the current medical problem, and a set of clinical orders to be completed. After the pre-brief, a 20-minute clinical scenario was conducted with four students delivering patient care and the remaining students being observers. Upon conclusion of the clinical scenario, a post simulation debrief was conducted, and all participants completed the post-test survey (NCRS) and placed the completed surveys into a sealed box.

Procedure – facilitator.

The simulation facilitator delivered debrief providing feedback to participants about performance and linking discussion to key learning outcomes. At the completion of each simulation and debriefing, the facilitator completed a CRFS in hard copy. Once completed, simulation facilitators placed the CRFS in a sealed box.

Data analysis

Quantitative data was entered into IBM Statistical Package for the Social Sciences (Version 22.0, Chicago, IL) prior to a random selection of 10% of data being cross checked for accuracy. Descriptive statistics, frequencies, percentages, means, and standard deviations,

where appropriate, were used to analyse the demographic characteristics of the sample and outcome variables. Kolmogorov-Smirnov tests were performed to verify the normality of data. Mann-Whitney U test and Wilcoxon signed-rank test were used to evaluate change in perceptions of clinical reasoning. Statistical significance was set at $p = .05$. Reliability was measured for internal consistency using Cronbach's alpha for the scale. Spearmans Rho correlation identified whether there was a statistically significant association between the demographic variable of age and the outcome variable of clinical reasoning score. Simulation facilitator responses included self-reported observations of participant and observer interactions and comments during debrief. Verbatim comments from the open-ended questions were analysed using six sensitising concepts (Blumer, 1969): *peer learning; active learning; transfer of learning; vicarious learning; simulation and clinical reasoning*. The six sensitising concepts helped decide on initial coding as raw data was moved under a sensitising concept. Initial codes were then compared, contrasted, and discussed using an iterative approach in the context of the research aim and known literature (by two experienced qualitative researchers). Moving from the list of several initial codes, researchers generated key focussed codes which moved data from raw to a more abstract interpretation to subsequently arrive at the overall analytical findings (Charmaz, 2014).

Results

Demographics

The majority 179/233 (77%) of the sampled students were female, with a mean age of 23.67 years ($SD = 6.497$). There were 219 (94%) participants who identified as full-time students and 104 (45%) were enrolled in the three-year Bachelor of Nursing program. A number of participants 40 (17%) were graduate entry students, 31 (13%) were diploma entry and 57 (25%) were double degree students. There were no significant differences between the demographic information of participants in control and intervention groups at baseline.

Quantitative results

The Cronbach alpha of the NCRS was .922, indicating a good measure of reliability. There was no statistically significant difference in total pre-test scores between the observers in the control (*Md* 51, *n* = 41) and observer intervention (*Md* 51.5, *n* = 22) ($U = 440$, $z = .159$, $p = .874$). There was no statistically significant difference in total post-test scores between the two groups ($U = 427$, $z = .052$, $p = .958$); control (*Md* = 56, *n* = 41); intervention (*Md* = 56, *n* = 21). Within the control group, there was a statistically significant change in total clinical reasoning scores after using the standard observer worksheet ($z = 3.257$, $p < .001$) with a small effect size (0.37). The median score increased on NCRS from 51 to 56 at completion of debriefing. Within the intervention group, there was a statistically significant change in total clinical reasoning scores after using the CROW ($z = 2.389$, $p = .017$) with a small effect size (0.38). The median score on the NCRS increased from 51 to 56. Scores of pre- and post-test were compared using Wilcoxon signed rank test to evaluate whether perceptions of clinical reasoning increased. There was a statistically significant improvement ($p < 0.05$) in clinical reasoning scores following participation in the simulation and debriefing in 10 out of 15 criteria for the control group and in three out of the 15 criteria for the intervention group.

Qualitative findings

From the simulation facilitator's perspective two analytical interpretations were generated: (a) *looking from the inside out;* and, (b) *looking from the outside in*.

Looking from the inside out was interpreted as the way facilitators perceived student experience of clinical reasoning within simulation. Insights about student observer behaviour and knowledge were expressed, including how they applied the clinical reasoning processes. Two facilitators noted student observers were:

> *Using the Clinical Reasoning Cycle and trying to establish links and connections with the data. (Facilitator #34 - control group);*

Understanding rationale behind actions - Link assessments to interventions.

(Facilitator #7 - intervention group)

Facilitators witnessed student observers working to understand the simulation scenario, including using the clinical reasoning cycle to guide and prompt their internal clinical decision making. This is evident in Participant #7's (intervention group) observation, that student observers were attempting to cognitively link data to interventions and rationalise clinical decisions. Facilitators recognised that the clinical reasoning cycle can externally guide thinking by scaffolding clinical reasoning; thus, reducing the internal cognitive load, allowing for more efficient, accurate and timely responses by students. There was also acknowledgement by some facilitators about the lack of understanding of clinical reasoning and its role in clinical decision making. Clinical decision making is at risk when patient assessment is not accurate:

It is a further break down of the APIE process as they obviously do not fully understand this process as beginner learners + this is to help them. (Facilitator #15 – control group);

Clear assessment using frameworks would help guide correct interventions.

(Facilitator #9 – control group)

The second analytical interpretation *looking from the outside in* became evident when clinical reasoning was found to be explicit and tangible. Facilitators actioned the clinical reasoning cycle by asking the *why*, *what*, *how* and *why will it be effective* questions, guiding the student to rationalise decisions and to evaluate actions. Facilitators either intentionally or serendipitously prompted student observers, rather than relying on the minimal reflection being demonstrated by students, to facilitate decisions and evaluation:

Why would you do that - why are you checking the wound site, what are you checking for? What would the implication of a particular finding mean? What is the goal - what

would you like to see? What would you do if you forward X. (Facilitator #4- control group);

Ask students to explain why they took a certain approach + how this could vary + why. (Facilitator #22 – control group)

Facilitators perceived that student observer decision making was underpinned by what they actions that would lead to best patient outcomes. However, it was noted that evaluation of the interventions was not undertaken, suggesting that students identify more strongly with nursing actions, and less so with evaluative and reflective thinking, as evidenced here:

> *That the student assesses the patient, is able to identify + prioritise problems, (in this case chest pain + the potential to bleed from removal artery), implement appropriate interventions + evaluate the success of same, the students are able to do the first 3 steps but fail with the rationale + evaluation has been hit and miss. (Facilitator #23 - intervention group)*

Facilitators noted that student observers collect and analyse assessment data. They witnessed student observers providing feedback on the breakdown of the clinical reasoning cycle, including how ineffective data collection contributed to negative patient outcomes. This interpretation suggests that student observer thinking can be successfully scaffolded to ensure effective clinical decision making.

> *Observers identified potential problems related to incomplete data being provided to the doctor and how this impacted the patient (#20 - intervention group)*.

Discussion

The twofold aim of this pilot study was to examine the effects of an observational worksheet on student's perceived learning outcomes and simulation facilitators' perceptions of clinical reasoning uptake; also, to test study recruitment procedures, instrumentation and analysis in preparation for a larger study.

With regard to students' perceived learning outcomes, there were no significant difference in total clinical reasoning scores between observers who used the CROW and observers who used the standard observational worksheet. Scores for both groups showed an increase in students' perception of clinical reasoning ability, consistent with systematic review findings of a high association between use of observer tools and learning outcomes (O'Regan et al., 2016); however, the lack of a difference between the two approaches in this study indicates further exploration is required. This study utilised self-report instruments to gain an understanding of student perspective. In the future, it may be beneficial to refine data collection methods, including the use of trained data collectors to assist in quantifying learning outcomes.

The findings of the pilot study also underline practicalities for the use of clinical reasoning within a nursing program. The development of clinical decision-making capability in nursing students is paramount to ensure quality and safe patient care (Bucknall et al., 2016; Forbes et al., 2016). It is vital that students are supported and encouraged to develop higher level cognitive skills. We recommend adequate preparation and education of simulation facilitators which emphasise and value the importance of reflection and to always challenge students to focus on the final two steps of the clinical reasoning cycle (Levett-Jones et al., 2010).

Finally, in future examination studying the role of observers in clinical simulation, use of the Educational Practices Questionnaire (Jeffries & Rizzolo, 2006) should be considered. This 16-item instrument uses a five-point Likert scale to measure whether four educational practices (i.e., active learning, collaboration, diverse ways of learning, and high expectations) are present in the simulation and the importance of each practice to the learner. This tool may offer a usable approach from which to better measure aspects of active learning, collaboration, and student expectations, as related to observer roles in simulation.

Limitations

There are several limitations of this study. A threat to validity in this study was the lack of standardisation and monitoring procedures. While consistent implementation of simulation processes was sought, simulation facilitator standardization was not completed prior to conducting the larger study to ensure all simulation facilitators were consistent in the process of simulation delivery and debriefing. Second, demographic section of the survey instrument was noted to not adequately detailed to capture the roles of the observer or participant in the simulation. Due to this lapse, students were not asked to indicate their role during the pre-test. At this point, students would not have been aware if they were going to be allocated to either a participant or observer role. This likely attributed to 125 (56%) of the study participants (combined intervention and control groups) not documenting their role (participant or observer) in this study. Subsequently, this resulted in a smaller cohort sample sizes to examine the pre- and post-test scores of the study instruments.

Conclusion

The observer role can be one of value if it involves active learning, such as with the use of an observer tool. While the CROW may be a useful approach during simulation, the null difference uncovered in this pilot study indicates that further development and evaluation is required in order for it to become a meaningful and useful adjunct to an observational activity. Further, to maximise learning of the observer by engaging in higher level thinking simulation facilitators must guide students during debriefing and prompt reflection. Adequate education and training for the simulation facilitators is therefore essential, not only for debriefing, but also in how to use the observational worksheet to scaffold questions to prompt student reflection.

References

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ, 1986.

Bell, C. A., Qi, Y., Croft, A. J., Leusner, D., Mccaffrey, D. F., Gitomer, D. H., & Pianta, R. C. (2014). Improving observational score quality: Challenges in observer thinking. *Designing teacher evaluation systems: New guidance from the measures of effective teaching project*, 50-97.

Blumer, H., 1969. *Symbolic interactionism perspectives and method*. University of California Press, Berkeley.

Bucknall, T. K., Forbes, H., Phillips, N. M., Hewitt, N. A., Cooper, S., Bogossian, F., & First2Act Investigators. (2016). An analysis of nursing students' decision-making in teams during simulations of acute patient deterioration. *Journal of Advanced Nursing*, *72*(10), 2482-2494.

Campbell, M. J., Eldridge, S., Farrin, A., Marchant, M., Muller, S., ... & Rait, G. (2010). Trials in primary care: statistical issues in the design, conduct and evaluation of complex interventions. *Statistical Methods in Medical Research,* 19(4), 349-377.

Collins, T., Lambert, L., Helms, C. D., & Minichiello, V. M. (2017). Use of mindful observer to extend simulation learning experience. *Nursing Education Perspectives*, *38*(2), 98-99.

Forbes, H., Bucknall, T. K., & Hutchinson, A. M. (2016). Piloting the feasibility of head-mounted video technology to augment student feedback during simulated clinical decision-making: An observational design pilot study. *Nurse Education Today*, *39*, 116-121.

Hallin, K., Bäckström, B., Häggström, M., & Kristiansen, L. (2016). High-fidelity simulation: Assessment of student nurses' team achievements of clinical judgment. *Nurse Education in Practice,* 19, 12-18.

Hege, I., Kononowicz, A. A., & Adler, M. (2017). A clinical reasoning tool for virtual patients: design-based research study. *JMIR Medical Education*, *3*(2), e21.

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high-fidelity simulation. *Clinical Simulation in Nursing*, *10*(10), 507-514.

Jeffries, P. R., & Rizzolo, M. A. (2006). Designing and implementing models for the innovative use of simulation to teach nursing care of ill adults and children: A national, multi-site, multi-method study. *New York, NY: National League for Nursing*.

Johnston, S., Nash, R., & Coyer, F. (2019). An Evaluation of Simulation Debriefings on Student Nurses' Perceptions of Clinical Reasoning and Learning Transfer: A Mixed Methods Study. *International Journal of Nursing Education Scholarship*, *16*(1).

Kaplan, B. G., Abraham, C., & Gary, R. (2012). Effects of participation vs. observation of a simulation experience on testing outcomes: Implications for logistical planning for a school of nursing. *International Journal of Nursing Education Scholarship*, *9*(1).

Lancaster, G. A., Campbell, M. J., Eldridge, S., Farrin, A., Marchant, M., Muller, S., ... & Rait, G. (2010). Trials in primary care: statistical issues in the design, conduct and evaluation of complex interventions. *Statistical Methods in Medical Research, 19*(4), 349-377.

Lasater, K. (2007). Clinical judgment development: Using simulation to create an assessment rubric. *Journal of Nursing Education*, *46*(11).

Leigh, G., Miller, L. B., & Ardoin, K. B. (2017). Enhancing observers' learning during simulations. *The Journal of Continuing Education in Nursing*, *48*(10), 454-457.

Levett-Jones, T., Hoffman, K., Dempsey, J., Jeong, S. Y. S., Noble, D., Norton, C. A., ... & Hickey, N. (2010). The 'five rights' of clinical reasoning: An educational model to enhance nursing students' ability to identify and manage clinically 'at risk'patients. *Nurse Education Today*, *30*(6), 515-520.

Liou, S. R., Liu, H. C., Tsai, H. M., Tsai, Y. H., Lin, Y. C., Chang, C. H., & Cheng, C. Y. (2016). The development and psychometric testing of a theory-based instrument to evaluate nurses' perception of clinical reasoning competence. *Journal of Advanced Nursing*, *72*(3), 707-717.

O'Regan, S., Molloy, E., Watterson, L., & Nestel, D. (2016). Observer roles that optimise learning in healthcare simulation education: a systematic review. *Advances in Simulation*, *1*(1).

Pendleton, D. (1984). *The consultation: an approach to learning and teaching* (No. 6). Oxford University Press.

Polit DF, Beck CT (2006). *Essentials of nursing research: Methods, appraisal, and utilization.* Lippincott Williams & Wilkins; 2006.

Stegmann, K., Pilz, F., Siebeck, M., & Fischer, F. (2012). Vicarious learning during simulations: is it more effective than hands-on training? *Medical Education*, *46*(10), 1001-1008.

Theobald, K. A., Windsor, C. A., & Forster, E. M. (2018). Engaging students in a community of learning: Renegotiating the learning environment. *Nurse Education in Practice*, *29*, 137-142.

Theobald, K. A., & Ramsbotham, J. (2019). Inquiry-based learning and clinical reasoning scaffolds: An action research project to support undergraduate students' learning to 'think like a nurse'. *Nurse Education in Practice, 38,* 59-65.

Thidemann, I. J., & Söderhamn, O. (2013). High-fidelity simulation among bachelor students in simulation groups and use of different roles. *Nurse Education Today*, *33*(12), 1599-1604.

Tricomi, E., & DePasque, S. (2016). The role of feedback in learning and motivation. In *Recent developments in neuroscience research on human motivation*. Emerald Group Publishing Limited.

Tutticci, N., Ryan, M., Coyer, F., & Lewis, P. A. (2018). Collaborative facilitation of debrief after high-fidelity simulation and its implications for reflective thinking: student experiences. *Studies in Higher Education*, *43*(9), 1654-1667.