

Mary Ann Jessee, MSN, RN

Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment

Dissertation

Oregon Health and Science University

Introduction

Today's complex healthcare environment requires that nurses possess sound clinical reasoning skill to recognize salient cues indicative of patient decline and take action to prevent costly complications, sentinel events, and death (Levett-Jones et al., 2010; Purling & King, 2012). Yet despite challenges for radical change of nursing education to improve clinical reasoning in new graduate nurses (Benner, Sutphen, Leonard, & Day, 2010; Institute of Medicine, 2010; National League for Nursing, 2010), significant deficits remain (Berkow, Virkstis, Stewart, & Conway, 2008; Casey, et al., 2011; Hickey, 2009; Levett-Jones et al., 2010; Purling & King, 2012). Alarming, 75% of frontline nurse managers (Berkow, et al., 2008) and 80% of nurse preceptors (Hickey, 2009) report new-graduate nurses are not yet proficient in making sound clinical judgments. Nurse preceptors have identified problem solving and decision-making among the weakest new-graduate competencies (Hickey, 2009) while graduating students consider themselves lacking the ability to discern changes in patient assessment findings and respond to urgent situations (Casey, et al., 2011). Hence, much of clinical education in nursing is not promoting skillful clinical reasoning (Benner, et al., 2010; Casey, et al., 2011; McNelis, et al., 2014) and is therefore failing to adequately prepare new-graduates to provide safe and effective care (Berkow, et al., 2008; Hickey, 2009).

Evidence shows that the development of skillful clinical reasoning is a complex process influenced by multiple factors including depth of knowledge and breadth of clinical experience (Benner, 1984; Norman, 2005), multiple opportunities for practice (Benner, et al., 2010; Ericsson, 2004; Lasater & Nielsen, 2009; Nielsen, 2009; Tanner, 2006) and sociocultural factors within the clinical learning environment (CLE) (Chuan & Barnett, 2012; Courtney-Pratt, FitzGerald, Ford, Marsden, & Marlow, 2012; Lave & Wenger, 1991; Warne, et al., 2010). The

CLE is a multifaceted sociocultural environment comprised of hierarchy, power structure, and relationships that impact the overall atmosphere of the CLE (Lave & Wenger, 1991). This overall atmosphere, as well as the interactions among students and the multiple factors that comprise the atmosphere of the CLE, result in highly variable student perceptions of learning experiences (Dunn & Hansford, 1997; Papp, Markkanen, & von Bonsdorff, 2003; Saarikoski, Isoaho, Warne, & Leino-Kilpi, 2008). An understanding of each of these factors will provide the foundation for inquiry that may finally begin to answer the call for change in pre-licensure clinical education.

Background and Significance

Skillful Clinical Reasoning Requires Knowledge and Multiple Clinical Experiences

Skillful clinical reasoning, the cognitive processes through which nurses combine patient data, knowledge, experience, professional values, and reflection in action to make nursing judgments (Simmons, 2010; Tanner, 2006), develops over time with multiple experiences (Benner, 1984; Benner, Tanner, & Chesla, 2009; Norman, 2005). Growing knowledge and experience with multiple representations of illnesses result in a cognitive repertoire of familiar situations from which expert nurses can deductively and inductively draw to solve complex patient problems (Benner, 1984; Norman, 2005). Long-standing (Ericsson, 2004) and recent evidence (Oermann, et al., 2011) demonstrates that deliberate, repetitive practice of both cognitive (Ericsson, 2004) and psychomotor skills (Oermann, et al., 2011) during clinical education significantly increases the development and retention of those skills. Novices have acquired fundamental knowledge but lack experience with multiple representations of illnesses and therefore lack the ability to discern subtle changes that do not fit the expected frame of reference (Benner, 1984; Benner, et al., 2009; Norman, 2005). This lack of experience is in part a

reflection of the inability of current pre-licensure clinical education structures to support multiple experiences (Ironsides & McNelis, 2010).

Current Clinical Education Structure Fails to Support Multiple Clinical Experiences

Group models. Most pre-licensure clinical education is implemented in traditional group models in which one instructor educates 6-10 nursing students, each engaged in total care of only one patient rather than engaged in learning activities with multiple patients. Access to the multiple experiences and deliberate practice known to promote skillful clinical reasoning (Ericsson, 2004; Norman, 2005) is limited by the capacity of that instructor to provide adequate supervision for patient care (Ironsides & McNelis, 2010; Jacobson & Grindel, 2006) and by the randomness of available patients (Niederhauser, et al., 2012). Further, this structure minimizes essential student-supervisor clinical coaching interactions and students' opportunities to gain the multiple patient experiences known to contribute to the development of sound clinical reasoning skill (Croxon & Maginnis, 2009; Ironsides & McNelis, 2010). While it is believed that clinical reasoning is best learned through direct engagement in nursing practice in the setting where practice occurs (Benner, et al., 2010; Lave & Wenger, 1991), this model of clinical education limits students' ability to fully engage in the cognitive and psychomotor work of nursing practice, therefore minimizing their ability to develop skillful clinical reasoning.

Preceptor models. There is an underlying assumption that collaboration between students and experienced nurses enhances students' learning of the key cognitive and psychomotor skills expected in a competent nurse (Mulready-Shick, Kafel, Banister, & Mylott, 2009; Mulready-Shick, Flanagan, Banister, Mylott, & Curtin, 2013; Rhodes, Meyers, & Underhill, 2012). In many preceptor models, the staff nurses who serve as preceptors are assigned, not self-selected as preceptors and may not be specifically trained in supervision and clinical teaching strategies,

thus bringing into question the quality of clinical education provided (McClure & Black, 2013).

Staff nurse preceptors function as the primary clinical instructor for one or two students thus reducing the instructor-to-student ratio when compared with traditional group models. While this increases the capacity of the preceptor to engage students in multiple experiences, preceptors often continue to carry a full patient care load and therefore may not be as available to engage directly with students as expected (Courtney-Pratt et al., 2012; Croxon & Maginnis, 2009). As a result, students educated in preceptor models may experience the same minimal opportunities for multiple experiences and deliberate practice as students educated in traditional group models.

The Dedicated Education Unit (DEU). The DEU is designed to purposefully engage students as members of the healthcare team and is characterized by 1) staff nurses who have a desire to teach and have been trained in methods of clinical instruction & supervision; 2) those trained nurses serve as the primary supervisors, or preceptors, of nursing students; and 3) university-employed clinical faculty collaborate with the trained staff nurses to educate students (Edgecombe, Wotton, Gonda, & Mason, 1999; Mulready-Shick, et al., 2009; Mulready-Shick et al., 2013; Rhodes, et al., 2012). It is believed that students immersed in nursing work in the environment of practice alongside these specifically trained, experienced nurses are afforded more opportunities for practice of essential cognitive and psychomotor skills than traditional group or preceptor models of clinical education (Mulready-Shick et al., 2009; Mulready-Shick et al., 2013; Rhodes, et al., 2012). Students educated in the DEU perceive improvement of their critical thinking and problem-solving skills while nurses in the DEU perceive that students benefit from the repetitive, hands-on experiences in the DEU (Rhodes, et al., 2012) and have improved achievement of quality and safety competencies such as safety, teamwork and

collaboration, informatics, patient-centered care, and evidence-based practice and quality improvement (Mulready-Shick et al., 2009).

Multiple studies of student, faculty, and nurse perceptions of learning in the DEU indicate that working alongside experienced nurses and engagement in direct coaching interactions with clinical supervisors, whether specifically trained staff nurses or school of nursing faculty, in the collaborative learning environment of the DEU fosters increased student engagement in the cognitive processes necessary to develop clinical reasoning skill (Hellstrom-Hyson, Martensson, & Kristofferzon, 2012; Henderson, Twentymann, Heel, & Lloyd, 2006; Newton, Jolly, Ockerby, & Cross, 2012; Newton, et al., 2011; Ransie & Grealish, 2007; Rhodes, et al., 2012). While these studies detail positive perceptions of learning outcomes in the DEU, to date there have been no studies identifying what factors within the CLE, including clinical instructor coaching behaviors, are associated with the development of students' clinical reasoning skill in the DEU or other models of clinical education.

Clinical Coaching Interactions are Not Promoting Skillful Clinical Reasoning

Clinical coaching interactions, the one-to-one verbal teaching, questioning, and feedback behaviors used by a clinical supervisor with a student situated in the patient care context, that occur within student-supervisor relationships during clinical education have been reported to have a significant impact on students' perceptions of learning (Chuan & Barnett, 2012; Courtney-Pratt et al., 2012; Warne, et al., 2010). Teaching behaviors that coach students in development and use of higher-order thinking skills foster improvement in essential cognitive skills, such as prioritization and clinical reasoning, while behaviors that focus students' thinking on factual knowledge, comprehension, and task completion may hinder the development of clinical reasoning (Benner et al., 2010). In order for students to engage in reflection and

incorporate new knowledge and experiences into future practice, clinical supervisors' teaching and questioning behaviors must be coupled with timely feedback that is very specific about how to improve (Clynes & Raftery, 2008; Ericsson, 2004). Unfortunately, while many faculty and staff nurse clinical supervisors believe their clinical coaching interactions with students are promoting problem-solving and reasoning skills, recent evidence shows these interactions are instead characterized by a focus on knowledge and task-completion, and therefore are not meeting this critical learning need in today's students (Raber, 2013; Ironside & McNelis, 2010; McNelis, et al., 2014). Hence, regardless of the structure of clinical education, clinical coaching interactions are not promoting skillful clinical reasoning. Although coaching for a sense of salience has been identified as a signature pedagogy in nursing (Benner, et al., 2010; Tanner, 2010), there is little evidence whether this and other forms of student-supervisor interactions actually promote pre-licensure students' development of skillful clinical reasoning.

Theoretical Framework

The complexity of clinical education and the development of clinical reasoning during clinical education are not well supported by a single theoretical perspective. Situated Learning Theory (Lave & Wenger, 1991), Expert Practice (Benner, 1984; Dreyfus & Dreyfus, 1986), Deliberate Practice (Ericsson, 2004), and the Tanner Clinical Judgment Model (Tanner, 2006) each offer relevant frameworks for pre-licensure clinical education, but each alone is incomplete to guide the design of clinical education that will support a comprehensive teaching and learning strategy to promote clinical reasoning skill. The Integrated Theory of Clinical Education (Jessee, 2015) is an amalgamation of Situated Learning Theory (Lave & Wenger, 1991), Expert Practice (Benner, 1984; Dreyfus & Dreyfus, 1986), Deliberate Practice (Ericsson, 2004), and the Tanner Clinical Judgment Model (Tanner, 2006) and posits that 1) clinical learning occurs in a

supportive sociocultural context of clinical practice, 2) clinical learning experiences are purposefully designed to provide multiple practice opportunities with essential psychomotor and cognitive skill-sets that support understanding, and 3) in-time discourse that promotes reflection in action, and feedback are integral to meaning making in clinical learning experiences. The Integrated Theory of Clinical Education proposes that the development of skillful clinical reasoning is promoted by engagement of students as members of the healthcare team in the context of nursing practice, deliberate multiple practices of essential cognitive and psychomotor skills, and purposeful clinical coaching interactions with their clinical supervisor. These tenets provide a comprehensive theoretical framework for clinical learning in nursing that promotes the development of clinical reasoning.

It is likely that there are elements of all models of clinical education in nursing that foster skillful clinical reasoning. Using the Integrated Theory of Clinical Education as the theoretical framework, this body of work will seek to identify characteristics within CLEs that are associated with clinical reasoning skill in nursing students. This knowledge will ultimately promote clinical education structures and environments that foster skillful clinical reasoning in nursing students and new-graduate nurses. Therefore, a melding of these four interrelated theoretical perspectives, Situated Learning Theory, Expert Practice, Deliberate Practice, and the Tanner Clinical Judgment Model as a comprehensive theoretical framework will guide design and implementation of pre-licensure clinical education that promotes clinical reasoning skill.

Purpose and Aims

The gaps in understanding of factors within pre-licensure CLEs that influence clinical reasoning inhibit the design and evaluation of learning experiences that foster skillful clinical reasoning. Therefore, the primary goal of this study is to gain insight into factors within the CLE

that influence the development of skillful clinical reasoning in baccalaureate-level pre-licensure nursing students. To achieve this goal, the following specific aims will be addressed (Table 1).

Aim 1. Synthesize what is known about factors within the pre-licensure clinical learning environment that influence students' perceptions of learning experiences.

To address this aim, a review of the literature was completed to determine the factors within the CLE that students' identify as meaningful or detrimental to their learning experiences. Findings from this literature review provided the background necessary to determine the variables that may contribute to students' clinical reasoning skill.

Aim 2. Describe a theoretical foundation to support pre-licensure nursing clinical education.

To address this aim, literature synthesized in Aim 1 and additional literature on clinical education models and clinical learning environments was analyzed for inclusion of theoretical support. It was found that there was inconsistent identification of a theoretical framework to support inquiry into clinical education. Identification of this crucial gap in the foundation for design and implementation of clinical education led to the amalgamation of Situated Learning Theory (Lave & Wenger, 1991), Expert Practice (Benner, 1984; Dreyfus & Dreyfus, 1986), Deliberate Practice (Ericsson, 2004), and the Tanner Clinical Judgment Model (Tanner, 2006) as the relevant theoretical support for design and implementation of pre-licensure clinical education to promote the development of clinical reasoning skill.

Aim 3. Develop and complete initial psychometric testing of a measure of clinical instructor clinical coaching characteristics.

To address this aim, a literature review of student-supervisor interactions, teaching, questioning, and feedback behaviors that contribute to student learning experiences and learning outcomes was completed. The findings from this literature review informed the development of a

measure to facilitate quantitative measurement of characteristics of student-supervisor clinical coaching interactions.

Aim 4. Describe the change in pre-licensure students' clinical reasoning skill after completion of a medical-surgical clinical rotation related to a) student perceptions of the CLE, b) characteristics of student-supervisor clinical coaching interactions (quantity of interactions, teaching-questioning strategies, and feedback characteristics), c) program type (traditional BSN, accelerated BSN equivalent), d) supervision type (university clinical instructor, staff nurse preceptor, or a collaborative supervision model by both), and e) CLE type (DEU, non-DEU).

Hypothesis 4.1: Students' clinical reasoning skill will improve following a 140-170 hour adult medical-surgical clinical experience.

Hypothesis 4.2: The degree of improvement in clinical reasoning skill will be positively related to more frequent clinical coaching interactions with the supervisor.

Hypothesis 4.3: The degree of improvement in clinical reasoning skill will be positively related to higher cognitive-level questioning during student-supervisor clinical coaching interactions.

The analyses from aim 4 contributed to an initial understanding of factors within the CLE that influence the development of and change in clinical reasoning skill in pre-licensure nursing students. These findings will inform future research and the design of clinical education structures and CLEs that foster skillful clinical reasoning and enhance the ability of new-graduate nurses to promote positive patient outcomes in the current healthcare environment.

Table 1.

Specific Aim	Corresponding Chapter and Manuscript
1. Synthesize what is known about factors within the pre-licensure clinical learning environment that influence students' perceptions of learning experiences.	Chapter 2: Influences of Sociocultural Factors within the Clinical Learning Environment on Students' Perceptions of Learning: An Integrative Review

2. Describe a theoretical foundation to support pre-licensure nursing clinical education structure and implementation.	Chapter 3: A New Apprenticeship: An Integrated Theory of Clinical Education for Advancing Clinical Reasoning in the Clinical Learning Environment
3. Develop and complete initial psychometric testing of a measure of clinical instructor clinical coaching characteristics.	Chapter 4: Pursuing Improvement in Clinical Reasoning: Development of the Clinical Coaching Interactions Inventory
4. Describe the change in pre-licensure students' clinical reasoning skill after completion of a medical-surgical clinical rotation related to a) student perceptions of the CLE, b) characteristics of student-supervisor clinical coaching interactions (quantity of interactions, teaching-questioning strategies, and feedback characteristics), c) program type (traditional BSN, accelerated BSN equivalent), d) supervision type (university clinical instructor, staff nurse preceptor, or a collaborative teaching model with both), and e) CLE type (DEU, non-DEU). Hypothesis 2.1: Students' clinical reasoning skill will improve following a 140-170 hour adult medical-surgical clinical experience. Hypothesis 2.2: The degree of improvement in clinical reasoning skill will be positively related to more frequent clinical coaching interactions with the supervisor. Hypothesis 2.3: The degree of improvement in clinical reasoning skill will be positively related to higher cognitive-level questioning during student-supervisor clinical coaching interactions.	Chapter 4: Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment

Summary

This body of work will contribute to the science of nursing education through synthesis and critique of the literature regarding influences of the CLE on students' perceptions of learning, theory application to pre-licensure clinical education, and measurement of how factors within the CLE influence the essential student outcome of skillful clinical reasoning.

Additionally, development and initial psychometric testing of a quantitative measure of clinical coaching will provide a first step toward improving the state of measurement of factors within nursing education that influence clinical reasoning. The persistent deficit in new-graduate nurses' clinical reasoning skill, thus their decreased ability to promote safe and accurate patient care,

makes clear the essential nature of this body of work. Overall, this work represents a seminal effort to address repeated challenges for nursing education to design and implement strategies that foster the development of clinical reasoning and advance measurement of critical student learning outcomes.

References for Chapter 1

- Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park: Addison-Wesley.
- Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation*. San Francisco: Jossey-Bass.
- Benner P, Tanner C, & Chesla C. (2009). *Expertise in nursing practice: Caring, clinical judgment, and ethics* (2nd ed.). New York: Springer.
- Berkow, S., Virkstis, K., Stewart, J., & Conway, L. (2008). Assessing new graduate nurse performance. *Journal of Nursing Administration*, 38(11): 468-474. doi: 10.1097/01.nna.0000339477.50219.06
- Casey, K., Fink, R., Jaynes, C., Campbell, L., Cook, P., & Wilson, V. (2011). Readiness for practice: The senior practicum experience. *Journal of Nursing Education*, 50(11): 646-652. doi: 10.3928/01484834-20110817-03
- Clynes, M. & Raftery, S. (2008). Feedback: An essential element of student learning in clinical practice. *Nurse Education in Practice* 8(6), 405-411.
- Chuan, O. & Barnett, T. (2012). Student, tutor and staff nurse perceptions of the clinical learning environment. *Nurse Education in Practice*, 12(4), 192-197. doi: <http://dx.doi.org/10.1016/j.nepr.2012.01.003>
- Courtney-Pratt, H., FitzGerald, M., Ford, K., Marsden, K., & Marlow, A. (2012). Quality clinical placements for undergraduate nursing students: a cross-sectional survey of undergraduates and supervising nurses. *Journal of Advanced Nursing*, 68(6), 1380-1390. doi: 10.1111/j.1365-2648.2011.05851.x

Croxon, L., & Maginnis, C. (2009). Evaluation of clinical teaching models for nursing practice.

Nurse Education in Practice, 9(4), 236-243. doi: 10.1016/j.nepr.2008.06.004

Dreyfus, H. & Dreyfus, S. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer*. New York: Free Press.

Dunn, S. & Hansford, B. (1997). Undergraduate nursing students' perceptions of their clinical learning environment. *Journal of Advanced Nursing*, 25(6), 1299-1306. doi:

10.1046/j.1365-2648.1997.19970251299.x

Edgecombe, K., Wotton, K., Gonda, J., & Mason, P. (1999). Dedicated education units: 1. A new concept for clinical teaching and learning. *Contemporary Nurse: A Journal for the Australian Nursing Profession*, 8(4), 166-171. doi: 10.5172/conu.1999.8.4.166

Ericsson, K. A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine*, 79(10): S70-S81.

Hellström-Hyson, E., Mårtensson, G., & Kristofferzon, M. (2012). To take responsibility or to be an onlooker. Nursing students' experiences of two models of supervision. *Nurse Education Today*, 32(1), 105-110. doi: 10.1016/j.nedt.2011.02.005

Henderson, A., Twentyman, M., Heel, A., & Lloyd, B. (2006). Students' perception of the psycho-social clinical learning environment: An evaluation of placement models. *Nurse Education Today*, 26(7), 564-571. doi: <http://dx.doi.org/10.1016/j.nedt.2006.01.012>

Hickey, M. T. (2009). Preceptor perceptions of new graduate nurse readiness for practice. *Journal for Nurses in Staff Development* 25(1), 35-41.

Institute of Medicine. (2010). *The future of nursing leading change advancing health*, from <http://iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx>

Ironside, P. M., & McNelis, A. M. (2010). Clinical education in prelicensure nursing programs:

Findings from a national survey. *Nursing Education Perspectives* 31(4), 264-265.

Jacobson, L. & Grindel, C. (2006). What is happening in pre-licensure RN clinical nursing

education? Findings from the faculty and administrator survey on clinical nursing education. *Nursing Education Perspectives*, 27(2): 188-189.

Jessee, M. (2015). *A new apprenticeship: An integrated theory of clinical education for*

advancing clinical reasoning in the clinical learning environment. Manuscript submitted for publication.

Lasater, K., & Nielsen, A. (2009). The influence of concept-based learning activities on

students' clinical judgment development. *Journal of Nursing Education*, 48(8), 441-446.

Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New

York: Cambridge University Press.

Levett-Jones, T., Hoffman, K., Dempsey, J., Jeong, S., Noble, D., Norton, C., Roche, J., 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), 515-20. doi: 10.1016/j.nedt.2009.10.020

McClure, E., & Black, L. (2013). The Role of the Clinical Preceptor: An Integrative Literature

Review. *Journal of Nursing Education*, 52(6), 335-341. doi:

<http://dx.doi.org/10.3928/01484834-20130430-02>

McNelis A. M., Ironside P. M., Ebright, P, Dreifuerst, K., Zvonar, S., & Conner, S. (2014).

Learning nursing practice: A multisite, multimethod investigation of clinical education. *Journal of Nursing Regulation*, 4(4), 30-35.

- Mulready-Shick, J., Kafel, K., Banister, G., & Mylott, L. (2009). Enhancing quality and safety competency development at the unit level: An initial evaluation of student learning and clinical teaching on dedicated education units. *Journal of Nursing Education*, 48(12), 716-719.
- Mulready-Shick, J., Flanagan, K., Banister, G., Mylott, L., & Curtin, L. (2013). Evaluating Dedicated education units for clinical education quality. *Journal of Nursing Education*, 52(11), 606-614. doi: 10.3928/01484834-20131014-07
- National League for Nursing (2010). Innovation in nursing education: A call for reform. [Position Statement]. Retrieved from www.nln.org/aboutnln/PositionStatements/innovation082203.pdf
- Newton, J., Cross, W., White, K., Ockerby, C., & Billett, S. (2011). Outcomes of a clinical partnership model for undergraduate nursing students. *Contemporary Nurse: A Journal for the Australian Nursing Profession*, 39(1), 119-127. doi: 10.5172/conu.2011.39.1.119
- Newton, J., Jolly, B., Ockerby, C., & Cross, W. (2012). Student centredness in clinical learning: the influence of the clinical teacher. *Journal of Advanced Nursing*, 68(10), 2331-2340. doi: 10.1111/j.1365-2648.2012.05946.x
- Niederhauser, V., Schoessler, M., Gubrud-Howe, P., Magnussen, L., & Codier, E. (2012). Creating innovative models of clinical nursing education. *Journal of Nursing Education*, 51(11), 603-608.
- Nielsen, A. (2009). Concept-based learning activities using the clinical judgment model as a foundation for clinical learning. *Journal of Nursing Education*, 48(6), 350-354.
- Norman, G. (2005). Research in clinical reasoning: past history and current trends. *Medical Education*, 39(4): 418-427.

- Oermann, M., Kardong-Edgren, S., Odom-Maryon, T., Hallmark, B., Hurd, D., Rogers, N., Haus, C., McColgan, J., Snelson, C., Dowdy, S. (2011). Deliberate practice of motor skills in nursing education: CPR as exemplar. *Nursing Education Perspectives*, 32(5): 311-315.
- Papp, I., Markkanen, M., & von Bonsdorff, M. (2003). Clinical environment as a learning environment: student nurses' perceptions concerning clinical learning experiences. *Nurse Education Today*, 23(4), 262-268. doi: [http://dx.doi.org/10.1016/S0260-6917\(02\)00185-5](http://dx.doi.org/10.1016/S0260-6917(02)00185-5)
- Purling, A., & King, L. (2012). A literature review: Graduate nurses' preparedness for recognizing and responding to the deteriorating patient. *Journal of Clinical Nursing*, 21(23/24): 3451-3465.
- Raber, A. (2013). Nursing faculty and undergraduate nursing student interaction in the clinical setting. (Doctoral dissertation). Retrieved from <http://digitalcommons.ohsu.edu/etd/974/>
- Ranse, K., & Grealish, L. (2007). Nursing students' perceptions of learning in the clinical setting of the Dedicated Education Unit. *Journal of Advanced Nursing*, 58(2), 171-179. doi: 10.1111/j.1365-2648.2007.04220.x
- Rhodes, M., Meyers, C., & Underhill, M. (2012). Evaluation Outcomes of a Dedicated Education Unit in a Baccalaureate Nursing Program. *Journal of Professional Nursing*, 28(4), 223-230. doi: <http://dx.doi.org/10.1016/j.profnurs.2011.11.019>
- Saarikoski, M., Isoaho, H., Warne, T., & Leino-Kilpi, H. (2008). The nurse teacher in clinical practice: Developing the new sub-dimension to the clinical learning environment and supervision (CLES) scale. *International Journal of Nursing Studies*, 45(8), 1233-1237. doi: <http://dx.doi.org/10.1016/j.ijnurstu.2007.07.009>

Simmons, B. (2010). Clinical reasoning: Concept analysis. *Journal of Advanced Nursing*, 66(5): 1151-1158.

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*. 45(6), 204-211.

Warne, T., Johansson, U., Papastavrou, E., Tichelaar, E., Tomietto, M., den Bossche, K., . . . Saarikoski, M. (2010). An exploration of the clinical learning experience of nursing students in nine European countries. *Nurse Education Today*, 30(8), 809-815. doi: <http://dx.doi.org/10.1016/j.nedt.2010.03.003>

Chapter 2 (Manuscript 1)

INFLUENCES OF SOCIOCULTURAL FACTORS WITHIN THE CLINICAL LEARNING
ENVIRONMENT ON STUDENTS' PERCEPTIONS OF LEARNING:
AN INTEGRATIVE REVIEW

Mary Ann Jessee, MSN, RN, is the sole author of this manuscript.

Funding acknowledgement: Funding was provided by the National League for Nursing Jonas
Scholar Foundation

Publication: Manuscript was submitted on September 1, 2015 to The Journal of Professional
Nursing

Introduction

The purpose of this review was to synthesize what is known about how factors within the acute care clinical learning environment (CLE) influences pre-licensure nursing students' perceptions of their clinical learning experiences. While student perceptions of learning do not directly contribute to an understanding of specific student learning outcomes, those perceptions provide evidence to support further investigation into the factors that make learning more meaningful or contribute to a perception of missed learning opportunities. There is an expansive body of research regarding students' perceptions of the CLE, yet no reviews of that literature to identify themes across multiple studies. In order to ensure students are afforded opportunities to develop the knowledge, skills, and attitudes required of competent practitioners, healthcare systems, schools of nursing, and nurses must understand how the CLE influences student nurses' learning experiences in the CLE. Further, the findings from this literature synthesis will inform the description of a theoretical foundation for pre-licensure clinical education and identify potential factors within the CLE that may influence students' clinical reasoning skill. The integrative review methodology will be used to synthesize the findings from qualitative and quantitative inquiries into students' perceptions of learning in the CLE.

This manuscript replaces the literature review portion of the Review of Literature chapter of the traditional dissertation and contributes to this body of work by identifying factors within the CLE that influence students' perceptions of learning, and may influence clinical reasoning skill.

INFLUENCES OF SOCIOCULTURAL FACTORS WITHIN THE CLINICAL LEARNING
ENVIRONMENT ON STUDENTS' PERCEPTIONS OF LEARNING:
AN INTEGRATIVE REVIEW

Mary Ann Jessee, MSN, RN – corresponding author
Oregon Health & Science University – PhD student
Vanderbilt University School of Nursing – Pre-licensure Level Director
101 Foxwood Trail
Hendersonville, TN 37075
USA (615) 481-5256

ABSTRACT

Background: A persistent deficit in new graduate nurses' clinical reasoning skill exists. Clinical reasoning is best learned in the sociocultural clinical learning environment (CLE), yet many CLEs fail to engage nursing students in the cognitive work of nursing that promotes development of clinical reasoning. Despite two decades of recommendations to improve CLEs based on students' perceptions of learning, widespread improvement remains elusive.

Objective: The aim of this review was to synthesize what is known about the influence of sociocultural factors in the acute-care CLE on pre-licensure nursing students' perceptions of learning, for the purpose of identifying factors that when modified may promote improvement of clinical reasoning skill.

Method: The integrative review methodology was used to synthesize and identify gaps in evidence on students' perceptions of learning in the acute-care CLE.

Results: Global commonalities exist in the impact of the sociocultural CLE on students' perceptions of learning, including: overall sociocultural atmosphere, membership in the healthcare team, supervisory relationships, peer relationships, and clinical education structure.

Conclusions: This review provides evidence that modification of CLE factors and examination of their influence on measurable learning outcomes such as clinical reasoning are the necessary next steps to facilitate improvement of new-graduate nurses' clinical reasoning skill.

Keywords: Clinical learning environment, perceptions, nursing education

HIGHLIGHTS

There is consensus across the globe that overall sociocultural atmosphere, membership in the healthcare team, supervisory relationships, peer relationships, and clinical education structure are factors within the CLE that significantly impact students' perceptions of learning.

Modification of CLE factors and examination of their influence on measurable learning outcomes such as clinical reasoning is the necessary next step to improvement of new-graduate nurses' clinical reasoning skill.

INFLUENCES OF SOCIOCULTURAL FACTORS WITHIN THE CLINICAL LEARNING
ENVIRONMENT ON STUDENTS' PERCEPTIONS OF LEARNING:
AN INTEGRATIVE REVIEW

INTRODUCTION

Over the last decade, nursing education has been repeatedly challenged to provide high quality clinical education that prepares nurses to safely navigate the complexities of patient care.^{1,2,3} Translation of knowledge, skills, and attitudes learned in classroom and laboratory settings into safe, effective nursing practice is best achieved through experiential learning in the clinical learning environment (CLE). The most facilitative CLEs provide ample opportunity for advancement of theoretical knowledge and mastery of cognitive and psychomotor skills through student engagement as a member of the healthcare team.^{4,5,6} Despite charges to investigate⁷ and efforts to promote quality clinical education,⁸ 90% of hospital and health system executives⁹ and 63% of nurse preceptors¹⁰ report that new-graduate nurses lack essential competency in cognitive skills such as clinical reasoning and decision-making expected upon entry into the workplace. Additionally, nursing students recognize that their ability to acquire those essential competencies and become competent clinical practitioners is influenced in part by the sociocultural characteristics of the clinical learning environment (CLE) in which their clinical education occurs.^{11,12,13} Variations in the multiple factors that comprise the sociocultural environment of the CLE as well as the interactions among students and those factors, result in highly variable student experiences.^{14,15,16} and in perceived ability to become competent clinical practitioners.¹⁷

There is a paucity of evidence about the influence of the CLE on measurable learning outcomes (e.g., gains in factual knowledge, objective ratings of clinical performance). For that

reason, this review will focus on studies related to student's perceptions of learning, which may provide insight into potentially modifiable factors within the CLE that may influence specific learning outcomes. This review will synthesize what is known and identify gaps in knowledge about factors within the acute-care (hospital) CLE which influence pre-licensure nursing students' perceptions of learning. The goal of this review is to identify factors that when modified may enhance clinical reasoning skill.

Methodology

The integrative review methodology was used to synthesize the evidence on the concept of student's perceptions of learning in the acute-care pre-licensure CLE.¹⁸ Due to the significant difference between acute-care (hospital) learning environments and non-acute (simulated, outpatient, and community) learning environments, this review is limited to empirical studies in English with a focus on students' perceptions of the influence of acute-care CLE characteristics on their learning experiences. The CINAHL and Medline OVID databases were searched using the key search terms of: clinical learning environment, nursing education, nursing students, clinical education, student placement, dedicated education unit, undergraduate, pre-licensure, and student perceptions. This initial search produced a total of 842 articles for review. After review for the inclusion criteria of English language and empirical study of pre-licensure nursing students' perceptions of learning in the acute-care (hospital) CLE, and elimination of duplicates, a total of 36 studies published from 1997 to 2015 met the inclusion criteria. Articles focused on nurse or faculty perceptions, or educational strategies without study of students' perceptions of the CLE were excluded. The remaining studies were analyzed, and common factors influencing students' perceptions of learning were identified (Table 1).

Results

This sample represents studies from countries across the globe, the majority originating in Australia (n=12), Scandinavia (n=9), US (n=5), Europe (n=4), Hong Kong (n=3), UK (n=2), and Canada (n=1). All articles were reports of studies using 1) quantitative methods that quantify the influence of CLE atmosphere, quality of relationships, and opportunities for learning on students' perceptions of learning in the CLE (n=16), 2) qualitative methods including interview and analysis of journals (n=9), or 3) mixed-methods approaches (n=11). Descriptive single-site (student participants were from only one college or university) (n=26) and multi-site (n=10) studies examining students' experiences in one model of clinical education dominate the sample. Comparison of the perceptions of students in different models of clinical education was common (n=19), with limited use of quasi-experimental design (n=3) or experimental design (n=1). It is important to note that all studies but one reported here rely on student self-report of experiences of learning rather than other measures of learning outcomes.

Five major sociocultural factors emerged as significant influences on students' perceptions of learning in the CLE across the globe: (a) overall sociocultural atmosphere, (b) membership in the healthcare team, (c) supervisory relationships, (d) peer relationships, and (e) clinical education structure.

Overall Sociocultural Atmosphere

It is clear that the CLE is a multifaceted sociocultural environment comprised of a hierarchy, power structure, and relationships that affect the overall atmosphere of the CLE and students' perceptions of the quality of learning experiences.^{14, 15, 19,20} Students are thrust into a complex social context of existing relationships where they are expected to assume an often ambiguous role as a member of the healthcare team and develop the competence and confidence necessary for clinical practice. There is consensus that a CLE characterized by a friendly,

welcoming atmosphere promotes positive student perceptions of the clinical learning environment.^{12,14,15,21-25} Staff acceptance of students facilitates students' engagement²⁵ and promotes feelings of camaraderie as expected in a functional team.²⁶⁻³² Conversely, an atmosphere characterized by staff condescension toward students and poor staff engagement in students' education negatively affects students' perceptions of clinical learning experiences.^{28,33,34} Despite years of consistency of this finding across the globe, only one study has evaluated an intervention designed to improve staff engagement in student learning and to develop best practices in clinical education.³⁵ This study found that a staff development intervention designed to improve the supervisory relationship between staff nurse supervisors and students improved students' perceptions of learning in the CLE.³⁵ This evidence demonstrates that the overall atmosphere of the CLE and the capacity of nurses to build relationships can be modified with behavioral interventions. Therefore, future study should advance from description to experimental or quasi-experimental design to modify and effect improvement of the overall sociocultural atmosphere in the CLE.

Student Membership in the Healthcare Team

Students consistently report that being considered an integral part of the healthcare team is critical to positive learning experiences in the CLE.^{12,14,15,21,22,27-29,35-37} Qualitative,^{15,26,28,29,37} quantitative,^{24,27,31,35,38,39} and mixed-methods studies^{12,14,22,40} across the globe show that students valued for their knowledge and treated as integral members of the healthcare team have positive perceptions of learning experiences in the CLE and higher confidence for clinical practice.

Ambiguity in the student role in the healthcare team inhibits students' ability to engage as members of the team.^{28,30,34,41} CLEs in which students' are afforded the opportunity to synthesize theoretical knowledge and practical skill into accurate clinical decision-making²⁴ promote

positive perceptions of learning. Conversely, CLEs that prioritize service needs over student learning needs contribute to students' dissatisfaction with learning experiences.^{12,42} For example, alignment of the student role with that of unlicensed assistive personnel (UAP) results in students engaging in low-skilled tasks rather than in the complex cognitive and psychomotor role of the nurse as expected.¹² Hence, the persistent deficit in new-graduate nurses' clinical reasoning skill^{9,10,43} may be, in part, a result of the CLE's expectation that students lighten the workload of practicing nurses by completion of unskilled tasks, over engagement in the complex cognitive and psychomotor role of the nurse.

The qualitative studies and qualitative portions of the mixed-methods studies in this sample offer significant insight into the specific atmosphere qualities that contribute to students' feeling integral to the healthcare team. Integration of students into the healthcare team facilitates participation in the ongoing clinical reasoning, prioritization, and decision-making central to nursing practice and may promote improvement of those skills. Achievement of consistent student integration into the healthcare team will require assessment of staff attitudes and team-building behaviors, education to improve these behaviors, and consideration of appropriateness of clinical placement on units that fail to present an inclusive, team-focused atmosphere for nursing students.

Supervisory Relationships

Students place high value on the relationships developed with preceptor and faculty supervisors in the CLE.^{12,22,23,26,28,31,35,40,41,44} In multiple large multi-site studies^{30,32,33,45} including a descriptive study of 17 schools of nursing across Western Europe⁴⁴, students identified the supervisory relationship as the most important aspect of the clinical learning experience. Smaller mixed-method²² and qualitative^{28,37} studies report that supportive relationships characterized by

open communication, constructive feedback, and mutual respect foster student confidence, while relationships characterized by condescension and lack of trust impede confidence and result in a poor perception of the learning experience.

The development of trust in the student supervisor relationship is influenced in part by the quantity of designated time for engagement between the student and the supervisor in the CLE.^{25,26,37} Students note that a consistent supervisory relationship^{22,25,31,33,34,37} rather than experience with multiple supervisors fosters trust and increased supervisors' willingness for the student to practice more independently.⁴⁶ Longer durations of placement in the same CLE result in higher student satisfaction with supervisory relationships.^{17,33,37,44} Conversely, lack of a consistent supervisor inhibit progression of learning^{28,33} as variation in individual supervisor expectations resulted in students being required to repeat demonstration of basic competencies rather than progressing forward from the competency level observed by previous supervisors.²²

There was a significant gap in this literature regarding how the characteristics of teaching approaches such as clinical coaching or questioning, used by clinical instructors within the supervisory relationship, influenced student perceptions of learning. A single recent qualitative study examining instructor-student interactions showed that the instructor-student relationship is most often characterized by a focus on knowledge and task-completion versus the students' ability to notice and synthesize salient data and make relevant clinical decisions.⁴⁷ The focus on timely task-completion as the primary measure of student learning instead of demonstration of competencies inhibits nursing education's ability to effect much needed improvement in clinical reasoning.⁴⁷ Additionally, students were reluctant to engage in learning activities that took priority over any planned nursing actions, while instructors failed to engage students in meaningful learning activities during down-time.⁴⁷ Modification of clinical learning activities to

focus on the promotion of higher-order thinking skills is essential to achieving significant improvement in new-graduates' clinical reasoning skill.

Peer Relationships

Although peer relationships are not often a direct focus of inquiry into students' perceptions of clinical learning experiences, those relationships are a significant source of psychological support for students experiencing the stress and anxiety that often accompanies practice in the CLE.^{15,23,25,26,41,48} Qualitative studies in this sample offer insight over quantitative studies into the meaning of peer relationships to students' clinical learning experiences.^{15,25,26,32} Students acknowledge that reflection with peers on individual experiences of learning within the CLE provides comfort and empowerment³² to persevere through difficult learning experiences.²⁵ The opportunity to educate and be educated by peers results in a perceived increase in self-confidence in both more experienced and less experienced students.^{28,29,36,41} Thus, modification of the use of peer-to-peer learning within clinical education may offer a powerful mechanism for fostering the deep reflection on knowledge and experiences known to enhance learning.

Clinical Education Structure

Nursing students' perceptions of learning experiences in the CLE varies significantly among the multiple structural models of clinical education.⁴⁹ Of note, use of faculty-facilitated group, preceptor (staff-nurse as primary clinical educator), or collaborative models varies significantly across geographic areas. The majority of studies in this sample were conducted in Australia and Scandinavia where preceptor and collaborative models are common, with only a recent surge of study of Dedicated Education Units (DEUs) in the United States where faculty-facilitated group and preceptor models are common.

Faculty-facilitated Group Models

Students educated in faculty-facilitated group models, characterized by direct teaching and supervision of 6 to 10 students on a hospital unit by a university faculty member, identified faculty knowledge and expertise,³⁴ faculty support, and multiple practice opportunities as positive influences on their clinical learning experiences.^{15,23,25,34,35} Conversely, other students reported that lack of individualization and supervision within group models resulted in fewer learning opportunities and dissatisfaction with the learning experience.^{23,34,38} One of the few comparative studies in this sample used mixed-methods to compare students educated in a faculty-facilitated group model with students educated in a preceptor model.²³ Results showed that students educated in a group model identified increased support from the nurse faculty member, feeling comfortable asking questions and receiving feedback as positive aspects of group models of education, while other students identified minimal availability of the nurse faculty for individual teaching as a hindrance to learning in the group model.²³

The variability of these results highlights the variability of group models of education. Presumably, the assignment of responsibility for 6-10 students and their assigned patients to one faculty member severely limits the likelihood of individualizing teaching to each student's needs, thus contributing to variable student perceptions of learning in this model. There is a notable lack of empirical study of students' learning experiences in group models of clinical education. Understanding aspects of group models that facilitate and hinder students' experience of learning in this model is limited.

In summary, differences in the style and quality of clinical coaching within supervisory relationships may contribute to the variability in students' perceptions of learning. Consequently, highlighting the need for experimental studies to examine the effects of clinical coaching

strategies on improvement in clinical reasoning and other measurable learning outcomes is essential.

Preceptor Models

Preceptor models of clinical education, characterized by a one-on-one teaching and supervisory relationship between a student and a staff nurse, are common. However, effective implementation is dependent on preceptor teaching skill, quality of the preceptor-student relationship, and preceptor workload that is conducive to teaching.^{50,51} In both qualitative,^{15,46} quantitative,^{27,52} and mixed-method studies²³ of preceptor models, students reported that individualized, student-focused learning experiences provided more practice opportunities⁵² and improved confidence and independence,^{23,27,28} and socialization into the nursing role through professional role modeling.^{15,46} Henderson et al.²⁷ (2006) compared students' perceptions of learning experiences in group, preceptor, and collaborative models and revealed that some students preferred the preceptor model as a result of the significant support and guidance within the student-preceptor relationship, while others reported that preceptors' staff responsibilities limited time for student teaching and inhibited the quality of clinical learning experiences. Additionally, when compared with a collaborative model, the preceptor model was rated lower in promotion of independent practice and availability of supervisory support.^{26,53} The only study in this sample examining how the CLE may influence measurable learning outcomes identified no statistically significant differences on standardized exams between students in preceptor or traditional group models.⁵²

Perceptions of learning in preceptor models of clinical education are highly dependent on the level of preceptor engagement in the supervisory relationship. Staff nurses functioning as preceptors must be clinically competent, express a desire to teach and be adequately trained in

the pedagogies of nursing education. These minimum qualifications along with modification of staff responsibilities to accommodate the teaching role are essential to positive student learning experiences and may contribute to student development of essential clinical reasoning and decision-making skills.

Collaborative Models

Collaborative clinical education models that purposefully engage both university faculty and nursing staff in student education are reported to have multiple positive effects on students' learning experiences.^{14,15,26,29,30,34,38,53} In large-sample mixed-methods,^{14,36} small-sample quantitative,³⁸ and qualitative studies,^{15,32} students reported increased involvement in the healthcare team,^{14,34,36,54} personalization of education strategies to meet their particular learning needs, and a greater understanding of the student role^{29,38,55} as factors within the collaborative model that contributed to positive learning experiences. A longitudinal mixed methods study using descriptive survey and focus group interviews found that students educated within a collaborative model noted that the positive atmosphere conveyed by all staff made them feel like part of the team and promoted critical thinking and evidence appraisal as part of a larger focus on problem solving.³⁶ In the same study, other students noted that while the model was well-intended, its effectiveness depended on the preceptor's desire to teach and adequate training for the role.³⁶ While the collaborative structure has been shown to provide a rich environment for learning, positive student perceptions are again highly dependent on positive supervisory relationships within that structure.

There has been a recent increase in development and implementation of DEUs in the US. The DEU is a collaborative clinical education model designed to purposefully engage students as members of the healthcare team and is characterized by 1) staff nurses who have a desire to teach

and have been trained in methods of clinical instruction and supervision; 2) those trained nurses serve as the primary supervisors, or preceptors, of nursing students; and 3) university-employed clinical faculty collaborate with the trained staff nurses to educate students.^{36,54,56} It is believed that students immersed in nursing work in the environment of practice alongside these specifically trained, experienced nurses are afforded more opportunities for practice of essential cognitive and psychomotor skills than traditional group or preceptor models of clinical education.^{36,54,56} Students educated in the DEU report a perceived improvement in their critical thinking and problem-solving skills.^{34,36} In a comparative study of a faculty-facilitated group and DEU model, students reported working with the nurse in the DEU promoted an understanding of the role of the nurse, while working with faculty in the faculty-facilitated group model promoted achievement of learning goals and integration of theory with practice.³⁴ Hence, the DEU model demonstrates that modification of sociocultural factors within the CLE may promote improvement of multiple cognitive and professional nursing practice competencies.

LIMITATIONS OF RESEARCH METHODS

There are a number of methodological limitations of note in this sample including: 1) single site studies with convenience samples, limiting generalizability; 2) varied contributions of each methodological approach; 3) measures focused on *perceived* learning rather than *actual* learning outcomes; and 4) lack of design that permits establishment of causal relationships. For over 3 decades, investigators have continued to develop valid, reliable measures for examining student nurses' perceptions of learning in the clinical environment that quantify the influence of CLE atmosphere, quality of relationships, and opportunities for learning on students' perceptions of learning in the CLE.⁵⁷ However, use of these measures of perceived learning rather than

advancement toward measurement of actual learning outcomes has contributed to failure to exact measurable improvement in salient components of nursing practice such as clinical reasoning.

Despite these limitations, there is consensus of findings: the overall sociocultural atmosphere, membership in the healthcare team, supervisory relationships, peer relationships, and clinical education structure each significantly impact students' perceptions of learning in the CLE. Consistent recommendations for improvement of the CLE based on these identified commonalities include a) collaboration between education and practice settings to clarify the roles of academic clinical teachers and staff nurse teachers in collaborative clinical education models,^{14,15,25,30,33,35,36,38,41,48} b) engagement of staff nurses in education to enhance their clinical teaching role,^{14,22,30,35,36,39,41,42} c) creation of a welcoming atmosphere that promotes student engagement in the healthcare team, and provision of consistent,^{25,29,31,33,38} d) positive supervisory relationships that promote students' ability to become independent practitioners,^{26,28,33,35,44,45,53,55} and e) use of multiple, diverse teaching strategies to promote student engagement in the cognitive work of nursing.^{22,24,26,29,36,55} Hence, the overarching question is why after two decades of replication of the same type of study producing the same results, have we failed to advance toward modification of these factors and evaluation of their effects on measurable learning outcomes?

IMPLICATIONS FOR NURSING EDUCATION

The long-standing global commonalities in the impact of sociocultural factors of the CLE on students' perceptions of learning are clear. The impact of overall atmosphere, membership in the healthcare team, supervisory relationships, peer relationships, and clinical education structure, on students' perceptions of learning indicates these factors may be modified to promote improvement in essential student learning outcomes such as clinical reasoning. Nursing

education must advance from description of students' perceptions to experimental design and examination of measurable learning outcomes to answer the now long-standing challenge^{1,58} to improve the structure and pedagogical foundations of pre-licensure clinical education.

Investigation of teaching-learning strategies including concept-based activities⁵⁹ that foster deliberate practice⁶⁰ of essential cognitive and psychomotor skills, and structured reflective practice⁶¹ that enhances student recognition and incorporation of significant learning experiences into future practice is a necessary first step. Advancement from traditional, often ineffective pedagogical approaches^{1,47} in combination with effective clinical coaching strategies within the supervisory relationship holds promise for promoting student achievement of critical cognitive competencies essential to the provision of safe, effective patient care in the current healthcare environment.

Modification of any factor within the CLE must be grounded in applicable theory. Situated Learning Theory¹⁹ supports the situated nature of nursing practice and the significance of social interactions within that practice. Learning a practice requires that newcomers be afforded the opportunity to be immersed as a member of that practice.¹⁹ The long-standing, often implicit, expectation that students' role in the healthcare team and within the CLE is to relieve workload from staff, is in direct conflict with this theoretical perspective. This expectation continues to limit nursing education's ability to implement clinical education strategies that effectively engage students in the essential cognitive work of nursing. The notable deficits in new-graduate cognitive competencies are in part reflective of these limitations. Thus, nursing educators and healthcare executives must partner to enact change in this expectation and design CLEs that contribute to improvement in the clinical reasoning skill of entry-level nurses.

Some progress has been made with the recent increase in the development of DEUs in the United States.^{36,54,56} Nurses in DEUs perceive that students benefit from the repetitive, hands-on experiences in the DEU³⁶ and have improved achievement of competencies such as safety, teamwork and collaboration, informatics, patient-centered care, and evidence-based practice and quality improvement. However, prior to widespread acceptance of the DEU as an improvement on current clinical education structures, we must move from study of student and nurse perceptions of learning toward evidence of improved student learning outcomes. Likewise, we must determine what features of the DEU structure contribute to that improvement.

Regardless of the model of clinical education, the impact of the supervisory relationship and the quality of clinical coaching strategies and feedback within that relationship must not be overlooked. Teaching behaviors that coach students in the development and use of higher-order thinking skills foster improvement in essential cognitive skills such as clinical reasoning.^{1,62} Further, meaningful feedback from instructors within clinical learning experiences is essential to students' ability to recognize and improve deficits in both cognitive and psychomotor skillsets.^{1,62} Examination of how specific characteristics of the instructor-student relationship influence student learning outcomes may provide valuable insight for development of educational programs to provide clinical instructors with the skillsets to effectively coach students toward higher-order thinking skills. It is likely that clinical coaching strategies that foster clinical reasoning and decision-making may improve student learning outcomes despite a less than optimal CLE environment or clinical education model.

CONCLUSION

The synthesis of findings from this sample provides substantive evidence of factors within the CLE that may be modified to enhance nursing students' clinical reasoning skill. Two

decades of repeated identification and recommendations for improving clinical education structure and the CLE have not resulted in widespread substantive change of clinical education structure. Thus, these findings should be used to guide rigorous design and testing of modifications to the CLE and clinical education structure to improve the persistent deficit in new graduate clinical reasoning skill. Sociocultural factors within the acute care clinical learning environment significantly impact student nurses' transformation from novice student to entry-level practitioner. The multiple commonalities in students' perceptions of learning in CLEs across the globe demonstrates the need and ability to effect widespread improvement of clinical education. If students are to develop the confidence and competence essential for transformation into valuable, contributing members of the nursing profession, they must be educated in environments that embrace them as integral members of the healthcare team, foster positive student-supervisor relationships, and provide ample opportunities for engaging in the cognitive and psychomotor work of nursing. Urgent engagement in rigorous research into how acute-care CLEs and structural models of clinical education influence measurable learning outcomes including clinical reasoning is a prerequisite imperative to realizing overdue improvement in new-graduate nurses' clinical reasoning skill. Ensuring each student is afforded this type of quality clinical learning experience depends on collaborative efforts among today's healthcare systems, nurses, and nurse educators.

References

1. Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation*. San Francisco: Jossey-Bass.
2. Institute of Medicine. (2010). The Future of Nursing Leading Change Advancing Health, from <http://iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx>
3. National League for Nursing. (2003). *Innovation in nursing education: A call for reform* [Position Statement]. Retrieved from www.nln.org/aboutnln/PositionStatements/innovation082203.pdf
4. Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park: Addison-Wesley
5. National Council of State Boards of Nursing. (2005). *Clinical instruction in prelicensure nursing programs*. Retrieved from http://www.ncsbn.org/pdfs/Final_Clinical_Instruction_Prelicensure_Nursing_Program.pdf
6. Tanner, C. (2010). From mother duck to mother lode: clinical education for deep learning. *Journal of Nursing Education*, 49(1), 3-4. doi: 10.3928/01484834-20091216-01
7. National League for Nursing. (2012). *Transforming research in nursing education* [Vision Series]. Retrieved from http://www.nln.org/aboutnln/livingdocuments/pdf/nlnvision_5.pdf
8. Ironside, P., & McNelis, A. (2010). Clinical education in prelicensure nursing programs: Findings from a national survey. *Nursing Education Perspectives* 31(4), 264-265.
9. Berkow, S., Virkstis, K. Stewart, J., & Conway, L. (2008). *Bridging the preparation-practice*

- gap, volume I: Quantifying new graduate nurse improvement needs*. Washington, DC: Nursing Executive Center, Advisory Board Company.
10. Hickey, M. (2009). Preceptor perceptions of new graduate nurse readiness for practice. *Journal for Nurses in Staff Development* 25(1), 35-41.
 11. Chappy, S., Jambunathan, J., & Mamocha, S. (2010). Evidence-based curricular strategies to enhance BSN graduates' transition into practice. *Nurse Educator* 35(1), 20-24.
 12. Chuan, O. & Barnett, T. (2012). Student, tutor and staff nurse perceptions of the clinical learning environment. *Nurse Education in Practice*, 12(4), 192-197. doi: <http://dx.doi.org/10.1016/j.nepr.2012.01.003>
 13. Orton, H. (1981). *Ward Learning Climate*. Royal College of Nursing, London.
 14. Dunn, S. & Hansford, B. (1997). Undergraduate nursing students' perceptions of their clinical learning environment. *Journal of Advanced Nursing*, 25(6), 1299-1306. doi: 10.1046/j.1365-2648.1997.19970251299.x
 15. Papp, I., Markkanen, M., & von Bonsdorff, M. (2003). Clinical environment as a learning environment: student nurses' perceptions concerning clinical learning experiences. *Nurse Education Today*, 23(4), 262-268. doi: [http://dx.doi.org/10.1016/S0260-6917\(02\)00185-5](http://dx.doi.org/10.1016/S0260-6917(02)00185-5)
 16. Saarikoski, M., Isoaho, H., Warne, T., & Leino-Kilpi, H. (2008). The nurse teacher in clinical practice: Developing the new sub-dimension to the clinical learning environment and supervision (CLES) scale. *International Journal of Nursing Studies*, 45(8), 1233-1237. doi: <http://dx.doi.org/10.1016/j.ijnurstu.2007.07.009>
 17. Newton, J., Cross, W., White, K., Ockerby, C., & Billett, S. (2011). Outcomes of a clinical partnership model for undergraduate nursing students. *Contemporary Nurse: A Journal for the Australian Nursing Profession*, 39(1), 119-127. doi: 10.5172/conu.2011.39.1.119

18. Whittemore, R. & Knaf, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52(5), 546-553.
19. Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.
20. Saarikoski, M. & Leino-Kilpi, H. (2002). The clinical learning environment and supervision by staff nurses: developing the instrument. *International Journal of Nursing Studies*, 39(3), 259-267. doi: [http://dx.doi.org/10.1016/S0020-7489\(01\)00031-1](http://dx.doi.org/10.1016/S0020-7489(01)00031-1)
21. Chan, D. S. K. (2002). Associations between student learning outcomes from their clinical placement and their perceptions of the social climate of the clinical learning environment. *International Journal of Nursing Studies*, 39(5), 517-524.
22. Courtney-Pratt, H., FitzGerald, M., Ford, K., Marsden, K., & Marlow, A. (2012). Quality clinical placements for undergraduate nursing students: a cross-sectional survey of undergraduates and supervising nurses. *Journal of Advanced Nursing*, 68(6), 1380-1390. doi: 10.1111/j.1365-2648.2011.05851.x
23. Croxon, L., & Maginnis, C. (2009). Evaluation of clinical teaching models for nursing practice. *Nurse Education in Practice*, 9(4), 236-243. doi: 10.1016/j.nepr.2008.06.004
24. Löfmark, A., Thorkildsen, K., Råholm, M., & Natvig, G. (2012). Nursing students' satisfaction with supervision from preceptors and teachers during clinical practice. *Nurse Education in Practice*, 12(3), 164-169. doi: <http://dx.doi.org/10.1016/j.nepr.2011.12.005>
25. Nolan, C. (1998). Learning on clinical placement: the experience of six Australian student nurses. *Nurse Education Today*, 18(8), 622-629. doi: [http://dx.doi.org/10.1016/S0260-6917\(98\)80059-2](http://dx.doi.org/10.1016/S0260-6917(98)80059-2)

26. Hellström-Hyson, E., Mårtensson, G., & Kristofferzon, M. (2012). To take responsibility or to be an onlooker. Nursing students' experiences of two models of supervision. *Nurse Education Today*, 32(1), 105-110. doi: 10.1016/j.nedt.2011.02.005
27. Henderson, A., Twentyman, M., Heel, A., & Lloyd, B. (2006). Students' perception of the psycho-social clinical learning environment: An evaluation of placement models. *Nurse Education Today*, 26(7), 564-571. doi: <http://dx.doi.org/10.1016/j.nedt.2006.01.012>
28. Löfmark, A., & Wikblad, K. (2001). Facilitating and obstructing factors for development of learning in clinical practice: a student perspective. *Journal of Advanced Nursing*, 34(1), 43-50. doi: 10.1046/j.1365-2648.2001.3411739.x
29. Ranse, K., & Grealish, L. (2007). Nursing students' perceptions of learning in the clinical setting of the Dedicated Education Unit. *Journal of Advanced Nursing*, 58(2), 171-179. doi: 10.1111/j.1365-2648.2007.04220.x
30. Dimitriadou, M., Papastavrou, E., Efstathiou, G., & Theodorou, M. (2015). Baccalaureate nursing students' perceptions of learning and supervision in the clinical environment. *Nursing and Health Sciences*, 17(2), 236-242.
31. D'Souza, M., Karkada, S., Parahoo, K., & Venkatesaperumal, R. (2015). Perception of and satisfaction with the clinical learning environment among nursing students. *Nurse Education Today*, 35(6), 833-840.
32. Bourgeois, S., Drayton, N., & Brown, A. (2011). An innovative model of supportive clinical teaching and learning for undergraduate nursing students: The cluster model. *Nurse Education in Practice*, 11(2), 114-118.
33. Sundler, A., Bjork, M., Bisholt, B., Ohlsson, U., Engstrom, A., & Gustafsson, M. (2014). Student nurses' experiences of the clinical learning environment in relation to the

- organization of supervision: A questionnaire survey. (2014). *Nurse Education Today*, 34(4), 661-666.
34. Nishioka, V., Coe, M. Hanita, M., & Moscato, S. (2014). Dedicated education unit: Student perspectives. *Nursing Education Perspectives*, 35(5), 301-307.
35. Henderson, A., Twentyman, M., Eaton, E., Creedy, D., Stapleton, P., & Lloyd, B. (2009). Creating supportive clinical learning environments: an intervention study. *Journal of Clinical Nursing*, 19(1-2), 177-182. doi: 10.1111/j.1365-2702.2009.02841.x
36. Rhodes, M., Meyers, C., & Underhill, M. (2012). Evaluation Outcomes of a Dedicated Education Unit in a Baccalaureate Nursing Program. *Journal of Professional Nursing*, 28(4), 223-230. doi: <http://dx.doi.org/10.1016/j.profnurs.2011.11.019>
37. Roxburg, M. (2014). Undergraduate student nurses' perceptions of two practice learning models: A focus group study. *Nurse Education Today* 34(1), 40-46.
38. Heel, A., Henderson, A., Lloyd, B., & Twentyman, M. (2006). Pre-test and post-test evaluation of students' perceptions of a collaborative clinical education model on the learning environment. *Australian Journal of Advanced Nursing*, 23(4).
39. Papathanasiou, I., Tsaras, K., & Sarafis, P. (2014). Views and perceptions of nursing students on their clinical learning environment: Teaching and learning. *Nurse Education Today*, 34(1), 57-60.
40. Chan, Dominic S. K. (2001). Combining qualitative and quantitative methods in assessing hospital learning environments. *International Journal of Nursing Studies*, 38(4), 447-459. doi: [http://dx.doi.org/10.1016/S0020-7489\(00\)00082-1](http://dx.doi.org/10.1016/S0020-7489(00)00082-1)

41. Gidman, J., McIntosh, A., Melling, K., & Smith, C. (2011). Student perceptions of support in practice. *Nurse Education in Practice*, *11*(6), 351-355. doi:
<http://dx.doi.org/10.1016/j.nepr.2011.03.005>
42. Papastavrou, E., Lambrinou, E., Tsangari, H., Saarikoski, M., & Leino-Kilpi, H. (2010). Student nurses experience of learning in the clinical environment. *Nurse Education in Practice*, *10*(3), 176-182. doi: <http://dx.doi.org/10.1016/j.nepr.2009.07.003>
43. Casey, K., Fink, R., Jaynes, C., Campbell, L., Cook, P., & Wilson, V. (2011). Readiness for practice: The senior practicum experience. *Journal of Nursing Education*, *50*(11): 646-652. doi: 10.3928/01484834-20110817-03
44. Warne, T., Johansson, U., Papastavrou, E., Tichelaar, E., Tomietto, M., den Bossche, K., . . . Saarikoski, M. (2010). An exploration of the clinical learning experience of nursing students in nine European countries. *Nurse Education Today*, *30*(8), 809-815. doi:
<http://dx.doi.org/10.1016/j.nedt.2010.03.003>
45. Skaalvik, M., Norman, H., & Henriksen, N. (2011). Clinical learning environment and supervision: Experiences of Norwegian nursing students – a questionnaire survey. *Journal of Clinical Nursing*, *20*(15-16), 2294-2304.
46. Callaghan, D., Watts, W., McCullough, D., Moreau, J., Little, M., Gamroth, L., & Durnford, K. (2009). The experience of two practice education models: Collaborative learning unit and preceptorship. *Nurse Education in Practice*, *9*(4), 244-252. doi:
<http://dx.doi.org/10.1016/j.nepr.2008.08.010>
47. McNelis, A., Ironside, P., Ebright, P., Dreifuerst, K., Zvonar, S., & Conner, S. (2014). Learning nursing practice: A multisite, multimethod investigation of clinical education. *Journal of Nursing Regulation*, *4*(4), 30-35.

48. Ip, W., & Chan, D. (2005). Hong Kong nursing students' perception of the clinical environment: a questionnaire survey. *International Journal of Nursing Studies*, 42(6), 665-672. doi: <http://dx.doi.org/10.1016/j.ijnurstu.2004.09.019>
49. Budgen, C, & Gamroth, L. (2008). An overview of practice education models. *Nurse Education Today*, 28(3), 273-283. doi: <http://dx.doi.org/10.1016/j.nedt.2007.05.005>
50. Luhanga, F. L, Billay, D., Grundy, Q., Myrick, F., & Yonge, O. (2010). The one-to-one relationship: Is it really key to an effective preceptorship experience? A review of the literature. *International Journal of Nursing Education Scholarship*, 7(1), 1-15.
51. McClure, E., & Black, L. (2013). The role of the clinical preceptor: An integrative literature review. *Journal of Nursing Education*, 52(6), 335-341. doi: <http://dx.doi.org/10.3928/01484834-20130430-02>
52. Hendricks, S., Wallace, L., Narwold, L., Guy, G., & Wallace, D. (2013). Comparing the effectiveness, practice opportunities, and satisfaction of the preceptored clinical and the traditional clinical for nursing students. *Nursing Education Perspectives*, 34(5), 310-314.
53. Newton, J., Jolly, B., Ockerby, C., & Cross, W. (2012). Student centredness in clinical learning: the influence of the clinical teacher. *Journal of Advanced Nursing*, 68(10), 2331-2340. doi: 10.1111/j.1365-2648.2012.05946.x
54. Mulready-Shick, J., Kafel, K.W., Banister, G., & Mylott, L. (2009). Enhancing quality and safety competency development at the unit level: An initial evaluation of student learning and clinical teaching on dedicated education units. *Journal of Nursing Education*, 48(12), 716-719.

55. Smedley, A., & Morey, P. (2010). Improving learning in the clinical nursing environment: perceptions of senior Australian bachelor of nursing students. *Journal of Research in Nursing, 15*(1), 75-88. doi: 10.1177/1744987108101756
56. Mulready-Shick J., Flanagan K., Banister G., Mylott L., & Curtin L. (2013). Evaluating dedicated education units for clinical education quality. *Journal of Nursing Education, 52*(11), 606-614. doi: 10.3928/01484834-20131014-0749.
57. Hooven, K. (2014). Evaluation of instruments developed to measure the clinical learning environment: An integrative review. *Nurse Educator, 39*(6), 316-320.
58. Tanner, C. A. (2006). The next transformation: Clinical education. *Journal of Nursing Education, 45*(4), 99-100.
59. Lasater, K. & Nielsen, A. (2009a). The influence of concept-based learning activities on students' clinical judgment development. *Journal of Nursing Education 48*(8), 441-446.
60. Ericsson, K.A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine, 79*(10) October Supplement
61. Lasater, K. & Nielsen, A. (2009b). Reflective journaling for clinical judgment development and evaluation. *Journal of Nursing Education 48*(1), 40-44.
62. Tanner, C. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education, 45*(6), 204-211.

Table 1. Summary of Reviewed Studies

Author, country of origin	Design and method; measure	Aim, Sample, and Setting	Major Findings	Strengths and Limitations
<p>Bourgeois, Drayton, & Brown (2011)</p> <p>Australia</p>	<p>Qualitative Thematic analysis</p>	<p>Describe a cluster model of supportive clinical teaching and learning (a unit on which 12-15 senior registered nurses supported clinical teaching of students; each teacher taking 3 week rotations) for undergraduate nursing students</p> <p>N=not reported; undergraduate nursing students</p> <p>One university</p> <p>One hospital</p> <p>Multiple units</p>	<p>The model promoted students’ feeling as if they belonged to the team which in turn facilitated ability to learn.</p> <p>Staff interest in their learning and interactions with those staff increased opportunities for learning and promoted belongingness to the team.</p> <p>Students reported that for the model to work well, staff nurses and clinical teachers needed to collaborate and the clinical teacher clarify the student scope of practice.</p> <p>Peer learning provided support and opportunities for collaborative problem solving.</p>	<p>Strengths:</p> <p>Rich qualitative description</p> <p>Longitudinal data collection</p> <p>Limitations:</p> <p>Unknown sample size</p> <p>One university</p>
<p>Callaghan (2009)</p> <p>Canada</p>	<p>Qualitative, retrospective Thematic analysis</p>	<p>Illuminate strengths of two different models of clinical education (A Collaborative Learning Unit model in which students worked with staff nurses and team members and a Preceptorship model in which students worked with one staff nurse)</p> <p>N=22 BSN graduates</p> <p>Number of hospitals or clinical units not specified</p>	<p>Collaborative Learning Unit model: working with many nurses and team members enabled students to develop independence, experience a broader exposure to nursing and the value of the multidisciplinary team.</p> <p>Preceptorship model: working with one nurse enabled students to develop a deep understanding of one practice area, the receipt of consistent feedback from the preceptor, and come to understand how all elements of practice work together.</p>	<p>Strengths:</p> <p>Random selection</p> <p>Limitations:</p> <p>Small sample size</p> <p>No identification of which semester, length of experience, or in which order they experienced the two models</p> <p>Number of hospitals or clinical units not specified</p>

<p>Chan (2001) Hong Kong</p>	<p>Mixed (survey and focus groups) Cross-sectional descriptive Clinical Learning Environment Inventory (CLEI)- Actual and Preferred</p>	<p>To develop and validate the CLEI, assess pre-registration nursing students' perceptions of hospital learning environments, and examine differences in actual and preferred learning environments N=108 pre-registration nursing students (survey); N=21 randomly selected from large group for focus groups One university Number of hospitals or clinical units not specified</p>	<p>Students desired a higher quality CLE than they experienced. Students desired a CLE that welcomed them as a part of the team, recognized their individuality, and were afforded flexible learning opportunities to meet their learning needs. Students reported interpersonal relationships with staff were key to perceptions of learning.</p>	<p>Strengths: Mixed method approach Limitations: One university Only second year students Findings limited to student perspective Number of hospitals or clinical units not specified</p>
<p>Chan (2002) Australia</p>	<p>Quantitative (Survey) Cross-sectional Descriptive CLEI, Actual and Preferred</p>	<p>Identify associations between students' perceptions of learning, outcome (satisfaction), and perceptions of the CLE N=108 second-year nursing students One university 14 metropolitan hospitals in South Australia</p>	<p>Students' satisfaction was strongly associated with all scales of CLEI. Significant differences between perceptions of actual CLE and their preferred CLE</p>	<p>Strengths: Multiple hospitals Comparison of students' perception of actual CLE and preferred CLE characteristics Limitations: Findings are student perception Satisfaction as outcome measure One university</p>

<p>Chuan & Barnett (2012)</p> <p>Malaysia</p>	<p>Mixed (Questionnaire and open questions)</p> <p>Cross-sectional</p> <p>Descriptive</p> <p>Measure developed for this study</p>	<p>Describe and compare student nurses, staff nurses, and nurse tutors perceptions of the CLE; identify factors that enhance or inhibit student learning (Student supervision by either clinical instructors-who had no patient assignment, or staff nurses-who maintained a patient assignment)</p> <p>N=142 students</p> <p>N=54 nurses</p> <p>N=8 nurse tutors</p> <p>*Only students' perceptions included in this review</p> <p>One private nursing college</p> <p>One private hospital</p> <p>Multiple clinical units</p>	<p>Significant differences in perception of students supervised by clinical instructors and students supervised by staff nurses</p> <p>Most positive perception was supervision by clinical instructors</p> <p>Enhancing factors: positive staff nurse' attitudes toward student learning, variety of opportunities, sufficient equipment, adequate time</p> <p>Inhibiting factors: too many students on unit, busy unit, students treated as workers</p>	<p>Strengths:</p> <p>Multiple clinical units</p> <p>Comparison of students', staff nurses', and nurse tutors' (instructors) perceptions</p> <p>Mixed approach provided rich description of quantitative results</p> <p>Limitations:</p> <p>One university</p> <p>One hospital</p> <p>Newly developed questionnaire</p>
<p>Croxon & Maginnis (2009)</p> <p>Australia</p>	<p>Mixed (survey and thematic analysis)</p> <p>Unidentified clinical evaluation tool; Open-ended questions.</p>	<p>Compare students' perceptions in a clinical facilitator model (staff nurse assigned to 8 students on the unit) and a preceptor model (staff nurse assigned to one student on the unit)</p> <p>N=20 second year nursing students</p> <p>One University</p> <p>Number of hospitals or clinical units not specified</p>	<p>The support of the facilitator in both models was most significant to students' perceptions of learning.</p> <p>Students in the clinical facilitator model felt the facilitator was an available, willing resource.</p> <p>Students in the preceptor model noted limited availability of the preceptor.</p> <p>Opportunities to practice and learn in both models were dependent on staff willingness to teach and include students as part of the team.</p> <p>Student confidence was increased by support of facilitators and preceptors.</p> <p>The clinical facilitator model promoted student peer support.</p>	<p>Strengths:</p> <p>Rich qualitative description</p> <p>Comparison of two clinical education models</p> <p>Limitations:</p> <p>Small sample size</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p>

<p>Courtney-Pratt (2011)</p> <p>Australia</p>	<p>Mixed (Survey and open questions)</p> <p>Cross-sectional descriptive</p> <p>Quality Clinical Placement Inventory (QCPI), adapted for this study</p>	<p>Describe quality of acute-care clinical placements</p> <p>N=178 second-year nursing students</p> <p>N=163 staff nurses</p> <p>N=22 clinical facilitators (RNs employed by university)</p> <p>*Only students' perceptions included in this review</p> <p>One university</p> <p>One hospital</p> <p>20 clinical units</p>	<p>Being welcomed and feeling a belongingness to the unit, positive relationships with instructors and staff nurses, and opportunities to discuss experiences with clinical facilitators were important influences on students' experiences in the CLE</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Multiple clinical units</p> <p>Mixed approach provided rich description of quantitative results</p> <p>Limitations:</p> <p>One university</p> <p>One hospital</p> <p>Newly adapted survey</p>
<p>D'Souza (2015)</p> <p>Oman</p>	<p>Quantitative</p> <p>Cross-sectional descriptive</p> <p>Clinical Learning Environment Scale + Teacher (CLEST)</p>	<p>Assess satisfaction with and effectiveness of the CLE among nursing students in Oman</p> <p>N=310 BSN students who had completed 50% of credits or two clinical courses.</p> <p>One public school of nursing</p> <p>Number of hospitals or clinical units not specified</p>	<p>Supervisory relationship with the clinical teacher received the most positive perceptions, and students reported positive perceptions of individual supervision, feedback, learning experiences, leadership style, and patient care</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Limitations:</p> <p>One school of nursing</p> <p>Number of hospitals or clinical units not specified</p>
<p>Dimitriadou (2015)</p> <p>Cyprus</p>	<p>Quantitative</p> <p>Descriptive, correlational</p>	<p>Explore students' perceptions of learning in the CLE, specifically supervisory relationships with staff nurses, mentors, and nurse teachers</p> <p>N=357 second year BSN students</p>	<p>Supervisory relationships with the mentor (staff nurse preceptor) were rated high and contributed to student satisfaction with learning experiences. Collaboration between the mentor and the nurse teacher facilitated achievement of individual learning needs.</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Multi-site</p> <p>Limitations:</p>

	CLEST	Four universities offering BSN Number of hospitals or clinical units not specified	Interpersonal relationships between staff and students were rated low and contributed to decreased satisfaction with learning experiences.	Only second-year nursing students
Dunn & Hansford (1997) Australia	Mixed (survey and focus groups) Cross-sectional Descriptive Clinical Learning Environment Scale (CLES)	Identify factors characterizing students' perceptions of the CLE N=229 second and third year nursing students One university Multiple clinical units	Student satisfaction with the CLE positively influenced by staff acceptance of students as a part of the team, engagement of staff in teaching students, positive student attitudes toward own learning	Strengths: Large sample size Multiple clinical units Mixed approach provided rich description of quantitative results Limitations: One university Unknown if multiple units were at one or multiple hospitals
Gidman (2011) England	Mixed (questionnaire, open questions, and focus groups) Cross-sectional Descriptive Questionnaire developed for this study	Explore nursing students' perceptions and experiences of support in clinical practice placements N=174 beginner students in first six months of nursing school N=98 finishing students in last three months of nursing school Focus groups included: N=15 beginner students and N=20 completing students One university Number of hospitals or clinical units not specified	Both beginning and finishing students ranked teaching and support of mentors and becoming part of the team as positive influence on perception of CLE. Beginning students ranked support of academic staff most important, clinical mentors second, family/friends third. Finishing students ranked clinical mentors first, academic staff second, and peers third.	Strengths: Large sample size Comparison of beginner and finishing students Mixed approach provided rich description of quantitative results Limitations: Newly developed questionnaire One university Number of hospitals or clinical units not specified

<p>Heel, Henderson, Twentyman, & Lloyd (2006)</p> <p>Australia</p>	<p>Quantitative (survey)</p> <p>Pre-post quasi-experimental</p> <p>CLEI</p>	<p>Evaluate impact of Clinical Education Unit (staff nurses paid by university to have no patient assignment while supervising students) on students' perceptions of the CLE</p> <p>N=370 second and third year nursing students: N=248 in 15 control placements with no change; N=122 in 5 placements using collaborative model</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p>	<p>New collaborative model resulted in student perceptions of increased involvement in team, personalization of teaching to meet students' learning needs, better organization of unit.</p>	<p>Strengths:</p> <p>Quasi-experimental design</p> <p>Large sample size</p> <p>Limitations:</p> <p>CLE self-selection to participate in new collaborative model</p>
<p>Hellstrom-Hyson, Martensson, & Kristofferzon (2012).</p> <p>Sweden</p>	<p>Qualitative descriptive (interview)</p> <p>Thematic analysis</p>	<p>Describe how nursing students experienced two models of supervision during clinical practice education: supervision on student wards (students work in pairs with supervision from a staff nurse preceptor), and traditional supervision (one student assigned one staff nurse preceptor)</p> <p>N=8 students in the final semester of a 3-year nursing program</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p>	<p>Students experiencing supervision on student wards reported an increased ability to assume responsibility for patient care and develop as a professional nurse.</p> <p>Students experiencing traditional supervision reported feeling as if they were in an observatory role that made it difficult to take responsibility and develop confidence and independence.</p>	<p>Strengths:</p> <p>Rich qualitative description</p> <p>Limitations:</p> <p>Small sample size</p> <p>Number of hospitals or clinical units not specified</p>
<p>Henderson, Twentyman, Heel, & Lloyd (2006)</p> <p>Australia</p>	<p>Quantitative (survey)</p> <p>Cross-sectional</p> <p>Descriptive</p>	<p>Describe students' perceptions of CLE in three models of clinical placement: Preceptor (One staff nurse-who maintains a patient assignment, working with one student), Clinical Education Unit (CEU) (Staff on unit have been trained to supervise student clinical learning, are clinically current, and take ownership for student learning), and Group</p>	<p>Students in preceptor model perceived higher individualization of teaching, involvement in the team, satisfaction, innovation, personalization, and unit organization; when preceptor model excluded, CEU rated higher than group facilitation</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Comparison of three different models</p>

	Comparative CLEI	Facilitation Model (One RN working with eight students across multiple hospital units) N=389 total: N=16 preceptor model; N=269 group facilitation model; N=114 Clinical Education Unit model One university One hospital		Limitations: Lack of qualitative data to describe quantitative results Small sample size in preceptor model Organizational differences in clinical learning environments Student self-selection to participate in new collaborative model (CEU) One hospital and clinical unit
Henderson et al. (2009) Australia	Quantitative Quasi-experimental, intervention CLEI	Assess impact of a staff-development intervention to build teaching capacity of RNs on enhancement of the CLE for nursing students N=62 first, second and third year nursing students; equal numbers evaluated the CLE before, during, and six months after intervention One university One hospital, two clinical units	During the intervention period, students' reported an increase in individualization of teaching, involvement in the team, satisfaction, innovation, personalization, and unit organization	Strengths: Educational intervention Quasi-experimental design Limitations: Small sample size Only two clinical units
Hendricks, Wallace, Narwold, Guy, & Wallace (2013) USA	Quantitative Comparative Longitudinal	Examine effects of preceptored clinical (Staff nurse-who maintained patient assignment-supervised one student) and regular group clinical (One clinical instructor supervised multiple students) learning situations among junior and senior nursing students	Students in preceptored clinical (student paired with preceptor and remained in same facility for all clinical rotations) reported significantly more practice opportunities than group students (faculty facilitated rotations and students move to different facilities for each rotation). First semester, preceptored students reported higher satisfaction and perception of learning facilitation,	Strengths: Use of standardized exam as measure of actual learning outcomes (gain in factual knowledge) Limitations:

	<p>Student Evaluation of Clinical Education Environment (SECEE);</p> <p>Standardized exam</p>	<p>N=73 nursing students</p> <p>One university</p> <p>One hospital, multiple clinical units not specified</p>	<p>but the differences were not present at mid and end measurement.</p> <p>No differences in standardized exam performance were identified</p>	<p>Small sample size</p> <p>One university</p> <p>Possible insufficient sensitivity of standardized exam to detect knowledge gain</p>
<p>Ip & Chan (2005)</p> <p>Hong Kong</p>	<p>Quantitative</p> <p>Cross-sectional Descriptive</p> <p>CLEI actual and preferred</p>	<p>Description of students' perception of the social climate of the CLE</p> <p>Second, third, and fourth year nursing students</p> <p>N=281 actual CLEI, N=243 preferred CLEI</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p>	<p>Students' rated personalized interactions with clinical teacher and nurse high on both report of actual CLE experience and preferred CLE experience; teaching innovation was rated lowest on both actual and preferred; personalization, student involvement in the team, and unit organization predicted satisfaction</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Limitations:</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p> <p>Satisfaction as outcome measure</p>
<p>Lofmark, Thorkildsen (2012)</p> <p>Norway</p>	<p>Quantitative</p> <p>Cross-sectional Descriptive</p> <p>Nursing Facilitator Clinical Questionnaire (NFCQ)</p>	<p>Description of nursing students' perceptions of preceptors' and university teachers' supervision in the CLE</p> <p>N=380 nursing students, all years of program</p> <p>One university</p> <p>Multiple hospitals</p> <p>Multiple hospital units</p>	<p>Supervision by university teachers and preceptors was rated high; supervision by teachers was associated with perceived achievement of learning outcomes including taking responsibility, using nursing research, and decision-making.</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Students from each year of program</p> <p>Multiple hospitals and clinical units</p> <p>Limitations:</p> <p>One university</p>

				Quantitative data limits understanding of specific aspects of supervision found valuable
Lofmark & Wikblad (2001) Sweden	Qualitative (weekly diaries) Longitudinal, 4 weeks Guided diary questions	Identify factors that student nurses found facilitating or obstructing their learning during final part of clinical education N=60 students in final semester Random selection Two universities Number of hospitals or clinical units not specified	Facilitating factors: collaboration with supervisors and staff, being allowed to take responsibility and work independently as member of team, opportunities to practice tasks, receiving feedback Obstructing factors: lack of trust and ability to take responsibility in the supervisory relationship, being treated condescendingly by supervisor, lack of feedback and opportunities to reflect, lack of opportunities to practice, identification of own insufficiency.	Strengths: Random selection Two universities Rich description provided by diaries Limitations: Small sample size Only two universities Number of hospitals or clinical units not specified
Mulready-Shick, & Kafel (2009) USA	Qualitative Open-ended survey and focus groups	Assess whether the DEU model facilitates students' learning of quality and safety competencies N=16 students; n=9 staff nurses (not included in this review) One university Two DEU CLEs	Students reported: a welcoming attitude and teamwork from nursing staff promoted their responsibility for patient care and communication skills; Smaller student-teacher ratio reduced error potential and supported knowledge gains about medications; Availability of resources promoted ease of access to patient records; Working alongside the staff nurses promoted students' patient care skills; Collaborative relationships promoted exceeding learning expectations.	Strengths: Elicitation of student and staff nurses' perceptions Rich qualitative description Limitations: Small sample size

<p>Mulready-Shick, Flanagan, Banister, & Curtin (2013)</p> <p>USA</p>	<p>Quantitative</p> <p>Randomized, controlled trial</p> <p>SECEE;</p> <p>Growth in Clinical Learning scale (GCLS);</p> <p>Quality and Safety Competency Development Scale</p>	<p>Investigate in what ways the DEU when compared to traditional clinical education, enhances educational quality (DEU-staff specially trained to supervise students worked collaboratively with a university clinical instructor to supervise students; traditional-university clinical instructor supervised a group of students)</p> <p>N=165 junior nursing students; n=111 in DEU, n=54 in traditional groups</p> <p>Number of hospitals or clinical units not specified</p>	<p>Students in both DEU and traditional groups report positive experiences, but DEUs were significantly more positive.</p> <p>DEU students rated instructor quality and learning opportunities higher than students in the traditional group.</p> <p>DEU students perceived greater clinical learning, nursing knowledge, clinical skills, and ethical and professional behaviors than traditional group students.</p> <p>DEU students reported experiencing more direct coaching, feedback, support, and facilitation of clinical judgment from their clinical instructors than students in traditional groups.</p>	<p>Strengths:</p> <p>Randomized controlled trial</p> <p>Limitations:</p> <p>Self-report measures</p> <p>Differences within multiple DEUs may contribute to different perceptions</p> <p>Number of hospitals or clinical units not specified</p>
<p>Newton, Jolly, Ockerby, & Cross (2012)</p> <p>Australia</p>	<p>Mixed (survey and interview)</p> <p>Longitudinal (3 years)</p> <p>CLEI-modified for this study</p>	<p>Describe students' perception of the CLE in MASH and other models of clinical education (MASH: Collaborative teaching by preceptor and clinical teacher (remains constant throughout rotations), and all placements in one healthcare organization;</p> <p>Non-MASH completed in multiple organizations;</p> <p>Non-MASH 1: Clinical teacher only; Non-MASH 2: Preceptor and clinical teacher)</p> <p>N= 659 second and third year students</p> <p>Two campuses of one university:</p> <p>Campus A N=319</p> <p>Campus B N=340</p>	<p>Student centeredness, or level of engagement of clinical teacher with student, was significantly higher in the MASH model.</p>	<p>Strengths:</p> <p>Longitudinal design</p> <p>Comparison of multiple models of clinical education</p> <p>Limitations:</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p> <p>Modification of CLEI for this study</p>

		Number of hospitals or clinical units not specified		
<p>Newton, Cross, White, Ockerby, & Billett (2011)</p> <p>Australia</p>	<p>Mixed (survey and interview)</p> <p>Longitudinal (3 years)</p> <p>Report of qualitative portion of larger study (Ockerby, Newton, Cross, & Jolly 2009)</p> <p>Semi-structured interview</p>	<p>Identify factors within the CLE during clinical education that facilitated or hindered their work readiness upon graduation</p> <p>N=23 second and third year students in a clinical partnership model (as reported in in (Ockerby Newton, Cross, & Jolly 2009)</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p>	<p>Familiarity with the organization due to continuity of working in the same healthcare facility for multiple clinical placements and working with same staff, and having a sense of belongingness in the workplace were identified as factors that facilitated a perception of being ready to transition to work.</p>	<p>Strengths:</p> <p>Longitudinal study design</p> <p>In-depth, semi-structured interview produced rich description</p> <p>Limitations:</p> <p>Small sample size</p> <p>One university</p> <p>Number of hospitals or clinical units not specified</p>
<p>Nishioka Coe, Hanita, & Moscato (2014)</p> <p>USA</p>	<p>Mixed (surveys and focus group)</p> <p>Comparative, Repeated measures</p> <p>CLEST and focus groups</p>	<p>Compare students' perceptions of clinical learning experiences in a DEU with traditional clinical education (DEU-staff specially trained to supervise students worked collaboratively with a university clinical instructor to supervise students; traditional-university clinical instructor supervised a group of students)</p> <p>N=209; n=32 students; n=35 nurse managers, n=75 nurses, n=39 faculty, n=16 clinical partner administrators</p> <p>*Only students' perceptions included in this review</p>	<p>A consistent supervisory relationship with a staff nurse mentor was associated with perception of higher quality learning experience.</p> <p>Quality of overall atmosphere, leadership style of the manager, and nursing care on the unit was higher quality in the DEU than traditional units.</p> <p>An unwelcoming atmosphere, unclear roles, and multiple staff nurse mentors in traditional units contributed to dissatisfaction with learning experiences.</p> <p>Students saw faculty as less active in assisting students to integrate theory and practice in the DEU, but acknowledged the knowledge, support, and expertise of faculty contributed to positive experiences in the traditional model.</p>	<p>Strengths:</p> <p>Elicitation of student, faculty, nurses, nurse manager, and clinical partner administrators' perceptions</p> <p>Limitations:</p> <p>Small student sample size</p> <p>Number of universities, hospitals or clinical units not specified</p>

		Number of universities not specified Number of hospitals or clinical units not specified		
Nolan (1998) Australia	Qualitative Thematic analysis of clinical conference discussions	Understand the clinical learning experience of undergraduate nursing students N=6 second year, second semester nursing students One university Number of hospitals or clinical units not specified	Students felt inadequate if not welcomed as part of the team; this contributed to decreased opportunities to learn. As acceptance into the team increased, so did opportunities to practice skills; this contributed to increased confidence. The gap between theory and practice contributed to frustration; students became aware of the gap and acknowledged the need to continue learning past their degree to close that gap.	Strengths: Rich qualitative description Findings congruent with other studies Limitations: Small sample size One university Number of hospitals or clinical units not specified One clinical teacher
Papastavrou, Lambrinou, Tsangari, Saarikoski, & Leino-Kilpi (2010) Cyprus	Quantitative Cross-sectional descriptive CLES	Explore student nurses' experiences of the CLE and supervision within the hospital-based education system of Cyprus N=645 nursing students (last cohort to complete the hospital-based education system prior to transition of nursing education to the university. One (the only) public school of nursing in Cyprus Number of hospitals or clinical units not specified	Students relate the CLE with the quality of nursing care and patient relationships. Students who were assigned a personal staff nurse mentor were more satisfied than those experiencing traditional group supervision. The supervisory relationship between the student and the staff nurse mentor was seen as most important.	Strengths: Large sample size Limitations: One school of nursing Number of hospitals or clinical units not specified
Papathanasiou (2014)	Quantitative	Assessment of students' views and perceptions of a Greek nursing school on their clinical learning environment	Students desired a more positive CLE than they had experienced. Interactions with the teacher and organization of learning opportunities were rated highly while	Strengths: Survey of actual experiences in the CLE and preferred experiences provides an understanding of the gap

<p>Greece</p>	<p>Cross-sectional descriptive</p> <p>CLEI, Actual and Preferred</p>	<p>N=196 nursing students: n=77 in 5th semester, n=53 in 7th semester, n=66 in 8th (final) semester</p> <p>One school of nursing, one hospital</p>	<p>opportunities to make decisions according to their skill level and innovative learning activities were rated poorly.</p>	<p>between what is available and what is needed.</p> <p>Limitations: One university, one hospital</p>
<p>Papp, Markkanen, & von Bonsdorff (2003)</p> <p>Finland</p>	<p>Qualitative</p> <p>Observation and Unstructured interviews</p>	<p>Describe the Finnish student nurses' experiences and perceptions of the clinical environment as a learning environment</p> <p>N=16 second, third, and fourth year nursing students</p> <p>One school of nursing</p> <p>Number of hospitals or clinical units not specified</p>	<p>Students needed to feel appreciated by staff in the CLE and be supported by the staff nurse mentor during learning.</p> <p>The quality of mentoring and patient care on the unit contributed to more positive.</p> <p>A positive learning environment was established through collaboration between school and clinical staff.</p> <p>Student self-directedness in part determined quality of learning experiences.</p>	<p>Strengths:</p> <p>Rich qualitative description of students' experiences</p> <p>Limitations:</p> <p>Small sample size</p> <p>One school of nursing</p> <p>Number of hospitals or clinical units not specified</p>
<p>Ranse & Grealish (2007)</p> <p>Australia</p>	<p>Qualitative</p> <p>Focus groups</p>	<p>Explore nursing students' experience of learning in the clinical setting of a DEU (staff specially trained to supervise students)</p> <p>N=25 second and third year nursing students</p> <p>One school</p> <p>Number of hospitals not specified</p> <p>Multiple hospital units</p>	<p>Acceptance of students by staff facilitated student engagement in nursing work.</p> <p>Peer learning was significant to students' development of confidence and sharing of experiences reinforced and enhanced knowledge.</p> <p>Accepting responsibility for work within the CLE was valued.</p>	<p>Strengths:</p> <p>Rich qualitative distinction</p> <p>Findings are congruent with other studies</p> <p>Limitations:</p> <p>Small sample size</p> <p>One university</p>

Rhodes, Meyers, & Underhill (2012) USA	Mixed (survey and focus groups) Longitudinal descriptive CLES-Revised and focus groups with thematic analysis	Investigate students' perceived outcomes of the DEU model on the CLE and explore staff nurses' and faculty's perceived outcomes of the DEU (staff specially trained to supervise students) N=85 senior nursing students; n=4 faculty and n=45 DEU nurses *Only students' perceptions included in this review One school of nursing Multiple hospitals and clinical units	Students were satisfied with the CLE on the DEU as the model facilitated trust from staff nurses in students' ability, improved orientation to the unit, and improved evaluation of their ability due to working alongside the nurse. Students felt the staff made them feel like a part of the team Students reported the DEU environment encouraged critical thinking and evidence appraisal, and promoted independent problem solving and connection of theory to practice. Students noted that nurses should have a desire to teach and be appropriately trained for the role.	Strengths: Mixed-method approach Comparison of student, faculty, and nurse perceptions Multiple hospitals and clinical units Limitations: Small sample size One university
Roxburg (2014) UK	Qualitative Comparison, Focus groups	Explore undergraduate nursing students' perceptions of two experienced practice learning models: hub and spoke (consistency of clinical facility and mentor/team for the entire year of clinical experiences), and classical rotational model (students rotate mentors and clinical facilities for each alternate clinical experience rotation) N=10 undergraduate students at end of year 2. One school of nursing Number of hospitals or clinical units not specified	Students reported that year one in the hub and spoke model contributed to a feeling of belongingness to the hub, but provoked anxiety with each short experience in a spoke placement. Students reported that although there was increased anxiety in the spokes, experiencing those short placements increased confidence and resilience that made year two experiences in the rotational model easier Students reported that knowledge and skills gained during year 1 were not recognized or did not advance in year 2 during the rotational model due to a lack of understanding of students' skill level. The short spoke placements limited the ability to build relationship with the mentor	Strengths: Rich qualitative description Comparison of student experiences in two models of clinical education Limitations: Small sample size One university Number of hospitals or clinical units not specified
Saarikoski, Leino-Kilpi, & Warne (2002)	Quantitative	Comparative analysis of experiences of Finnish and English nursing students in CLEs and test the CLES.	Finnish students evaluated their experiences in the CLE more positively than those in the UK. The Finnish students reported higher satisfaction with the overall atmosphere and more frequent nurse teacher and	Strengths: Large sample

<p>Finland</p>	<p>Cross-sectional descriptive</p> <p>CLES</p>	<p>N=558 nursing students: n=416 in Finland, n=142 in UK.</p> <p>Four nursing colleges in Finland, two universities in the UK</p> <p>Number of hospitals or clinical units not specified</p>	<p>student meetings. Satisfaction was higher in students' experiencing more meetings with the nurse teacher.</p>	<p>Multiple universities</p> <p>Comparison across geographic areas</p> <p>Limitations:</p> <p>Minimal explanation of the nurse teacher role</p> <p>Number of hospitals or clinical units not specified</p>
<p>Skaalvik, Normann, & Henriksen (2011)</p> <p>Norway</p>	<p>Quantitative</p> <p>Cross-sectional descriptive</p> <p>CLEST</p>	<p>Measure nursing students' experiences and satisfaction with their CLEs</p> <p>N=511 nursing students; n=261 in acute-care CLEs, n=146 in nursing homes (not included in this review)</p> <p>Five universities</p> <p>Number of hospitals or clinical units not specified</p>	<p>Supervisory relationship and a welcoming overall atmosphere in the CLE were rated highest and were associated with higher satisfaction with learning experiences. Limitations in variety of learning situations was associated with lower satisfaction.</p>	<p>Strengths:</p> <p>Large sample size</p> <p>Multiple universities</p> <p>Comparison between acute-care and sub-acute care CLEs</p> <p>Limitations:</p> <p>Cross-sectional design, self-report</p> <p>Number of hospitals or clinical units not specified</p>
<p>Smedley & Morey (2009)</p> <p>Australia</p>	<p>Quantitative</p> <p>Cross-sectional descriptive</p> <p>CLEI-actual and preferred</p>	<p>Assess senior bachelor of nursing students' perceptions of the characteristics of their CLE.</p> <p>N=38 senior nursing students</p> <p>One university</p>	<p>Actual CLE satisfaction was high, but still lower than preferred CLE</p> <p>Development of a positive relationship with teaching staff was the most important factor in a positive CLE.</p> <p>Satisfaction with the CLE was increased when students were engaged as integral members of the team</p>	<p>Strengths:</p> <p>Comparison of actual and preferred CLE characteristics</p> <p>Limitations:</p> <p>Small sample size</p>

		Number of hospitals or clinical units not specified		One university Number of hospitals or clinical units not specified
Sundler et al. (2014) Sweden	Mixed (survey and open-ended question) Cross-sectional comparative CLEST plus an open-ended question	Investigate student nurses' experiences of the CLE in relation to how supervision was organized N=185 final term undergraduate nursing students Three universities Multiple clinical units	Students had positive experiences of the CLE atmosphere, leadership style, nursing care, and supervisory relationships with the nurse preceptor and nurse teacher. Students with one preceptor reported more positive supervisory relationships than those with multiple preceptors.	Strengths: Comparative design Mixed-method approach Three universities Multiple CLEs Limitations: Small sample at each site
Warne, et al. (2010) Finland	Quantitative Cross-sectional descriptive CLEST	Identify factors that enhance the learning experiences of student nurses while in clinical education N=1903 pre-registration students from 17 schools of nursing in Western Europe Multiple schools Multiple hospitals	Supervisory relationship was rated the most important element of clinical learning experiences. Overall atmosphere of the CLE rated second most important. Longer clinical placements were associated with higher satisfaction with clinical experiences	Strengths: Large sample size Multiple schools Multiple hospitals Limitations: Large size and wide geographic area coupled with quantitative methodology limited explanation and generalization of findings

Chapter 3 (Manuscript 2)

A New Apprenticeship: An Integrated Theory of Clinical Education for Advancing
Clinical Reasoning in the Clinical Learning Environment

Mary Ann Jessee, MSN, RN, is the sole author of this manuscript

Funding acknowledgement: Funding was provided by the National League for Nursing Jonas
Scholar Foundation

Publication: Manuscript was submitted on September 1, 2015 to The Journal of Nursing
Education

Introduction

The purpose of this manuscript is to describe an amalgamation of Situated Learning Theory (Lave & Wenger, 1991), Expert Practice (Dreyfus & Dreyfus, 1986; Benner, 1984), Deliberate Practice (Ericsson, 2004), and the Tanner Clinical Judgment Model (Tanner, 2006) as the framework for advancing the design and study of pre-licensure clinical education in nursing to promote the skillful clinical reasoning essential for nurses in the current healthcare environment. Learning a multifaceted practice such as nursing requires that learning take place in the context of practice (Lave & Wenger, 1991) through purposeful design and implementation of teaching-learning strategies that foster deliberate practice of higher-order thinking skills (Ericsson, 2004) and are not subject to the random learning opportunities or the limited capacity of a single instructor (Tanner, 2010).

The practice of nursing always occurs in context (Benner, 1984), including the physical environment and specific tasks, as well as the culture and values, goals and expectations, and knowledge and experience of participants in the practice. However, it is the interactions among these factors that contributes to the meaning of learning experiences in clinical education (Lave & Wenger, 1991). Enhancing the quality of interactions to improve meaning making in clinical learning may be achieved with the framework of an integrated theoretical framework to advance the concept of apprenticeship from one in which the novice learns *under* the master to one in which the novice is an active participant *alongside* the expert in the context of learning a practice profession (Lave & Wenger, 1991).

The synthesis of literature for Manuscript #1 identified the sociocultural factors within the CLE that contribute to students' perceptions of learning. These findings, the complexity of learning the multifaceted practice of nursing, and repeated calls for reform of clinical education in nursing (Benner, Sutphen, Leonard, & Day, 2010; IOM, 2010) necessitates articulation of a theoretical foundation to support the design of clinical learning environments that promote the development of clinical reasoning. As such, this manuscript

will describe a new Integrated Theory of Clinical Education as the theoretical support for radical change of pre-licensure clinical education in nursing.

This manuscript will replace the theoretical framework portion of the Review of Literature chapter of the traditional dissertation and will contribute to this body of work through articulation of a sound theoretical support for clinical learning in pre-licensure nursing.

Abstract

Background: Clinical reasoning is an essential skill for nurses and is best learned in the clinical learning environment. The link between clinical education and the development of clinical reasoning is not well supported by a single theoretical perspective.

Method: Description and synthesis of theories supporting clinical education in nursing.

Results: Situated Learning Theory, Expert Practice, Deliberate Practice, and the Tanner Clinical Judgment Model each offer relevant, yet incomplete frameworks to guide design of pre-licensure clinical education that supports comprehensive teaching and learning to promote clinical reasoning skill.

Conclusion: A melding of these four interrelated theoretical perspectives provides a comprehensive theoretical framework to guide design and implementation of pre-licensure clinical education that promotes clinical reasoning skill.

A New Apprenticeship: An Integrated Theory of Clinical Education for Advancing Clinical Reasoning in the Clinical Learning Environment

Nurses in today's acute-care healthcare environments must possess sound clinical reasoning skill to recognize salient cues indicative of early patient decline and take action to prevent costly complications, sentinel events, and death (Berkow, Virkstis, Stewart, & Conway, 2008; Purling & King, 2012). Clinical reasoning is best learned over time and through experiences with multiple patient situations in the clinical learning environment (CLE) (Tanner, 2010). Multiple theoretical perspectives (Ericsson, 2008; Galton, 1869; Lave & Wenger, 1991) and mounting evidence support that learning to reason through patient situations during clinical education may be best achieved with a combination of three key components: 1) direct interaction with other participants in the complex sociocultural context of nursing practice (Lave & Wenger, 1991; McNelis, et al., 2014; Mulready-Shick, Flanagan, Banister, Mylott, & Curtin, 2013), 2) multiple opportunities to practice reasoning through patient situations within that context (Benner, Sutphen, Leonard, & Day, 2010; Ericsson, 2004; Lasater & Nielsen, 2009; Nielsen, 2009; Tanner, 2006), and 3) participation in an effective instructor-student coaching relationship characterized by collaborative discourse and meaningful feedback about students' reasoning within those patient situations (Benner, Sutphen, Leonard, & Day, 2010; McNelis, et. al. 2014; Tanner, 2006).

However, there is evidence that current clinical education seldom incorporates these critical components, and thus fails to consistently promote the learning and practice of clinical reasoning (Benner, Sutphen, Leonard, & Day, 2010; Ironside & McNelis, 2010; Ironside, McNelis, & Ebright, 2014; Jacobson & Grindel, 2006; McNelis et.al, 2014). Part of this failure may be due to a lack of a theoretical framework linking clinical education practices to development of key competencies such as clinical reasoning. Therefore, the purpose of this paper is to propose a melding of three interrelated theoretical perspectives,

Situated Learning Theory, Expert Practice, Deliberate Practice, and the Tanner Clinical Judgment Model (TCJM) as a comprehensive theoretical framework to guide design and implementation of pre-licensure clinical education that promotes clinical reasoning skill.

Background

What is Clinical Reasoning and Why is it Important?

Clinical reasoning encompasses the cognitive processes through which nurses combine patient data, knowledge, experience, professional values, and reflection in action to make nursing decisions (Benner, 1984; Simmons, 2010; Tanner, 2006). These nursing decisions, or clinical judgments, contribute to the trajectory and outcome of patient situations. In the acute-care setting, poor clinical reasoning skill is often characterized by failure to recognize salient data or inability to interpret data due to a deficit in foundational knowledge or minimal experience; poor clinical reasoning is often difficult to discern in practice until it results in an adverse event. Evidence shows that failure to rescue, or failure to notice and appropriately act on early patient decline, results in avoidable morbidity and mortality (Mok, Wank, & Liaw, 2015). Conversely, the effectiveness of rapid response teams demonstrates that early identification of potential physiologic decline and the decision to take action contributes to reduction in morbidity and mortality in acute-care settings (Salvatierra, Bindler, Corbett, Roll, & Daratha, 2014). Skillful clinical reasoning enables clinicians to recognize salient data, discern trends, weigh findings against previous experiences and evidence, and determine the most appropriate action to prevent harm and promote positive patient outcomes.

How is Clinical Reasoning Learned?

Documented differences in clinical reasoning skill in novice and expert nurses demonstrate that this skill develops over time with experience in reasoning through multiple patient situations (Benner, 1984). Novice thinking is characterized by analytic, rule-based

processes best suited to well-structured tasks (Cader, Campbell, & Watson, 2005) that can be broken down into appreciable steps such as taking a blood pressure, placing an IV, or administering medications. Ill-structured tasks (Cader, Campbell, & Watson, 2005) including interpreting ambiguous patient situations such as an increased respiratory rate and accompanying patient agitation, are challenging to the novice. A lack of experience with these types of situations results in an inability to discern subtle changes that do not fit the expected frame of reference for the situation, and thus the ability to take appropriate action (Benner, 1984; Benner, Tanner, & Chesla, 2009; Norman, 2005). Conversely, experienced nurses have a depth of knowledge and experience that results in a cognitive repertoire of familiar situations from which to deductively and inductively draw to solve complex client problems (Benner, 1984; Norman, 2005). The experienced nurse is capable of shifting patterns of thinking across the continuum from analytic to intuitive based on the complexity of the task and past experience with similar situations, whereas the novice becomes “stuck” when the situation does not fit within the frame of reference created by their limited knowledge and experience.

Shortcomings of Current Clinical Education

Optimal clinical education provides students with the opportunity to be actively engaged with the healthcare team in the complex cognitive and psychomotor work of nursing (Tanner, 2010). Opportunities to engage with multiple similar situations in the context of care are believed to promote the ability to discern subtle qualitative distinctions, and reason in transition toward optimal patient outcomes (Benner, Tanner, & Chesla, 2009; Benner et al., 2010; Tanner, 2006). Traditional total-care clinical education pedagogy fails to provide these opportunities as learning is focused on the care of one patient, rather than comparison across multiple patients. The opportunities to actually engage in clinical reasoning are dependent on the demands of the particular patient care situation, and may also be limited. Further, most

current clinical education is implemented in a traditional group model, with one instructor supervising the learning of 6-10 students, each assigned to one patient (Ironsides & McNelis, 2010). Multiple experiences and repetitive practice are limited primarily by the capacity of that instructor to provide adequate supervision for patient care (Ironsides & McNelis, 2010; Jacobson & Grindel, 2006). Preceptor models in which a student is assigned to a staff nurse as the primary clinical instructor may provide more opportunities for experience as students learn to manage multiple patients. However, effective implementation is dependent on preceptor teaching skill, quality of the preceptor-student relationship, and preceptor workload that is conducive to teaching (Luhanga, Billay, Grundy, Myrick, & Yonge, 2010; McClure & Black, 2013). Regardless of the model, clinical learning is often measured by task completion rather than demonstration of knowledge and skill through reasoning toward accurate clinical judgments (Benner, Sutphen, Leonard, & Day, 2010; McNelis, et al., 2014; Nishioka, Coe, Hanita, & Moscato, 2014a).

Pre- and post-clinical conferences and written clinical evaluations persist as the primary forms of discourse and feedback within clinical education despite decades of calls for interactive verbal discourse and in-time (at the time of the clinical interaction) specific feedback to engage students' higher order thinking skills (Benner, Sutphen, Leonard, & Day, 2010; McNelis, et al., 2014). Instructor-student clinical coaching interactions are primarily characterized by focus on task-completion and confirmation of knowledge and understanding rather than analysis of the meanings embedded in situations that facilitate clinical reasoning and judgment (McNelis, et al., 2014).

A recent integrative review of two decades of research on students' perceptions of learning in the clinical learning environment (CLE) identified that students reporting more positive perceptions of overall sociocultural atmosphere, inclusion in the healthcare team, supervisory relationships, peer learning/peer relationships, and clinical education structure

expressed more positive perceptions of their overall learning (Author, 2015). From these findings, it was postulated that theoretically-based modification of these factors may offer the potential for designing clinical education that better promotes clinical reasoning in pre-licensure nursing students (Author, 2015).

There is a reemerging appreciation of apprenticeship learning in clinical education based on an underlying assumption that collaboration between students and experienced nurses provides more opportunities for practice and enhances students' learning of key cognitive and psychomotor skills expected in a competent nurse (Mulready-Shick, Kafel, Banister, & Mylott, 2009; Mulready-Shick, Flanagan, Banister, Mylott, & Curtin, 2013; Nishioka, Coe, Hanita, & Moscato, 2014a). Early apprenticeship learning characteristic of hospital-based nursing programs is remembered as a hierarchical, power-based structure in which students assumed task-focused roles within the healthcare team. While this model immersed nursing students in the physical environment of care, it failed to engage students as full participants in the interactive context of practice (Krekeler, 1978). New-graduates often worked in the hospital in which they trained, and thus experienced a seamless transition from education to practice.

Promising Advances in Clinical Education

The recent increase in development of Dedicated Education Units (DEU) demonstrates a turn toward the ideal that learning a practice requires direct learner engagement with the sociocultural context of that practice. The DEU is a collaborative model in which university- faculty and experienced staff nurses collaborate in implementation of clinical education.¹⁰⁻¹² Students learn while immersed in the nursing work of the clinical learning environment (CLE) alongside experienced nurses. Students educated in the DEU are perceived to have improved competency in the skills of safety, teamwork, informatics, and evidence-based practice (Mulready-Shick, Kafel, Banister, & Mylott, 2009; Mulready-Shick,

Flanagan, Banister, Mylott, & Curtin, 2013). Since clinical reasoning develops over time and through multiple experiences, the potential increase in opportunities for practice in the DEU may lead to improved clinical reasoning skill. However, there has been no evidence to support improvement in student reasoning processes from learning alongside the expert nurse in these models.

Multiple teaching strategies within clinical education have been shown to support improved clinical reasoning and judgment. Concept-based learning (Heims & Boyd, 1990) has been effective in ensuring students gain essential experiences with individual concepts (Nielsen, 2009), and in improving clinical judgment (Lasater & Nielsen, 2009a). Engagement with peers in collaborative learning activities within the CLE improves confidence in decision-making ability (Hellstrom-Hyson et al., 2012; Rhodes, Meyers, & Underhill, 2012) while positive supervisory, or coaching relationships between students and instructors (Grealish, 2000; McNelis, 2014; Warne et al., 2010) foster critical thought processes (Grealish, 2000; Nishioka, Coe, Hanita, & Moscato, 2014a); Price, 2009; Ruth-Sahd, 2011). However, these strategies are inconsistently incorporated in clinical education, including in the DEU, and thus fail to promote widespread achievement of desired learning outcomes.

Overview of Supporting Theories

The complexity of clinical education and the development of clinical reasoning are not well supported by a single theoretical perspective. SLT, EP, DP, and the TCJM each offer relevant frameworks for pre-licensure clinical education, but each alone is incomplete to guide the design of clinical education that will support a comprehensive teaching and learning strategy to promote clinical reasoning skill. The tenets of each theory and how each supports the development of clinical reasoning will be discussed.

Situated Learning Theory

SLT posits that 1) learning is influenced by, dependent on, and a result of experiences situated in the sociocultural context of a practice; 2) context is inherent in experience; 3) it is the evolving *interaction* between the participant and the context that shapes thinking and enables meaning making in the experience; 4) there is equal emphasis on the participant context in shaping cognition. Context, or the interaction of factors that contribute to the meaning of a clinical learning experience, is foundational to learning and practicing in a practice profession – it influences and is influenced by the physical environment, the participants, the knowledge and assumptions each participant brings, and the interactions among all of these factors (Lave & Wenger, 1991). Since learning is inherently social, it should be conducted in a manner that embraces that social nature (Lave & Wenger, 1991).

SLT embraces the social learning aspects of the traditional apprenticeship model but advances the concept from one in which the apprentice learns *under* the master, disconnected from the holistic nature of the practice, to one in which the student actively participates *alongside* the expert from the viewpoint of *legitimate peripheral participation* (LPP): meaningful engagement in the individual components of the work of a practice characterized by repeated practice, interactions with members of the community of practice, and a gradual building of participation and responsibility toward full membership in a community of practice (Lave & Wenger, 1991). LPP does not describe a learning of decontextualized psychomotor skills, but an evolving progression of skill through acceptance as a member evolving toward full practice responsibility. Thus, it is the *interactions* between the learner and the context through LPP that drive learning. Integral in these interactions is discourse, or purposeful engagement in the language of the practice, both verbal and nonverbal, within the context. Learning to talk as a full participant in a practice is essential to becoming a fully competent participant (Lave & Wenger, 1991). Thus, LPP supports clinical education that purposefully integrates students in the cognitive and psychomotor tasks within the

sociocultural context of nursing practice and engages them in discourse within supportive relationships with experienced nurses and skilled instructors.

Expert Practice

While SLT acknowledges interactions with the sociocultural context of practice as the key to learning, EP focuses on the individual's ability to gain expertise through practice over time. Early EP dictated that skill acquisition was limited by innate ability/limitations; practice resulted in initial large gains, followed by subsequently smaller gains in ability to the point of innate limitation (Galton, 1869). Contemporary proponents of expert practice theory note the quantity of practice over time, not innate ability, as the catalyst of performance mastery (Fitts & Posner, 1967). Gradual acquisition of pattern recognition during full-time engagement in practice can progress to the point of highly skilled performance, or automaticity, unrelated to any innate ability (Simon & Chase, 1973). Dreyfus and Dreyfus' study of skill acquisition (1986) posits that experience over time leads to increased numbers and complexities of cognitive patterns that foster progression from rule-based analytic to intuitive thinking and performance, or automaticity as described in early EP (Dreyfus & Dreyfus, 1986). Benner's (1984) Novice to Expert further specifies the path to expert practice into appreciable steps based on time and reflection on experiences while fully engaged in practice. Perceptual skills, clinical grasp, clinical reasoning, and ethical comportment develop over time, with experience in a supportive social context, and reflection on practice (Benner, Sutphen, Leonard, & Day, 2010). Multiple experiences build an understanding of what to expect in patient situations, thus an improved ability to recognize deviations from those expectations. Hence, contemporary EP supports clinical education that monitors appreciable improvement in students' clinical reasoning through use of multiple practice opportunities and reflection on those experiences.

Deliberate Practice

According to DP, most individuals engaging in practice will experience improvement in performance until they plateau at an acceptable level that is less than expert (Ericsson, 2004; Ericsson, 2008). To advance toward expertise, 1) practice must focus on improvement of a specific aspect of performance for a well-defined task (Ericsson, 2004), 2) the learner must receive immediate, detailed feedback on performance, and 3) the learner must have multiple, purposeful opportunities for repeated practice of the same or similar tasks. It is a deliberate progression from the point of automaticity, as articulated in EP, to acquisition of a repertoire of cognitive skills that support ongoing improvement toward expertise (Ericsson, 2004). Expert performance is therefore achieved over time with deliberate practice and feedback that promotes integration of newly acquired improvements into future practice (Ericsson, 2004; Ericsson, 2008). Thus, DP supports clinical education characterized by purposefully designed practice with multiple patient situations coupled with discourse and meaningful feedback to promote positive modification of future practice.

The Tanner Clinical Judgment Model

The Tanner Clinical Judgment Model (TCJM) is a dynamic, research-based description of the components of clinical judgment in experienced nurses (Noticing, Interpreting, Responding, and Reflecting) as well as a practical framework for teaching and evaluating clinical reasoning and judgment in nursing students during clinical education (Tanner, 2006). According to the model, what nurses notice about a patient situation (Noticing) is influenced by the context of that situation: most notably the knowledge, experience, and expectations the nurse brings to the situation as well as their initial grasp, or understanding, of the situation. What is noticed activates patterns of reasoning ranging from analytic to intuitive that facilitate the nurse's understanding of the situation and consideration of plausible alternative actions (Interpreting). Hence, attention to teaching and evaluating these components of students' reasoning during actual or simulated patient situations is key

to improving individual aspects of the reasoning process and promotion of skillful clinical reasoning and judgment.

**A New Apprenticeship: An Integrated Theory of Clinical Education for
Advancing Clinical Reasoning in Pre-licensure Clinical Education**

The amalgamation of these theoretical perspectives supports the centrality of context, multiple practice opportunities, and discourse with meaningful feedback as key components in the development of clinical reasoning during clinical education. Hence, the tenets of the Integrated Theory of Clinical Education are 1) clinical learning occurs in a supportive sociocultural context of clinical practice, 2) clinical learning experiences are purposefully designed to provide multiple practice opportunities with essential psychomotor and cognitive skill-sets that support understanding, and 3) in-time discourse that promotes reflection in action, and feedback are integral to meaning making in clinical learning experiences. These tenets along with the underlying tenets of the parent theories of SLT, EP, DP, and the TCJM provide a comprehensive theoretical framework for clinical learning in nursing.

This framework is focused on the ideals of clinical learning, not necessarily on one type of clinical learning (i.e., acute-care, community, primary care) or level of nursing student (i.e., pre-licensure or advanced practice), and is therefore transferrable across a variety of clinical education arenas. Indeed, these tenets are transferrable to other practice professions characterized by participant interaction within a sociocultural context and the need for expert practice. A practical use of this theory to undergird the design of clinical education in pre-licensure acute-care clinical learning environments is described to facilitate translation of the theory to practice in that arena. The three key components: centrality of context, multiple practice opportunities, and discourse with meaningful feedback, provide the framework for the design of clinical education that prioritizes the learning and practice of clinical reasoning in nursing.

The Centrality of Context

Clinical education that promotes acquisition of the essential competencies needed by the next generation of nurses will not be achieved with one methodology but must be a purposeful incorporation of multiple strategies (Gubrud-Howe & Schoessler, 2008; Tanner, 2006). The social and physical environment, the participants, the knowledge and assumptions each participant brings, and the interactions among all of these factors will influence the success of these strategies (Lave & Wenger, 1991). In order to embrace the centrality of the sociocultural context of nursing practice to clinical learning and promote clinical reasoning in clinical education, nursing education and practice arenas must collaborate to ensure that students are granted full access and are embraced as belonging members of the practice.

Collaborative teaching. The development of the DEU has initiated change in the view of students as supernumerary and has begun to rightly focus clinical education on the sociocultural influences on student learning. Traditional total-care models of acute-care clinical education perpetuated current practice placement expectations that nursing students assume responsibility for total care of patients when they are present on the clinical unit. Academia's reluctance to move toward more evidence-based clinical teaching strategies is likely due in large part to this expectation and fear of losing practice placements already in short supply. Fostering purposeful use of the clinical expertise of hospital-employed registered nurses and the theoretical content and teaching expertise of university-employed faculty in a truly collaborative teaching-learning process has promise for creating robust academic-practice relationships and for promoting skillful clinical reasoning in nursing students.

Currently, there is high variability in implementation of the DEU model. To ensure consistency and promote effectiveness of this model, the DEU must be characterized by 1) staff nurses who have a desire to teach and have been trained in methods of clinical

instruction & supervision; 2) those trained nurses serve as the primary supervisors, or preceptors, of nursing students; and 3) university-employed clinical faculty collaborate with the trained staff nurses to educate students (Moscato, Miller, Logsdon, Weinberg, & Chorpenning, 2007; Mulready-Shick, Kafel, Banister, & Mylott, 2009; Nishioka, Coe, Hanita, & Moscato, 2014a; Rhodes, Meyers, & Underhill, 2012). It has been assumed that students will learn the expert nurse's reasoning processes if they are working in the practice environment alongside an expert nurse. Students report that learning alongside the expert nurse improves understanding of the full context of nursing practice while collaboration with university faculty in the DEU promotes purposeful integration of theoretical content with application to practice (Nishioka, Coe, Hanita, & Moscato, 2014b). However, even in the DEU, unless experiences are designed to facilitate achievement of specific competencies, opportunities to do so are left to chance (Benner, Sutphen, Leonard, & Day, 2010; Tanner, 2006). The rigors of nursing practice in the CLE, even in the DEU, often prevent the expert nurse and instructor from engaging in discourse with students and providing timely, meaningful feedback that fosters deep learning. While there is still much progress to be made, structured collaborative models such as the DEU are poised to provide the rich context and the guided experiences essential for advancing students' clinical reasoning skill.

Multiple Practice Opportunities

Student engagement with multiple patients, for whom they do not assume total care but instead seek an understanding of how one disease process or concept manifests differently in those multiple patients, promotes the building of cognitive patterns. Those patterns enable students to develop frames of reference, or expectations, for patient responses in given situations and enhance students' ability to recognize deviations from those expectations, which may facilitate improved clinical reasoning skill. The teaching-learning

strategies of concept-based activities, peer learning, and group processes provide mechanisms for engaging students with multiple practice opportunities to promote clinical reasoning skill.

Concept-based activities. Concept-based strategies that engage students in deliberate practice with concepts as they manifest in multiple patient situations increases the number of experiences upon which students can draw to reason through patient situations (Lasater & Neilsen, 2009a). In order for the practice to be considered deliberate, it must be coupled with timely and meaningful discourse and feedback, or clinical coaching, that identifies strengths and areas needing improvement and focuses reflection on improvement of specific aspects of future practice. This deliberate practice with reasoning through multiple representations of a concept may accelerate the development of cognitive scripts, or cognitive representations of expectations around that concept, from which to draw when solving complex problems related to that concept (Charlin, Boshuizen, Custers, & Feltovich, 2007). Hence, the use of concept-based activities as a mechanism for deliberate practice of cognitive skills may foster more rapid acquisition of the knowledge and experiences necessary to improve clinical reasoning.

Group processes. The use of concept-mapping in a group format versus traditional linear care planning focused on the nursing process provides students' the opportunity to hear peers' thought processes and incorporate multiple perspectives into their own decision-making (Epstein, 2013; Ruth-Sahd, 2011). Individual student presentations of their observations, experiences, and plans for promoting a patient's health, followed by peer discussion of varied meanings and possible actions greatly increases each student's repertoire of cognitive patterns and alternative strategies for providing and evaluating patient's responses to care. While these strategies provide students with multiple practice opportunities, they simultaneously engage students in discourse and feedback with peers. Future decisions are then shaped by not just the individual student's experiences and

understandings, but by the interactions and subsequent incorporation of multiple perspectives on multiple situations (Lave & Wenger, 1991; Epstein, 2013).

Discourse and Meaningful Feedback

Discourse, or purposeful engagement in the language of the practice, both verbal and nonverbal within the context, is essential to meaningful learning (Lave & Wenger, 1991; NCSBN, 2005). Discourse with peers as well as with instructors is integral to enhancing clinical reasoning skill. Students commonly report that engaging with peers in the clinical learning environment decreases the anxiety often associated with clinical experiences and fosters confidence in the ability to provide patient care (Gidman, McIntosh, Melling, & Smith, 2011; Rhodes, Meyers, & Underhill, 2012; Ruth-Sahd, 2011) while discourse with instructors along with immediate feedback on performance and thought processes promotes reflection in action and thus enhances learning (Benner, Sutphen, Leonard, & Day, 2010). Unfortunately, discourse between clinical instructors and students often focuses on knowledge, understanding, and task-completion rather than the higher order thinking skills believed to promote clinical reasoning. (McNelis et al, 2014). To promote discourse that challenges students' knowledge and reasoning skill, whether with peers, instructors, or other members of the practice, and provide feedback that is specific enough to guide improvement, educators must consistently use a framework that supports those goals. Thus, the TCJM is described as the framework for both the instructor-student clinical coaching relationship and peer learning activities.

Clinical Coaching. Clinical coaching, or the process of mutual engagement in exploration of knowledge, patterns of thinking about that knowledge, evaluation of actions based on that knowledge (Price, 2009), has been demonstrated as a strategy for promoting growth and competence in leadership (Batson, 2012), nursing practice (Duff, 2013), patient education (Vincent, 2013) and clinical education as a strategy for promoting student

understanding of content and implementation of the nursing process (Grealish, 2000; Price, 2009). The TCJM provides a practical, comprehensive framework for verbal discourse within the instructor-student clinical coaching relationship: the one-to-one verbal questioning, teaching, and feedback behaviors used by a clinical instructor with a student in the context of patient care situations to promote student identification of salient aspects of nursing practice. Purposeful engagement of students in higher-order thinking characterized by application, analysis, and evaluation are believed to promote clinical reasoning skill (Benner, Sutphen, Leonard, & Day, 2010; Tanner, 2006). Collaborative discussion based on the TCJM will engage students in metacognition, or thinking about their thinking, and bring concrete awareness to their ability or inability to notice salient cues, interpret patient data in the context of background knowledge, prior experience, and expectations of the situation, and consider possible actions. Engaging in this discourse in the midst of, or just after student engagement in a patient situation, fosters reflection in action, or the consideration of the patient's response to nursing interventions and modification of interventions based on that response. This reflection brings awareness to the nurse's or student's strengths and weaknesses and therefore drives improvement in future reasoning in nursing practice (Tanner, 2006).

Without specific attention to the characteristics of feedback provided about discourse, the effectiveness of that discourse in improving practice may be limited. In order for multiple practice opportunities to result in learning gains and improvement in future practice, feedback must be provided that addresses the specific components of the practice needing improvement. In clinical education, feedback is often given too far after the learning situation to be effective or is too general to promote specific improvement in performance (Clynes & Raftery, 2008). Once the patient situation or learning activity has passed and thinking is focused on another issue, the opportunity for clarification and discourse about faulty

assumptions is lost. Effective clinical coaching includes the integration of feedback in the moments surrounding identification of a deficit to ensure recognition of the deficit, clarification of how to improve, and promote incorporation of newly constructed knowledge into future practice.

Success of this clinical coaching role is highly dependent on the design of clinical education structures that move away from primarily total care models that overburden instructors and students with tasks, in favor of novel strategies that increase student practice of cognitive and psychomotor skills and the evaluation of meaning within the sociocultural context of practice. There is a time for total-care pedagogy within clinical education, but it should be used as a specific teaching-learning strategy in combination with others in the implementation of a comprehensive clinical education curriculum that promotes clinical reasoning.

Peer-learning. Collaboration on cognitive tasks can facilitate clarification and deeper understanding of concepts that may be challenging for an individual to process alone (Epstein, 2013). Student nurse dyads have reported that “two brains are better than one” in engaging in the nursing role (Ruth-Sahd, 2011), acknowledging the social embeddedness of learning. Structured peer-learning exercises around common concepts such as safety and infection control have been successful in improving students’ cognitive awareness of patient implications resulting from their decisions (Stevens & Brenner, 2009). Likewise, peer mentoring projects in which senior level students mentored novice students during clinical education using the TCJM as a framework resulted in 100% of the novice students and 80% of the mentors’ perceiving improved clinical judgment in the novice students after the project (Harmer, Huffman, & Johnson, 2011). Therefore, use of structured peer-learning exercises, or pairing students for concept-based learning activities, within clinical education provides a

secondary mechanism for engaging students in discourse as a strategy for advancing students' clinical reasoning skill in clinical education.

Measurement of clinical reasoning in the CLE

While these proposed teaching-learning strategies offer promising methods for promoting advancement of students' clinical reasoning in the CLE, their effectiveness may best be determined through objective measurement of students' clinical reasoning skill. The process of clinical reasoning is not linear, but fluid, and occurs over time during unfolding patient situations. Hence, measurement of this multi-faceted process should provide an understanding of the patterns of reasoning made by individuals across time with multiple unfolding patient scenarios created for this purpose (Ericcson, 2004). Currently, there is no measure of this type.

The Health Sciences Reasoning Test is the only objective quantitative measure of clinical reasoning. While this is a measure of critical thinking and reasoning set in the context of healthcare, it is not specific to nursing and does not measure reasoning over time in transitioning patient situations. Recent work based on the TCJM (Tanner, 2006) demonstrates the ability to assess student reasoning processes and outcomes from those processes using the Lasater Clinical Judgment Rubric (Lasater, 2010) in simulated patient care settings (Jensen, 2013; Johnson, et al., 2012) and in written reflections (Lasater & Neilsen, 2009b), and could be adapted for use in evaluation of student reasoning processes in the clinical setting. Despite the infancy of measurement of clinical reasoning, academia cannot afford to delay implementation of clinical education designed to promote clinical reasoning in nursing students.

Conclusion

These three major precepts, centrality of context, multiple practice opportunities, and discourse and meaningful feedback are clearly interrelated and critical for learning clinical

reasoning. Context is significant to the meaning of experiences that occur within that context. Inclusion of multiple specifically designed experiences within that context provides students the opportunity to practice discernment of subtle distinctions between multiple similar situations. Discourse and feedback about those practice opportunities facilitates student understanding of the nuanced differences between similar situations and enables faculty evaluation of students' ability to recognize and modify expectations of the situation based on those nuances. Hence, the melding of SLT, EP, and DP creates a comprehensive theoretical framework grounded in the centrality of context, multiple practice opportunities, and discourse with meaningful feedback. The Integrated Theory of Clinical Education is well-situated to undergird the design and implementation of clinical education that advances students' clinical reasoning skill.

References

- Author (2015). Influences of the acute care clinical learning environment on undergraduate student nurses' perceptions of the clinical learning experience: An integrative review. *Manuscript submitted for publication.*
- Batson, V., & Yoder, L. (2012). Managerial coaching: A concept analysis. *Journal of Advanced Nursing, 68*(7), 1658-69.
- Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice.* Menlo Park: Addison-Wesley.
- Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation.* San Francisco, CA: Jossey-Bass.
- Benner, P., Tanner, C., & Chesla, C. (2009). *Expertise in nursing practice: Caring, clinical judgment, and ethics* (2nd ed.). New York: Springer.
- Berkow S, Virkstis K, Stewart J, & Conway L. (2008). Assessing new graduate nurse performance. *Journal of Nursing Administration, 38*(11), 468-474. doi: 10.1097/01.nna.0000339477.50219.06
- Cader, R., Campbell, S., & Watson, D. (2005). Cognitive continuum theory in nursing decision-making. *Journal of Advanced Nursing, 49*(4), 397-405.
- Charlin, B., Boshuizen, H., Custers, E., & Feltovich, P. (2007). Scripts and Clinical Reasoning. *Medical Education, 41*(12), 1178-1184.
- Clynes, P.M., & Raftery, S.E. (2008). Feedback: An essential element of student learning in clinical practice. *Nurse Education in Practice, 8*(6), 405-411.
- Dreyfus, H. & Dreyfus, S. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer.* New York: Free Press.
- Duff, B. (2013). Creating a culture of safety by coaching clinicians to competence. *Nurse Education Today, 33*(10), 1108-11.

- Epstein, R., (2013). Whole mind and shared mind in clinical decision-making. *Patient Education and Counseling*, 90, 200-206.
- Ericsson, K.A. (2004). Deliberate practice and acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine*, 79(10Supl), S70-81.
- Ericsson, K.A. (2008). Deliberate practice and acquisition of expert performance: A general overview. *Academic Emergency Medicine*, (15)11, 988-984.
- Fitts, P., & Posner, M. (1967). *Human performance*. Belmont: Brooks/Cole Publishing.
- Galton, F., (1869). *Hereditary genius: An inquiry into its laws and consequences*. London: Macmillan and Co, Ltd.
- Gidman, J., McIntosh, A., Melling, K., & Smith, C. (2011). Student perceptions of support in practice. *Nurse Education in Practice*, 11(6), 351-355. doi: <http://dx.doi.org/10.1016/j.nepr.2011.03.005>
- Grealish, L. (2000). The skills of coach are an essential element in clinical learning. *Journal of Nursing Education*, 39(5), 231-233.
- Gubrud-Howe, P., & Schoessler, M. (2008). From random access opportunity to a clinical education curriculum. *Journal of Nursing Education*, 47(1), 3-4
- Harmer, B., Huffman, J., & Johnson, B. (2011). Clinical peer mentoring: Partnering BSN seniors and sophomores on a dedicated education unit. *Nurse Educator*, 36(5), 197-202.
- Heims, M.L., & Boyd, S.T. (1990). Concept-based learning activities in clinical nursing education. *Journal of Nursing Education*, 29(6), 249-254.
- Hellström-Hyson, E., Mårtensson, G., & Kristofferzon, M. (2012). To take responsibility or to be an onlooker. Nursing students' experiences of two models of supervision. *Nurse Education Today*, 32(1), 105-110. doi: 10.1016/j.nedt.2011.02.005

- Ironside, P. & McNelis, A. (2010). Clinical education in prelicensure nursing programs: Findings from a national survey. *Nursing Education Perspectives*, 31(4): 264-265.
- Ironside, P., McNelis, A., & Ebright, P. (2014). Clinical education in nursing: Rethinking learning in practice settings. *Nursing Outlook*, 62(3), 185-191.
- Jacobson, L. & Grindel, C. (2006). What is happening in pre-licensure RN clinical nursing education? Findings from the faculty and administrator survey on clinical nursing education. *Nursing Education Perspectives*, 27(2), 108-109.
- Jensen, R. (2013). Clinical reasoning during simulation: Comparison of student and faculty ratings. *Nurse Education in Practice*, 13(1), 23-28.
- Johnson EA; Lasater K; Hodson-Carlton K; Siktberg L; Sideras S; Dillard N. (2012). Geriatrics in simulation: Role modeling and clinical judgment effect. *Nursing Education Perspectives*, 33(3): 176-180.
- Krekeler, K. (1978). The detrimental side of tradition. *Supervisor Nurse*. 9(3):47-51
- Lasater, K. (2011). Clinical judgment: The last frontier for evaluation. *Nurse Education in Practice*, 11(2), 86-92.
- Lasater, K., & Nielsen, A. (2009a). The influence of concept-based learning activities on students' clinical judgment development. *Journal of Nursing Education*, 48(8), 441-446.
- Lasater, K., & Nielsen A. (2009b). Reflective journaling for clinical judgment development and evaluation. *Journal of Nursing Education*, 48(1), 40-44.
- Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York: Cambridge.
- Luhanga, F. L, Billay, D., Grundy, Q., Myrick, F., & Yonge, O. (2010). The one-to-one relationship: Is it really key to an effective preceptorship experience? A review of the literature. *International Journal of Nursing Education Scholarship*, 7(1), 1-15.

- McClure, E., & Black, L. (2013). The Role of the Clinical Preceptor: An Integrative Literature Review. *Journal of Nursing Education, 52*(6), 335-341. doi: <http://dx.doi.org/10.3928/01484834-20130430-02>
- McNelis, A., Ironside, P., Ebright, P., Dreifuerst, K., Zvonar, S., & Conner, S. (2014). Learning nursing practice: A multisite, multimethod investigation of clinical education. *Journal of Nursing Regulation, 4*(4), 30-35.
- Mok, W.Q., Wang, W., & Liaw, S.Y. (2015). Vital signs monitoring to detect patient deterioration: An integrative literature review. *International Journal of Nursing Practice, 21*(Suppl 2): 91-98.
- Moscato, S. R., Miller, J., Logsdon, K., Weinberg, S., & Chorpenning, L. (2007). Dedicated education unit: An innovative clinical partner education model. *Nursing Outlook, 55*(1), 31-37.
- Mulready-Shick J., Flanagan K., Banister G., Mylott L., & Curtin L. (2013). Evaluating dedicated education units for clinical education quality. *Journal of Nursing Education, 52*(11), 606-614. doi: 10.3928/01484834-20131014-07
- Mulready-Shick, J., Kafel, K.W., Banister, G., & Mylott, L. (2009). Enhancing quality and safety competency development at the unit level: An initial evaluation of student learning and clinical teaching on dedicated education units. *Journal of Nursing Education, 48*(12), 716-719.
- National Council of State Boards of Nursing. (2005). Clinical instruction in prelicensure nursing programs. Retrieved July 12, 2015, from https://www.ncsbn.org/pdfs/Final_Clinical_Instr_Pre_Nsg_programs.pdf
- Nishioka, V., Coe, M., Hanita, M., & Moscato, S. (2014). Dedicated education unit: Nurse perspectives on their clinical teaching role. *Nursing Education Perspectives, 35*(5), 294-300.

- Nishioka, V., Coe, M., Hanita, M., & Moscato, S (2014b). Dedicated education unit: Student perspectives. *Nursing Education Perspectives*, 35(5), 301-307.
- Nielsen, A. (2009). Concept-based learning activities using the clinical judgment model as a foundation for clinical learning. *Journal of Nursing Education*, 48(6), 350-354.
- Norman, G. (2005). Research in clinical reasoning: Past history and current trends. *Medical Education*, 39, 418-427.
- Price, A. (2009). Using coaching interventions to develop clinical skills. *Nursing Standard*, 23(44), 48-55.
- Purling A, & King L. (2012). A literature review: Graduate nurses' preparedness for recognizing and responding to the deteriorating patient. *Journal of Clinical Nursing*, 21(23/24): 3451-3465.
- Rhodes, M., Meyers, C., & Underhill, M. (2012). Evaluation outcomes of a Dedicated Education Unit in a baccalaureate nursing program. *Journal of Professional Nursing*, 28(4), 223-230. doi: <http://dx.doi.org/10.1016/j.profnurs.2011.11.019>
- Ruth-Sahd, L. (2011). Student nurse dyads create a community of learning: Proposing a holistic clinical education theory. *Journal of Advanced Nursing* 67(11), 2445-2454.
- Salvatierra, G., Bindler, R.C., Corbett, C., Roll, J., & Daratha, K.B. (2014). Rapid response team implementation and in-hospital mortality. *Critical Care Medicine*, 42(9); 2001-2006.
- Simmons, B. (2010). Clinical reasoning: Concept analysis. *Journal of Advanced Nursing*, 66(5), 1151-1158.
- Simon, H., & Chase, W. (1973). Skill in chess. *American Scientist* 61, 394-403
- Stevens, J. & Brenner, Z. (2009). The peer active learning approach for clinical education: A pilot study. *Journal of Theory Construction & Testing*, 13(2), 51-56.
- Tanner, C. (2006). Thinking like a nurse: A research-based model of clinical judgment in

nursing. *Journal of Nursing Education*. 45(6), 204-211.

Tanner, C. (2010). From mother duck to mother lode: Clinical education for deep learning.

Journal of Nursing Education, 49(1), 3-4. doi: 10.3928/01484834-20091216-01

Vincent, A. & Sanchez Birkhead, A. (2013). Evaluation of the effectiveness of nurse

coaching in improving health outcomes in chronic conditions. *Holistic Nursing*

Practice, 27(3), 148-61.

Warne, T., Johansson, U., Papastavrou, E., Tichelaar, E., Tomietto, M., den Bossche, K., . . .

Saarikoski, M. (2010). An exploration of the clinical learning experience of nursing

students in nine European countries. *Nurse Education Today*, 30(8), 809-815. doi:

<http://dx.doi.org/10.1016/j.nedt.2010.03.003>

Chapter 4 (Manuscript 3)**Pursuing Improvement in Clinical Reasoning: Development of the
Clinical Coaching Interactions Inventory**

Mary Ann Jessee, MSN, RN, is the primary author of the manuscript and contributed to the conceptualization and design of the tool, and conducted validity and reliability testing of the tool.

Christine A. Tanner, PhD, RN, FAAN, is the secondary author of the manuscript and contributed to the conceptualization and design of the tool, provided oversight of the validity and reliability testing of the tool.

Funding acknowledgement: Funding was provided by the National League for Nursing Jonas Scholar Foundation

Publication: Manuscript will be submitted to The Journal of Nursing Education.

Introduction

The purpose of this manuscript is to describe the development and initial psychometric testing of a new, research-based tool to characterize the nature of clinical instructor questioning and coaching behaviors within the instructor-student clinical coaching interactions that occur as a part of pre-licensure nursing clinical learning experiences. Persistent limitations exist in the ability of current pre-licensure clinical education to promote the higher-order thinking skills essential for nurses in today's healthcare environment. As a result, questioning and coaching behaviors within instructor-student interactions and how those interactions influence student thinking and learning has become a subject of inquiry (Ironside & McNelis, 2009; McNelis, et al., 2014; Raber, 2014). This inquiry has been conducted using solely narrative description (Ironside & McNelis, 2009; McNelis, et al., 2014; Raber, 2014) but has contributed sufficient evidence to support the design of a quantitative measure that will allow transition from qualitative to quantitative inquiry of instructor-student clinical coaching interactions. The psychometric evaluation of this tool will include content validity and reliability testing.

This manuscript replaces a portion of the Design and Methods and Results chapters of the traditional dissertation. This manuscript will be submitted to the *Journal of Nursing Education*, a peer-reviewed journal with an impact factor of .761. This journal was chosen as its readership includes academic nurse educators designing and implementing educational interventions in undergraduate and graduate level nursing programs. Mary Ann Jessee and Christine A. Tanner are co-authors on this manuscript.

Abstract

The Clinical Coaching Interactions Inventory (CCII) was developed to facilitate pre-licensure nursing students' report of the teaching and questioning behaviors, including levels of questions asked by their clinical supervisors – remembering, understanding, applying, analyzing, or evaluating/creating – and types of feedback used by their clinical supervisors during one to one student-supervisor interactions during clinical experiences. This report describes development of the CCII and reliability and validity of the instrument for use with senior pre-licensure nursing students.

Pursuing Improvement in Clinical Reasoning: Development of the Clinical Coaching Interactions Inventory

Development of nursing students' clinical reasoning skill is a major goal of pre-licensure nursing education. It is believed that discourse and meaningful feedback within the student-supervisor relationship during clinical education experiences has an impact on students' development of clinical reasoning skill (Lave & Wenger, 1991; Benner, Sutphen, Leonard, & Day, 2010). The Carnegie study (Benner, et al., 2010) identified clinical coaching, the one-to-one verbal teaching, questioning, and feedback behaviors used by a clinical supervisor with a student situated in the patient care context, as a signature pedagogy in nursing education. Recent findings show that clinical coaching interactions between school of nursing faculty supervisors and students in the clinical learning environment (CLE) are primarily characterized by remembering and understanding level questions that fail to engage students in the higher-order thinking skills believed to promote clinical reasoning (McNelis et al., 2014). Further, protected time for one to one student-supervisor interactions during clinical experiences is limited because much of current clinical education pedagogy focuses on task completion rather than ability to reason through complex patient situations as the measure of student competence (Benner, et al., 2010; McNelis, et al., 2014).

Because new-graduate nurses are expected to enter the workforce with reasoning skill to navigate the complex patient situations, students must have the opportunity to engage in learning that requires students to reason in the same manner required in the practice environment. Clinical coaching provides a framework for engagement of students in deliberate practice of reasoning skills and the provision of feedback on that practice, and is particularly important for helping students to notice and respond appropriately to changing patient situations. Coaching students to use thinking characterized by application, analysis, evaluation, creating, and reflecting coupled with in-time feedback provided during or just

after the clinical encounter that is very specific about how to improve, promotes learning and incorporation of newly acquired skills into future practice (Clynes & Raftery, 2008; Ericsson, 2004). Often, feedback is not consistently provided during clinical experiences, but instead is provided long after the clinical encounter or is not specific enough to facilitate learning (McNelis, et al., 2014). Further, feedback provided in a supportive manner contributes to increased student self-efficacy for clinical practice (van de Riddler, Peters, Stokking, de Ru, & Ten Cate, 2015). In order to promote improvement in students' clinical reasoning skill, clinical education pedagogy must prioritize strategies that promote discourse, part of which may include coaching, which is situated – pointing out and discussing salient aspects of a situation and providing corrective feedback in a supportive manner during or just after an encounter.

Currently, there are no instruments designed to describe or quantify the clinical coaching behaviors of clinical supervisors or to facilitate student report of experiences with those coaching behaviors. Qualitative studies using observation and interview of school of nursing faculty clinical supervisors (McNelis et al., 2014) and students (Ironsides, McNelis, & Ebright, et al., 2014) provide initial data to support the need for advancement of measurement of clinical coaching behaviors.

Purpose

The purpose of this study was to develop an instrument to describe and quantify the construct of clinical coaching, defined as the one-to-one teaching, verbal questioning, and feedback behaviors used by a clinical supervisor (school of nursing faculty or staff nurse preceptor) with a student in the context of patient care situations to promote student identification of salient aspects of nursing practice. The instrument was designed to assist students in identifying the 1) teaching behaviors and levels of questioning demonstrated by their clinical supervisors, 2) characteristics of feedback provided by their clinical supervisors

during student-supervisor clinical coaching interactions, and 3) provide an initial quantitative understanding of questioning and feedback characteristics used by clinical supervisors during one to one clinical coaching interactions with students in the CLE.

Literature Review

Coaching is often characterized as a collaborative effort between a skillful coach and an individual or team to achieve specific outcomes, typically in a game or sport situation (ICF, 2015). The individual or team sets goals based on personal improvement desires and expectations of the “game” (ICF, 2015). The role of the coach is to facilitate individual team members’ identification of areas for growth, design practice to achieve specific improvement, and provide feedback during that practice that enables the team member to incorporate specific behavior changes into subsequent practice. Coaching as a teaching strategy has been used successfully in leadership (Batson, 2012), nursing practice (Duff, 2013), patient education (Vincent, 2013) and clinical education as a strategy for promoting student understanding of content and implementation of the nursing process (Grealish, 2000; Price, 2009). Coaching that includes teaching, questioning, and feedback that facilitates student awareness of their knowledge level and how to improve the use of that knowledge in specific situations (Bransford, Brown, & Cocking, 2000) offers a solid framework for guiding students’ reasoning processes as clinical situations unfold.

Skillful clinical reasoning requires that an individual consider multiple self, patient, and situation factors to make a sound judgment (Tanner, 2006). The CLE provides multiple opportunities for honing clinical reasoning skill (Benner, et al., 2010; Tanner, 2006). However, these opportunities may be lost if the focus of learning is on task completion as opposed to exploration of students’ thought processes around the nuances of individual situations and subtle distinctions among multiple similar situations. It is understood that the use of higher-order cognitive questioning as a teaching-learning strategy promotes deeper

learning (Anderson, et al., 2001). In nursing, analysis and synthesis of knowledge, past experience, and situation-specific data is essential to making sound judgments regarding complex patient care situations (Tanner, 2006). While knowledge and understanding are foundational to nursing practice, without the ability to apply knowledge to specific situations, analyze subtle distinctions in patient situations, and evaluate possible interventions appropriate for that situation, students lack the skill to take action that promotes positive patient outcomes.

Research by McNelis and associates (2014) has shown that student-supervisor interactions during clinical experiences tend to focus on task-completion as opposed to discussion of the complexities of patient care (McNelis, et al, 2014). Helping students learn about qualitative distinctions among complex patients was notably absent (McNelis, et al, 2014). Further, purposeful discourse focused on application of knowledge learned in the classroom setting to specific patient situations was also absent (McNelis, et al, 2014).

Effective clinical coaching should include collaboration between the supervisor and student to identify the individual student's strengths and areas in need of improvement and specific questioning and discussion to engage students in analysis of data, consideration of alternative responses, and sound decisions based on those identified areas (Benner, et al., 2010; ICF, 2007). Further, feedback on the student's knowledge, interpretation of the situation, and on the decisions and actions taken should be given during or just after the encounter to provide the student with specific guidance on how to improve (Tanner, 2006). Thus, clinical coaching may facilitate focus on the higher order thinking skills needed to accurately reason through patient situations.

Method

The Clinical Coaching Interactions Inventory (CCII) was designed to describe the characteristics of the student-supervisor interaction in the clinical setting along two important

dimensions of clinical coaching: (1) Teaching-Questioning: type and quantity of teaching and questioning strategies used, and (2) Feedback: qualities of feedback provided on student performance. Initial development of the (CCII) was based on previous qualitative study of the types of questioning used by clinical supervisors during clinical coaching interactions (McNelis et al., 2014), the theoretical foundation of the Tanner Clinical Judgment Model (Tanner, 2006), Bloom's Taxonomy (Anderson et al., 2001), and validated simulation evaluation tools (Hayden, Keegan, Kardong-Edgren & Smiley, 2014; Lasater, 2011). Further, development of the inventory was focused on promoting students' ability to discern the variety of types of teaching, questioning, and feedback behaviors occurring during one to one clinical coaching interactions with their supervisor during clinical experiences. The 20 items were developed in three areas 1) number of one to one clinical coaching interactions experienced on the most recent clinical day, and the perception of how that number of interactions affected their learning (4 items), 2) identification of the range and most representative types of teaching and questioning behaviors during those interactions (10 items), and 3) qualities of feedback provided during that clinical day (6 items).

Teaching-Questioning Dimension

The items and corresponding example questions in the teaching-questioning dimension were based on the common clinical teaching strategies of providing information, demonstrating nursing skills, and role-modeling professional behaviors, as well as five categories of questions derived from the literature: 1) task completion; 2) remembering with definition; (3) analysis of situation-specific data; 4) synthesis of multiple types of data; and 5) reflection on thinking and decisions (Anderson, 2001; Tanner, 2006). Examples of remembering, understanding, analyzing, and evaluating/creating, and reflective questions were provided to facilitate student differentiation among levels of questions posed to them by their clinical supervisors.

Feedback Dimension

The 6 items in the feedback dimension were constructed to facilitate student identification of when feedback was given, how often the feedback occurred, how it made the students feel about their ability to be successful, and whether they felt it was sufficient to facilitate their learning.

Scoring

Binary structure of items facilitated identification of the range and most representative types of teaching, questioning, and feedback behaviors demonstrated by clinical instructors. Students answered yes or no to indicate whether their clinical supervisor demonstrated each type of teaching, questioning, or feedback behavior. Additionally, students were asked to identify the most, and second-most representative type of teaching or questioning behaviors demonstrated by their clinical supervisor. Further investigation is necessary to determine if calculation of a total score will provide valuable structure for analysis over simple description of behaviors.

Validity

A priori content validity was established through evidence-based construct definition and analysis of the dimensions of clinical teaching-questioning and feedback within the pre-licensure CLE. Posteriori content validity was established with expert assessment (Lynn, 1986). Six experienced school of nursing faculty clinical supervisors, each with over 10 years of experience engaging in one to one interactions with students in the CLE, were invited to review the items for relevance, content accuracy, and wording. Items were evaluated on a 4-point ordinal scale: 1=*not relevant*, 2=*somewhat relevant*, 3=*quite relevant*, and 4=*highly relevant*. Ratings were evaluated by examining the number of faculty rating items as relevant to one to one clinical coaching interactions. Initially, the range of I-CVI for items was .60 –

1.0. The one item below .80 resulted in clarification wording of the construct definition that improved the relevance of the item to .80.

A second round of expert review resulted in a .80-1.0 range of I-CVI. Subsequently, average scale-level CVI (S-CVI/Ave) was calculated by summing the I-CVIs and dividing by the number of items and determined to be .91. Since the S-CVI/Ave was above the recommended criterion for acceptability of .90 (Polit & Beck, 2006), the content validity of the inventory was determined to be acceptable. Additionally, students who had recently completed pre-licensure nursing education and had recently experienced one to one clinical coaching interactions with school of nursing faculty and staff nurse preceptor supervisors in the CLE were invited to evaluate the tool for ease of use and item clarity. The 5 person student sample completed the tool based on their experience on a recent clinical day and rated the items for clarity. Individual ratings were followed by discussion to determine students' ability to discern the distinctions between levels of questions. The final inventory consisted of 17 items divided into three sections – number of interactions with clinical instructor, description of teaching-coaching behaviors demonstrated by the clinical supervisor, and description of feedback received from the clinical supervisor.

Reliability

The teaching-questioning dimension demonstrated a K-R 20 of .70 overall, .63 for the faculty version, and .71 for the staff nurse preceptor version. The feedback dimension demonstrated a K-R 20 of .70 overall, .53 for the faculty version and .57 for the staff nurse preceptor version. The inventory is composed of a minimal number of binary items and therefore a lower K-R 20 is not unexpected. Further, this inventory facilitates student report of supervisor clinical coaching behaviors, which will be different and thus elicit different student responses on items. As a result, the use of measures of repeatability of individual test performance should not be the primary evaluation of overall reliability of this tool (Sijtsma,

2009). Further, the array of items in the inventory provides essential coverage of the teaching-questioning and feedback domains of clinical coaching that supports use of the measure despite lower internal consistency values (Schmitt, 1996).

Results

Participants

The sample consisted of 135 senior-level pre-licensure nursing students: 53 traditional BSN students who experienced supervision by only a staff nurse preceptor or collaborative supervision by a staff nurse preceptor and a university faculty member where some were educated in a Dedicated Education Unit (DEU), and 82 accelerated baccalaureate-equivalent MSN students who experienced supervision by only a university faculty member or collaborative supervision by a staff nurse preceptor and a university faculty member and were educated in a non-DEU. All students were asked to complete the index after completion of one third of their final medical-surgical clinical experience. The students in the traditional BSN program were asked to complete the index two additional times, after completion of two-thirds and at the end of their clinical experience.

Students completing the index after one third of their clinical experience (Table 1)

Of all students who completed the index after completion of one third of their clinical experience, 41% percent of students who experienced any supervision by a school of nursing faculty and 55% of students experiencing any supervision by a staff nurse preceptor reported having 5 or more one to one interactions with that supervisor during the course of the most recent clinical day. The majority of students perceived the number of interactions they had with their supervisor as just enough to facilitate their learning. The teaching-questioning behaviors of both types of supervisors were varied with the majority of students reporting being asked a wide variety of question types ranging from knowledge to synthesis level. Students reported the most representative types of teaching-questioning they received from

their school of nursing faculty were analysis or synthesis level questions, while staff nurse preceptors most often gave instructions about how to provide care and demonstrated nursing skills.

The majority of students reported receiving verbal feedback from their supervisor, and that the feedback was given in a way that made them feel supported. Seventy percent of students reported that verbal feedback was given during or soon after a patient encounter by the school of nursing faculty and 88% of students said the same about the staff nurse preceptor. Over half of all students reported the verbal feedback they received was very specific about how to improve, while another third reported feedback as helpful, but not specific about how to improve. The majority of students reported receiving feedback about their delivery of nursing care while just over a third reported receiving feedback on their level of knowledge, skill performance, and communication with members of the healthcare team. Forty-eight percent of students reported receiving feedback on decisions made about patient care from their school of nursing faculty while only 26% of students reported receiving the same from a staff nurse preceptor.

Students Completing the Index Three Times (Table 2)

Of students who experienced any supervision by a staff nurse preceptor, just over a third of students reported having 5 or more one to one interactions with that preceptor at each time point, with the majority of others reporting 3-4 interactions at each time point. Of students who experienced any supervision by a university faculty, the majority reported having none or only 1-2 interactions with that supervisor at each time point. The majority of students perceived the number of interactions they had with both types of supervisors as just enough to facilitate their learning. Although students reported a wide variety of teaching-questioning behaviors from both types of supervisors, the most representative types of teaching-questioning received from university faculty at all time points were analysis or

synthesis level questions. Staff nurse preceptors used an equally distributed frequency of giving instructions, demonstrating nursing skills, and using a variety of question types across all time points.

At each time point and for both types of supervisors, the majority of students reported receiving verbal feedback that was given during or soon after a patient encounter and was given in a way that made them feel supported. Feedback provided by university faculty was perceived as very specific about how to improve by 46% of students at time 1, 100% at time 2, and 73% at time 3. Feedback provided by staff nurse preceptors was perceived as very specific about how to improve by 73% of students at time 1, and 65% at both time 2 and time 3. Both types of supervisors provided feedback on a variety of topics, but the majority of students received feedback primarily on their responses to supervisor questions and delivery of nursing care, regardless of the type of supervisor.

Discussion

In the sample of students who completed the index multiple times, there was a marked difference in the number of interactions reported with the university clinical instructor than the staff nurse preceptor. This is likely reflective of the fact that all of the students in this group were supervised by only a staff nurse preceptor, but still had a university faculty assigned to oversee that supervision, or they were supervised in a collaborative manner by both a staff nurse preceptor and a university faculty in a DEU. It is unknown if there was a specific guideline for frequency or type of interaction of the university faculty with students or staff nurse preceptors.

Students in this study reported that university clinical instructors most often used questioning at the analysis and synthesis level while staff nurse preceptors most often demonstrated skills or gave directions about how to provide care. Conversely, McNelis, et al. (2014) observed that university clinical instructors used primarily task and knowledge-

focused questions during clinical coaching interactions. As education is the primary role of university clinical instructors, questioning at the analysis and synthesis level could be expected. It is possible that the different groups of university clinical instructors in these two studies were trained differently in the skill of clinical coaching and that these differences actually exist. However, although efforts were made to facilitate students' ability to accurately report the teaching-questioning and feedback behaviors experienced in clinical coaching interactions, their reporting may not reflect actual occurrences. The finding that demonstration and providing directions were some of the primary coaching behaviors of staff nurse preceptors is congruent with their primary role of patient care, and may be attributed to the limited capacity of staff nurse preceptors to teach due to patient care load or a lack of training in clinical teaching-questioning and feedback skills (Henderson, Twentyman, Heel, & Lloyd, 2006; Luhanga, Billay, Grundy, Myrick, & Yonge, 2010; McClure & Black, 2013). However, some students completing the index at multiple time points reported more analysis, synthesis, and reflective levels of questions by staff nurse preceptors, which could be reflective of increased education on clinical teaching pedagogy provided for staff nurses in the DEU (Mulready-Shick, Kafel, Banister, & Mylott, 2009; Rhodes, Meyers, & Underhill, 2012) .

Students reported most feedback by both university faculty and staff nurse preceptors was provided during or just after the patient encounter and often included specific feedback about the student's level of knowledge and performance of psychomotor skills. The group of students who completed the index multiple times reported receiving feedback on decisions made about patient care more often by staff nurse preceptors than by university faculty at all time points. This is not unexpected given that the staff nurse preceptor was the primary instructor in this group of students and the university faculty was likely not present for most of the encounters in which decisions were made.

Recommendations for Future Study

The current use of the CCII sampled only senior-level students, described the clinical coaching behaviors of supervisors on one clinical day, and compared student reports of interactions with the same supervisor on multiple clinical days. Future study should examine if there are differences in clinical coaching behaviors used with students at various times during the nursing program and how those differences contribute to student learning at those particular times. While examples of each type of teaching and questioning were provided to facilitate accurate student reporting of clinical coaching behaviors, comparison of student ratings with observation of actual clinical coaching behaviors for congruence would further validate the instrument. Results from use of this inventory may identify the need for further education in university faculty and staff nurse preceptors and provide guidance for development and implementation of education to improve their ability to engage students in the higher order thinking known to promote clinical reasoning.

Conclusion

The CCII advances measurement of clinical coaching interactions from qualitative to quantitative and provides users with the ability to quantify and characterize the clinical coaching interactions that occur in pre-licensure clinical education in nursing. The identified differences in clinical coaching behaviors in university faculty supervisors and staff nurse preceptor supervisors warrants further investigation to determine how those differences impact student learning outcomes. Ultimately, results from use of this inventory may facilitate the design of pre-licensure clinical coaching strategies that promote improvement of students' clinical reasoning skill.

Table 1. Completed by participants at one third completion of clinical rotation

Characteristics of one to one interactions with supervisor during most recent clinical day	Students reporting some supervision by a University Clinical Instructor n=85	Students reporting some supervision by a Staff Nurse Preceptor n=58
Quantity of interactions	%	%
Number of interactions:		
None	9.0	29.3
1-2	14.4	5.2
3-4	20.7	10.3
5+	41.4	55.2
Perception of number of interactions:		
Too few	2.4	5.2
Just enough	94.1	84.5
Too many, did not interfere with learning	3.5	8.6
Too many, did interfere with learning	0	1.7
Characteristics of interactions with supervisor		
Supervisor:		
Gave instructions on actions to take	36.9	89.3
Asked task-focused questions	71.8	81.8
Asked knowledge questions	92.9	68.4
Demonstrated skills	70.6	86.0
Role modeled professional practice	77.6	85.7
Asked analysis questions	83.5	73.2
Asked synthesis questions	80.0	58.9
Asked reflective questions	81.2	51.8
Most representative action by supervisor:		
Gave instructions	0	22.8
Asked task-focused questions	9.5	8.8
Asked knowledge-focused questions	10.7	5.3
Demonstrated skills	9.5	15.8
Role modeled professional practice	7.1	15.8
Asked analysis questions	25.0	15.8
Asked synthesis questions	29.8	12.3
Asked reflective questions	8.3	3.5
Second-most representative characteristic of interactions:		
Gave instructions	4.8	1.9
Task-focused questions	7.1	13.2
Knowledge-focused questions	10.7	5.7
Demonstrated skills	10.7	34.0
Role modeled professional practice	10.7	9.4
Analysis questions	16.7	13.2
Synthesis questions	21.4	15.1
Reflective questions	17.9	7.5
Analysis or synthesis reported as one of most representative characteristics	70.2	43.9
Characteristics of Verbal Feedback Given by Supervisor		

Any Verbal feedback	87.1	84.2
Timeframe for feedback:		
Feedback given during or just after interaction	70.5	88.2
Feedback given at end of day	29.5	11.8
Supportive or Discouraging:		
Feedback given in a way that was supportive	93.6	96.0
Feedback given in a way that was discouraging	6.4	4.0
Specificity-helpfulness:		
Feedback was too general to be helpful	7.7	5.9
Feedback was helpful, but not specific	34.6	31.4
Feedback was very specific about how to improve	57.7	62.7
Topics on which feedback was provided:		
Responses to instructor questions	87.1	84.2
Knowledge level	47.1	56.9
Delivery of nursing care	86.9	87.7
Psychomotor skill level	57.6	65.5
Communication with others	49.4	46.6
Decisions made	63.5	26.1

Table 2. Completed by participants at one third, two thirds, and full completion of clinical rotation

	Attempt 1	Attempt 2	Attempt 3			
Characteristics of one to one interactions with supervisor during most recent clinical day	Students reporting some supervision by a University Clinical Instructor n=20	Students reporting some supervision by a Staff Nurse Preceptor n=34	Students reporting some supervision by a University Clinical Instructor n=12	Students reporting some supervision by a Staff Nurse Preceptor n=21	Students reporting some supervision by a University Clinical Instructor n=16	Students reporting some supervision by a Staff Nurse Preceptor n=21
Quantity of interactions	%	%	%	%	%	%
Number of interactions:						
None	40	0	66.7	0	25	0
1-2	35	12.1	33.3	0	62.5	9.5
3-4	0	42.4	0	57.1	0	52.4
5+	25	45.5	0	42.9	12.5	38.1
Perception of number of interactions:						
Too few	8.3	2.9	0	4.8	0	0
Just enough	91.7	85.3	100	81	100	81
Too many, did not interfere with learning	0	8.8	0	14.3	0	14.3
Too many, did interfere with learning	0	2.9	0	0	0	4.8
Characteristics of interactions with supervisor						
Supervisor:						
Gave instructions on actions to take	41.7	90.9	25	85.7	33.3	90.5
Asked task-focused questions	41.7	87.5	25	95.2	50	95.2
Asked knowledge questions	90.9	78.8	75	81	75	76.2
Demonstrated skills	58.3	93.9	25	90.5	41.7	85.7
Role modeled professional practice	50	90.9	25	100	66.7	100
Asked analysis questions	91.7	87.9	25	81	58.3	81

Asked synthesis questions	66.7	72.7	50	76.2	83.3	81
Asked reflective questions	75	63.6	75	61.9	83.3	71.4
Most representative action by supervisor:						
Gave instructions	0	18.2	0	15	0	14.3
Asked task-focused questions	16.7	6.1	25	0	8.3	0
Asked knowledge-focused questions	8.3	3	25	15	16.7	9.5
Demonstrated skills	0	18.2	0	15	8.3	9.5
Role modeled professional practice	16.7	15.2	0	25	16.7	23.8
Asked analysis questions	33.3	15.2	0	15	8.3	28.6
Asked synthesis questions	25	18.2	50	15	25	14.3
Asked reflective questions	0	6.1	0	0	16.7	0
Second-most representative characteristic of interactions:						
Gave instructions	8.3	3.4	25	5.3	16.7	5.6
Task-focused questions	8.3	13.8	0	15.8	16.7	11.1
Knowledge-focused questions	16.7	3.4	25	10.5	8.3	16.7
Demonstrated skills	8.3	0	0	0	0	0
Role modeled professional practice	0	10.3	25	5.3	8.3	5.6
Analysis questions	16.7	20.7	0	15.8	16.7	16.7
Synthesis questions	25	13.8	0	15.8	16.7	22.2
Reflective questions	16.7	34.5	25	31.6	16.7	22.2
Analysis or synthesis reported as one of most representative characteristics	75	51.5	50	47.6	50	52.4
Characteristics of Verbal Feedback Given by Supervisor						
Any Verbal feedback	91.7	97.1	50	95.2	93.8	95.2
Timeframe for feedback:						
Feedback given during or just after interaction	72.7	93.9	100	100	81.8	90
Feedback given at end of day	27.3	6.1	0	0	18.2	10

Supportive or Discouraging:						
Feedback given in a way that was supportive	81.8	100	100	90	100	95
Feedback given in a way that was discouraging	18.2	0	0	10	0	5
Specificity-helpfulness:						
Feedback was too general to be helpful	18.2	0	0	10	0	0
Feedback was helpful, but not specific	36.4	27.3	0	25	27.3	35
Feedback was very specific about how to improve	45.5	72.7	100	65	72.7	65
Topics on which feedback was provided:						
Responses to instructor questions	83.3	97	50	90.5	83.3	90.5
Knowledge level	50	61.8	50	61.9	41.7	42.9
Delivery of nursing care	83.3	97	50	95.2	75	95.2
Psychomotor skill level	33.3	67.6	50	71.4	58.3	71.4
Communication with others	33.3	47.1	25	52.4	58.3	71.4
Decisions made	33.3	55.9	25	61.9	33.3	57.1

Percentages of students reporting having these types of interactions with the university clinical instructor or the staff nurse preceptor

References

- Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., Wittrock, M.C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of educational objectives*. New York: Pearson, Allyn & Bacon.
- Batson, V., & Yoder, L. (2012). Managerial coaching: A concept analysis. *Journal of Advanced Nursing*, 68(7), 1658-69.
- Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation*. San Francisco: Jossey-Bass.
- Bransford, J., Brown, A., & Cocking, R. (2000). *How people learn. Brain, mind, experience, and school*. National Academy Press: Washington, D.C.
- Clynes, M. & Raftery, S. (2008). Feedback: An essential element of student learning in clinical practice. *Nurse Education in Practice* 8(6), 405-411.
- Duff, B. (2013). Creating a culture of safety by coaching clinicians to competence. *Nurse Education Today*, 33(10), 1108-11.
- Grealish, L. (2000). The skills of coach are an essential element in clinical learning. *Journal of Nursing Education*, 39(5), 231-233.
- Hayden, J., Keegan, M., Kardong-Edgren, S., & Smiley, R., (2014). Reliability and validity testing of the Creighton competency evaluation instrument for use in the NCSBN national simulation study. *Nursing Education Perspectives*, 35(4): 244-252.
- Hellström-Hyson, E., Mårtensson, G., & Kristofferzon, M. (2012). To take responsibility or to be an onlooker. Nursing students' experiences of two models of supervision. *Nurse Education Today*, 32(1), 105-110. doi: 10.1016/j.nedt.2011.02.005

- Henderson, A., Twentyman, M., Heel, A., & Lloyd, B. (2006). Students' perception of the psycho-social clinical learning environment: An evaluation of placement models. *Nurse Education Today*, 26(7), 564-571. doi: <http://dx.doi.org/10.1016/j.nedt.2006.01.012>
- International Coach Federation, (2015). Retrieved October 1, 2015, from <http://www.coachfederation.org>.
- Ironside, P., McNelis, A., & Ebright, P. (2014). Clinical education in nursing: Rethinking learning in practice settings. *Nursing Outlook*, 62(3), 185-191.
- Lasater, K., (2011). Clinical judgment: The last frontier for evaluation. *Nurse Education in Practice* 11(2), 86-92.
- Luhanga, F. L, Billay, D., Grundy, Q., Myrick, F., & Yonge, O. (2010). The one-to-one relationship: Is it really key to an effective preceptorship experience? A review of the literature. *International Journal of Nursing Education Scholarship*, 7(1), 1-15.
- Lynn, M.R., (1986). Determination and quantification of content validity. *Nursing Research*, 35, 382-385.
- McClure, E., & Black, L. (2013). The Role of the Clinical Preceptor: An Integrative Literature Review. *Journal of Nursing Education*, 52(6), 335-341. doi: <http://dx.doi.org/10.3928/01484834-20130430-02>
- McNelis, A., Ironside, P., Ebright, P., Dreifuerst, K., Zvonar, S., & Conner, S. (2014). Learning nursing practice: A multisite, multimethod investigation of clinical education. *Journal of Nursing Regulation*, 4(4), 30-35.
- Mulready-Shick, J., Kafel, K.W., Banister, G., & Mylott, L. (2009). Enhancing quality and safety competency development at the unit level: An initial evaluation of student learning and clinical teaching on dedicated education units. *Journal of Nursing Education*, 48(12), 716-719.

- Polit, D.F., Beck, C.T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, 29: 489-497.
- Price, A. (2009). Using coaching interventions to develop clinical skills. *Nursing Standard*, 23(44), 48-55.
- Rhodes, M., Meyers, C., & Underhill, M. (2012). Evaluation Outcomes of a Dedicated Education Unit in a Baccalaureate Nursing Program. *Journal of Professional Nursing*, 28(4), 223-230. doi: <http://dx.doi.org/10.1016/j.profnurs.2011.11.019>
- Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological Assessment*, 8(4), 350-353.
- Sijtsma, K. (2009). On the use, misuse, and the very limited usefulness of cronbach's alpha. *Psychometrika*, 74(1), 107-120.
- van de Ridder, J., Peters, C., Stokking, K., de Ru, J., Ten Cate, O. (2015). Framing of feedback impacts student's satisfaction, self-efficacy and performance. *Advances in Health Sciences Education*. 20(3): 803-16.
- Vincent, A. & Sanchez Birkhead, A. (2013). Evaluation of the effectiveness of nurse coaching in improving health outcomes in chronic conditions. *Holistic Nursing Practice*, 27(3), 148-61.

Chapter 5 (Manuscript 4)

Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment

Mary Ann Jessee, MSN, RN, is the sole author of this manuscript.

Funding acknowledgement: Funding was provided by the National League for Nursing Jonas Scholar Foundation

Publication: Manuscript is in process and will be submitted to The Journal of Nursing Education

Acknowledgements: I would like to acknowledge Nathan Dieckmann, PhD and Jacquelyn Pennings, PhD, PStat® for their input into the statistical analysis of this project. I would also like to acknowledge the immeasurable mentorship of Dr. Christine A. Tanner, PhD, RN, FAAN.

Introduction

The purpose of this manuscript is to describe the findings from the dissertation study, *Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment*. This manuscript replaces a portion of the Design and Methods and Results chapters of the traditional dissertation. This study was designed based on the gaps in knowledge identified through the literature searches for Manuscripts 1 and 2 and was conducted according to Oregon Health & Science University Institutional Review Board approval, IRB00011199. In order for nursing education to answer the repeated calls for reform of pre-licensure clinical education, we must first identify how clinical education, specifically the clinical learning environment (CLE), influences student learning outcomes. The critical need for nurses in today's healthcare environment to possess sound clinical reasoning skill along with the identified gaps in understanding of how that skill is influenced by the CLE, creates the urgency of this study.

The gaps in understanding of factors within pre-licensure CLEs that influence clinical reasoning inhibit the design and evaluation of learning experiences that foster skillful clinical reasoning. Therefore, the primary goal of this study is to gain insight into factors within the clinical learning environment that influence the development of skillful clinical reasoning in baccalaureate-level pre-licensure nursing students. To achieve this goal, a quantitative pre- and post-test design will seek to answer the following questions:

1. Are there differences in the clinical coaching behaviors of university clinical instructors and staff nurse preceptors? Do these differences influence clinical reasoning?
2. Are there differences in perception of the CLE in students educated in a DEU versus a non-DEU? Do these differences influence clinical reasoning?

3. Are there differences in perception of the CLE in students supervised by a university clinical instructor, staff nurse preceptor, or collaboratively by both? Do these differences influence clinical reasoning?

To achieve this goal, a quantitative pre- and post-test design will address the following aims:

Specific Aim 1. Describe the clinical coaching behaviors of university clinical instructors and staff nurse preceptors.

Specific Aim 2. Describe the change in pre-licensure students' clinical reasoning skill after completion of a medical-surgical clinical rotation related to a) student perceptions of the CLE, b) characteristics of student-supervisor clinical coaching interactions (quantity of interactions, teaching-questioning strategies, and feedback characteristics), c) program type (traditional BSN, accelerated BSN equivalent), d) supervision type (university clinical instructor, staff nurse preceptor, or a collaborative teaching model with both), and e) CLE type (DEU, non-DEU).

Hypothesis 2.1: Students' clinical reasoning skill will improve following a 140-170 hour adult medical-surgical clinical experience.

Hypothesis 2.2: The degree of improvement in clinical reasoning skill will be positively related to more frequent clinical coaching interactions with the supervisor.

Hypothesis 2.3: The degree of improvement in clinical reasoning skill will be positively related to higher cognitive-level questioning during student-supervisor clinical coaching interactions.

Design

This study is an exploratory quantitative pre- post-test design examining factors within the pre-licensure CLE that may influence students' clinical reasoning skill. A convenience sample of senior baccalaureate-level nursing students in their final medical-

surgical clinical rotation at two schools of nursing, one traditional Bachelor of Science in Nursing (BSN) program in the northeast US, and one baccalaureate-equivalent level of an MSN program in the southeast US, were invited to participate. Student selection into the clinical groups was per the usual registration procedure at each school.

Participants

All students classified as senior students who were enrolled in the final semester medical-surgical clinical course at the traditional BSN school (85 students) and the accelerated baccalaureate-equivalent level of the MSN school (140 students) were eligible to participate. Students were recruited from their courses and provided informed consent to participate following university institutional review board approval. The final sample consisted of 135 students: 53 traditional BSN students and 82 accelerated baccalaureate-equivalent MSN students.

Procedure

Student demographics and initial clinical reasoning skill level were collected at the beginning of the course in the classroom setting. Nursing program characteristics were collected from the program director of each school of nursing. At the midpoint of the 140-170 hour clinical rotation, students accessed an online survey to record student-supervisor clinical coaching interactions that occurred during the most recent clinical day. After completion of the full 140-170 hour clinical course, student perceptions of the clinical learning environment and a second measurement of clinical reasoning skill level were collected.

Statistical Analysis

Descriptive statistics characterized student demographics, program and CLE type, supervision types, student-supervisor clinical coaching interactions, clinical reasoning pre- and post-test scores, and change in scores from pre- to post-test. ANOVA was used to examine differences in students' perceptions of the CLE by supervision type and CLE type.

Repeated-measures ANOVA was used to identify the relationship between improvement in clinical reasoning skill and clinical coaching interactions. Two-way ANOVA was used to identify change in clinical reasoning over time by supervision type and CLE type. Linear mixed-effects modeling was used to predict the impact of multiple sources of variation among the fixed- and random-effects variables on students' clinical reasoning skill.

Ethical Considerations

IRB approval was obtained from OHSU (IRB00011199) and each of the other study schools of nursing, VUSN (IRB# 141906), and UMB (IRB2014265). Students were informed that election to participate in the study would have no impact on evaluation of their clinical performance or assignment or course grades, and informed consent was obtained from interested students. Additionally, enrolled students completing all study measures as required will receive a five dollar Starbucks gift card and be entered into a drawing for an iPad.

Limitations

This study was limited by the use of a convenience sample. However, the selection of study schools in different geographic regions and of various program types that utilize a variety of CLE types may improve the generalizability of the study findings. There was high attrition in this study since the participants were full-time students. While the Health Sciences Reasoning Test has been deemed reliable and valid for use in this context, it may not have the sensitivity to detect changes in clinical reasoning over time.

Skillful Clinical Reasoning: Influences of the Pre-licensure

Clinical Learning Environment

Today's complex healthcare environment requires that nurses possess sound clinical reasoning skill to recognize salient cues indicative of patient decline and take action to prevent costly complications, sentinel events, and death (Levett-Jones et al., 2010; Purling & King, 2012). Despite challenges for radical change of nursing education to improve clinical

reasoning in new graduate nurses (Benner, Sutphen, Leonard, & Day, 2010; Institute of Medicine, 2010; National League for Nursing, 2003), significant deficits remain (Berkow, Virkstis, Stewart, & Conway, 2008; Casey, et al., 2011; Hickey, 2009; Levett-Jones et al., 2010; Purling & King, 2012). Nurse preceptors have identified problem solving and decision-making among the weakest new-graduate competencies (Hickey, 2009) while graduating students consider themselves lacking the ability to discern changes in patient assessment findings and respond to urgent situations (Casey, et al., 2011).

The gaps in understanding of factors within the pre-licensure clinical learning environment (CLE) that influence clinical reasoning inhibit the design and evaluation of clinical learning experiences that foster skillful clinical reasoning. This study will provide insight into factors within the CLE that influence the development of skillful clinical reasoning in baccalaureate-level pre-licensure nursing students. This study represents a first step toward the long-term goal of designing and implementing effective, evidence-based clinical teaching models that foster skillful clinical reasoning and enhance the ability of new-graduate nurses to promote positive patient outcomes in the current healthcare environment.

Background

Evidence shows that the development of skillful clinical reasoning is a complex process influenced by multiple factors including depth of knowledge and breadth of clinical experience (Benner, 1984; Norman, 2005), and sociocultural factors within the clinical learning environment (CLE) (Chuan & Barnett, 2012; Courtney-Pratt, FitzGerald, Ford, Marsden, & Marlow, 2012; Hellstrom-Hyson, Martenansson, & Kristofferzon, 2012; Warne, et al., 2010). The CLE is a multifaceted sociocultural environment comprised of hierarchy, power structure, and relationships that impact the overall atmosphere of the CLE (Lave & Wenger, 1991). This overall atmosphere, as well as the interactions among students and the multiple factors that comprise the CLE, result in highly variable student perceptions of

learning experiences (Dunn & Hansford, 1997; Papp, Markkanen, & von Bonsdorff, 2003; Saarikoski, Isoaho, Warne, & Leino-Kilpi, 2008). An understanding of how these factors influence clinical reasoning skill will provide the foundation for inquiry that may finally begin to answer the call for change in pre-licensure clinical education.

Skillful Clinical Reasoning Requires Knowledge and Multiple Clinical Experiences

Skillful clinical reasoning, the cognitive processes through which nurses combine patient data, knowledge, experience, professional values, and reflection in action to make nursing judgments (Simmons, 2010; Tanner, 2010), develops over time with multiple experiences (Benner, 1984; Benner, Tanner, & Chesla, 2009; Norman, 2005) and is best learned through direct engagement in the nursing practice setting (Benner, et al., 2010; Lave & Wenger, 1991). Growing knowledge and experience with multiple representations of illnesses result in a cognitive repertoire of familiar situations from which expert nurses can deductively and inductively draw to solve complex patient problems (Benner, 1984; Norman, 2005). Long-standing (Ericsson, 2004) and recent evidence (Oermann, et al., 2011) demonstrates that deliberate, repetitive practice of both cognitive (Ericsson, 2004) and psychomotor skills (Oermann, et al., 2011) during clinical education significantly increases the development and retention of those skills. Novices have acquired fundamental knowledge but lack experience with multiple representations of illnesses and therefore lack the ability to discern subtle changes that do not fit the expected frame of reference (Benner, 1984; Benner, et al., 2009; Norman, 2005). This lack of experience is in part a reflection of the inability of current pre-licensure clinical education structures to support multiple experiences (Ironsides & McNelis, 2010).

Current Clinical Education Structure Fails to Support Multiple Clinical Experiences

Much of pre-licensure clinical education is implemented in traditional group models in which one instructor, either school of nursing faculty or a nurse employed by the

healthcare facility, educates 6-10 nursing students, each engaged in total care of only one patient rather than engaged in learning activities with multiple patients. Access to the multiple experiences and repetitive practice known to promote skillful clinical reasoning (Ericsson, 2004; Norman, 2005) is limited by the capacity of that instructor to provide adequate supervision for patient care (Ironside & McNelis, 2010; Jacobson & Grindel, 2006) and by the randomness of available patients (Gubrud-Howe & Schossler, 2008). Alternative to group models, the use of staff nurses as clinical instructors in a one to one preceptorship is common. There is an underlying assumption that collaboration between students and experienced nurses enhances students' learning of the key cognitive and psychomotor skills expected in a competent nurse (Mulready-Shick, Kafel, Banister, & Mylott, 2009; Mulready-Shick, Flanagan, Banister, Mylott, & Curtin, 2013; Rhodes, Meyers, & Underhill, 2012). Staff nurses who serve as preceptors are often assigned, not self-selected as preceptors, and may not be specifically trained in clinical teaching strategies, thus bringing into question the quality of clinical education provided (McClure & Black, 2013). While the decreased instructor-student ratio in the preceptor model may increase the capacity of the preceptor to engage students in multiple experiences, preceptors often continue to carry a full patient care load and therefore may not be as available to engage directly with students as expected (Courtney-Pratt et al., 2012; Croxon & Maginnis, 2009). In both models, students' experiences with essential student-instructor clinical coaching interactions and the ability to fully engage in the work of nursing practice is limited, therefore minimizing their ability to develop skillful clinical reasoning.

The Dedicated Education Unit (DEU). The DEU is designed to purposefully engage students as members of the healthcare team and is characterized by 1) staff nurses who have a desire to teach and have been trained in methods of clinical instruction & supervision; 2) those trained nurses serve as the primary supervisors, or preceptors, of nursing students; and

3) university-employed clinical faculty collaborate with the trained staff nurses to educate students (Edgecombe, Wotton, Gonda, & Mason, 1999; Mulready-Shick, et al., 2009; Mulready-Shick, et al., 2013; Rhodes, et al., 2012). It is believed that students immersed in nursing work in the environment of practice alongside these specifically trained, experienced nurses are afforded more opportunities for practice of essential cognitive and psychomotor skills than traditional group or preceptor models of clinical education (Mulready-Shick, et al., 2009; Mulready-Shick, et al., 2013; Rhodes, et al., 2012). Students educated in the DEU perceive improvement of their critical thinking and problem-solving skills while nurses in the DEU perceive that students benefit from the repetitive, hands-on experiences in the DEU (Rhodes, et al., 2012) and have improved achievement of quality and safety competencies such as safety, teamwork and collaboration, informatics, patient-centered care, and evidence-based practice and quality improvement (Mulready-Shick, et al., 2009).

Multiple studies of student, faculty, and nurse perceptions of learning in collaborative learning models such as the DEU indicate that working alongside experienced nurses and engagement in direct one on one coaching interactions with specifically trained nurses and faculty in the collaborative learning environment fosters increased student engagement in the cognitive processes necessary to develop clinical reasoning skill (Hellstrom-Hyson, et al., 2012; Henderson, Twentyman, Heel, & Lloyd, 2006; Newton, Jolly, Ockerby, & Cross, 2012; Newton, Cross, White, Ockerby, & Billett, 2011; Ranse & Grealish, 2007; Rhodes, et al., 2012). While these studies detail positive perceptions of learning outcomes in the DEU and other collaborative learning models, to date there have been no studies identifying what factors within the CLE, including clinical instructor coaching behaviors, are associated with the development of students' clinical reasoning skill in the DEU or other models of clinical education.

Clinical Coaching is not Promoting Skillful Clinical Reasoning

The interactions that occur within student-instructor relationships during clinical education, whether school of nursing faculty or staff nurse preceptor, have been reported to have a significant impact on students' perceptions of learning (Chuan & Barnett, 2012; Courtney-Pratt, et al., 2012; Warne, et al., 2010). Clinical coaching is defined as the one-to-one verbal questioning, teaching, and feedback behaviors used by a clinical instructor with a student in the context of patient care situations to promote student identification of salient aspects of nursing practice. Clinical coaching that guides students in development and use of higher-order thinking skills fosters improvement in essential cognitive skills, such as prioritization and clinical reasoning, while behaviors that focus students' thinking on factual knowledge, comprehension, and task completion may hinder the development of skillful clinical reasoning (Benner, et al., 2010). Unfortunately, while many faculty and nurse clinical instructors believe their clinical coaching interactions with students are promoting problem-solving and reasoning skills, recent evidence shows these interactions are often characterized by a focus on knowledge and task-completion, and therefore are not meeting this critical learning need in today's students (Ironside & McNelis, 2010; McNelis, et al., 2014). Further, feedback provided during clinical coaching interactions is often provided too far after a clinical learning event to promote student reflection and learning (Clynes & Raftery, 2008). Although coaching for a sense of salience has been identified as a signature pedagogy in nursing (Benner, et al., 2010; Tanner, 2006), there is little evidence whether this and other forms of student-supervisor interactions actually promote pre-licensure students' development of skillful clinical reasoning.

Theoretical Framework

The Integrated Theory of Clinical Education (Author, 2015) is an amalgamation of Situated Learning Theory (Lave & Wenger, 1991), Expert Practice (Dreyfus & Dreyfus,

1986; Benner, 1984), Deliberate Practice (Ericsson, 2004), and the Tanner Clinical Judgment Model (Tanner, 2006) and posits that 1) clinical learning occurs in a supportive sociocultural context of clinical practice, 2) clinical learning experiences are purposefully designed to provide multiple practice opportunities with essential psychomotor and cognitive skill-sets that support understanding, and 3) in-time discourse that promotes reflection in action, and feedback are integral to meaning making in clinical learning experiences. The Integrated Theory of Clinical Education proposes that the development of skillful clinical reasoning is promoted by engagement of students as members of the healthcare team in the context of nursing practice, deliberate multiple practices of essential cognitive and psychomotor skills, and purposeful clinical coaching interactions with their supervisor. These tenets along with the underlying tenets of the parent theories provide a comprehensive theoretical framework for clinical learning in nursing that promotes the development of clinical reasoning.

It is likely that there are elements of all models of clinical education in nursing that foster skillful clinical reasoning. Using the Integrated Theory of Clinical Education as the theoretical framework, this study will seek to identify factors within the pre-licensure CLE that are associated with clinical reasoning skill in nursing students. This knowledge will ultimately promote development of clinical education models and CLEs that foster skillful clinical reasoning in nursing students and new-graduate nurses.

Purpose/Aims

The primary goal of this study was to gain insight into factors within the clinical learning environment that influence the development of skillful clinical reasoning in baccalaureate-level pre-licensure nursing students. Specifically, it was designed to describe the change in pre-licensure students' clinical reasoning skill after completion of a medical-surgical clinical rotation related to a) student perceptions of the CLE, b) characteristics of student-supervisor clinical coaching interactions (quantity of interactions, teaching-

questioning strategies, and feedback characteristics), c) program type (traditional BSN, accelerated BSN equivalent), d) supervision type (university clinical instructor, staff nurse preceptor, or a collaborative teaching model with both), and e) CLE type (DEU, non-DEU).

The following hypotheses were tested:

Hypothesis 2.1: Students' clinical reasoning skill will improve following a 140-170 hour adult medical-surgical clinical experience.

Hypothesis 2.2: The degree of improvement in clinical reasoning skill will be positively related to more frequent clinical coaching interactions with the supervisor.

Hypothesis 2.3: The degree of improvement in clinical reasoning skill will be positively related to higher cognitive-level questioning during student-supervisor clinical coaching interactions.

Design and Method

Design

This study was an exploratory quantitative pre- post-test design examining factors within the pre-licensure CLE that may influence students' clinical reasoning skill. A convenience sample of 135 senior baccalaureate-level nursing students in their final medical-surgical clinical rotation at two schools of nursing, one traditional Bachelor of Science in Nursing (BSN) program in the northeast US, and one baccalaureate-equivalent level of an MSN program in the southeast US, were invited to participate. Student selection into the clinical groups was per the usual registration procedure at each school.

Participants

All students classified as senior students who were enrolled in the final semester medical-surgical clinical course at the traditional BSN school (85 students) and the accelerated baccalaureate-equivalent level of the MSN school (140 students) were eligible to participate. Students were recruited from their courses and provided informed consent to

participate following university institutional review board approval. The final sample consisted of 135 students: 53 traditional BSN students and 82 accelerated baccalaureate-equivalent MSN students (Table 1). The sample was predominantly female, aged 20-30 years, with a Bachelor of Arts or Science as a previous degree. Over half of students had 1-5 years of work experience before entering nursing, and of those with work experience, just over half worked in healthcare. Sixty percent of students were from the BSN equivalent program and 40% in the traditional BSN program, with 13% of the traditional BSN students experiencing their clinical rotation in a Dedicated Education Unit, the remaining 87% of students in the sample in a non-DEU clinical environment. Students were supervised only by a university-employed clinical instructor (47%), a staff nurse preceptor (21%), or collaboratively supervised by both a university-employed clinical instructor and a staff nurse preceptor (32%). Of note, students in the traditional BSN program were supervised by either a staff nurse preceptor only or collaboratively by both, students in the accelerated BSN equivalent level of the MSN program were supervised by only a university clinical instructor, or collaboratively by both.

Table 1. Characteristics of the Sample

Table 1. Characteristics of the Sample (N=135)			
<i>n</i> (%)			
Gender		Type of Work	
Female	121 (90.3)	Health care	55 (51.4)
Male	13 (9.7)	Non-healthcare	54 (48.6)
Age		Type of Program	
20-30	118 (87.4)	Traditional BSN	53 (39.3)
31-40	12 (8.9)	BSN Equivalent	82 (60.7)
41-50	5 (3.7)		
Previous Degree		Type of CLE	
None	44 (32.6)	Non-DEU	117 (87.3)
Associate of Science	2 (1.5)	DEU*	17 (12.7)
Bachelor of Arts	44 (32.6)		
Bachelor of Science	36 (26.7)		

Masters/Doctorate	9 (6.5)	*all DEUs are in the Traditional BSN program
Years Work Experience		Type of Supervision in CLE
Less than 1	27 (20.3)	University Clinical Instructor 40 (46.8)
1-5	80 (60.6)	Staff Nurse Preceptor 15 (21.1)
6-10	16 (12.1)	Both 30 (32.1)
11-20	9 (7.0)	*n=85 students who completed this information and are included in independent groups analyses
Over 20	1 (.8)	

Measures

The 33 question version of the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2006) is a multiple-choice test that measures high-stakes reasoning and decision-making processes in the health-science context across the domains of analysis, inference, evaluation, induction, and deduction, which are assumed to be integral components of the complex problem solving process of clinical reasoning. The overall clinical reasoning score is calculated by summing the individual domain scores, and was used as the measure of clinical reasoning in this study. The HSRT is the only reasoning test that targets health-science related contextual situations and is specifically calibrated for health-sciences students and practitioners. Therefore, it is more appropriate for this study than traditional critical thinking measures typically used as proxy measures of clinical reasoning skill (Facione, Facione, & Sanchez, 1994).

A modified version of the Clinical Learning Environment Scale + Teacher (CLES+T) (Saarikoski, et al., 2008) (Cronbach's alpha=.95; .79-.95 individual domains) was used to measure students' perceptions of the CLE. The CLES+T is a 34 item instrument that measures overall student perceptions of the CLE in the domains of pedagogical atmosphere (9 items), supervisory relationship with staff nurse preceptor (8 items), role of the faculty member (9 items), leadership style of the CLE management staff (4 items), and premise of nursing on the CLE (4 items). Students educated only by university clinical instructors or only by staff nurse preceptors completed only the student-faculty or student-preceptor

relationship domain as applicable. The measurement scale was modified from a 5-point to a 4-point Likert scale for this study to promote student commitment to a meaningful rating (strongly disagree, disagree, agree, strongly agree) (DeVellis, 2012). In this study, the modified scale demonstrated Cronbach's alpha of .96 overall and .79-.91 for individual dimensions.

The Clinical Coaching Interactions Inventory (CCII) is a 26 item index developed for this study to facilitate student report of characteristics of student-supervisor interactions in the clinical setting along two important dimensions of clinical coaching: (1) Teaching-Questioning: type and quantity of teaching and questioning strategies used, and (2) Feedback: qualities of feedback provided on student performance. The index, which consists of primarily binary items, demonstrated an overall Kuder-Richardson of .70. The teaching-questioning domain demonstrated a KR of .70 overall, .63 for the clinical instructor version, and .71 for the preceptor version. The feedback domain demonstrated a KR of .70 overall, .53 for the clinical instructor version and .57 for the preceptor version. This index provides essential coverage of the questioning and feedback domains of clinical coaching that warrants use of the measure despite lower reliability values (Schmitt, 1996).

Procedure

Student demographic form and initial clinical reasoning test, the Health Sciences Reasoning Test (HSRT), were administered at the beginning of the course in the classroom setting. Data about nursing program characteristics were collected from the program director of each school of nursing. At the midpoint of the 140-170 hour clinical rotation, participants completed an online survey to describe student-supervisor clinical coaching interactions that occurred during the most recent clinical day. After completion of the full 140-170 hour clinical course, participants completed the measure of their perceptions of the clinical learning environment and a second HSRT.

Statistical Analysis

All data were entered into SPSS (IBM Corp., 2013). Descriptive statistics characterized student demographics, program and CLE type, supervision types, student-supervisor clinical coaching interactions, clinical reasoning pre- and post-test scores, and change in scores from pre- to post-test. ANOVA was used to examine differences in students' perceptions of the CLE by supervision type and CLE type. Repeated-measures ANOVA was used to test the relationship between improvement in clinical reasoning skill and clinical coaching interactions. Two-way ANOVA was used to evaluate the interactions among change in clinical reasoning over time by supervision type and CLE type.

Results

Description of Student-Supervisor Clinical Coaching Interactions (Table 2)

Teaching-Questioning. Forty-one percent of students who experienced any supervision by a university clinical instructor and 55% of students experiencing any supervision by a staff nurse preceptor reported having 5 or more one to one interactions with that supervisor during the course of the most recent clinical day. The majority of students perceived the number of interactions they had with their supervisor as just enough to facilitate their learning. Most students reported being asked a wide variety of question types ranging from knowledge to synthesis level. The most representative types of teaching-questioning strategies used by university clinical instructors were analysis or synthesis level questions, while nurse preceptors most often gave instructions about how to provide care and demonstrated nursing skills.

Feedback. The majority of students reported receiving verbal feedback from their supervisor, and that the feedback was given in a way that made them feel supported. Seventy percent of students reported that verbal feedback from their university clinical instructor was given during or soon after a patient encounter, while 88% of students reported the same about their

staff nurse preceptor. Over half of all students reported the verbal feedback they received was very specific about how to improve, while another third reported feedback as helpful, but not specific about how to improve. Most students reported receiving feedback from university clinical instructors and staff nurse preceptors on how they responded to supervisors' questions and their delivery of nursing care. Half of all students reported receiving feedback on their level of knowledge, psychomotor skill performance, and communication with members of the healthcare team. Forty eight percent of students reported receiving feedback on decisions made about patient care from their university clinical instructor, while only 26% of students reported receiving the same by a nurse preceptor.

Table 2. Characteristics of Clinical Coaching Interactions

Characteristics of one to one interactions with supervisor during most recent clinical day	Students reporting some supervision by a University Clinical Instructor n=85	Students reporting some supervision by a Staff Nurse Preceptor n=58
Quantity of interactions	%	%
Number of interactions:		
None	9.0	29.3
1-2	14.4	5.2
3-4	20.7	10.3
5+	41.4	55.2
Perception of number of interactions:		
Too few	2.4	5.2
Just enough	94.1	84.5
Too many, did not interfere with learning	3.5	8.6
Too many, did interfere with learning	0	1.7
Characteristics of interactions with supervisor		
Supervisor:		
Gave instructions on actions to take	36.9	89.3
Asked task-focused questions	71.8	81.8
Asked knowledge questions	92.9	68.4
Demonstrated skills	70.6	86.0
Role modeled professional practice	77.6	85.7
Asked analysis questions	83.5	73.2
Asked synthesis questions	80.0	58.9
Asked reflective questions	81.2	51.8
Most representative action by supervisor:		
Gave instructions	0	22.8

Asked task-focused questions	9.5	8.8
Asked knowledge-focused questions	10.7	5.3
Demonstrated skills	9.5	15.8
Role modeled professional practice	7.1	15.8
Asked analysis questions	25.0	15.8
Asked synthesis questions	29.8	12.3
Asked reflective questions	8.3	3.5
Second-most representative characteristic of interactions:		
Gave instructions	4.8	1.9
Task-focused questions	7.1	13.2
Knowledge-focused questions	10.7	5.7
Demonstrated skills	10.7	34.0
Role modeled professional practice	10.7	9.4
Analysis questions	16.7	13.2
Synthesis questions	21.4	15.1
Reflective questions	17.9	7.5
Analysis or synthesis reported as one of most representative characteristics	70.2	43.9
Characteristics of Verbal Feedback Given by Supervisor		
Any Verbal feedback	87.1	84.2
Timeframe for feedback:		
Feedback given during or just after interaction	70.5	88.2
Feedback given at end of day	29.5	11.8
Supportive or Discouraging:		
Feedback given in a way that was supportive	93.6	96.0
Feedback given in a way that was discouraging	6.4	4.0
Specificity-helpfulness:		
Feedback was too general to be helpful	7.7	5.9
Feedback was helpful, but not specific	34.6	31.4
Feedback was very specific about how to improve	57.7	62.7
Topics on which feedback was provided:		
Responses to instructor questions	87.1	84.2
Knowledge level	47.1	56.9
Delivery of nursing care	86.9	87.7
Psychomotor skill level	57.6	65.5
Communication with others	49.4	46.6
Decisions made	63.5	26.1

Note: Percentages of students reporting these types of interactions with the university clinical instructor or the staff nurse preceptor.

Change in Clinical Reasoning Skill

Overall, there was no statistically significant difference between pre- and post-test scores. However, clinical reasoning pre-test scores were significantly higher in the group of students reporting supervision by only a university clinical instructor ($F(1,82) = 6.00, p = .004$) (Table 5). There was no statistically significant difference in the amount of change in clinical reasoning skill in students educated in different CLE types or by different supervision types. There was no main effect of time: $F(1,82) = 2.97, p = 0.089$ and no significant

interaction between time and group: $F(2,82) = 0.136, p = 0.873$. Due to the preliminary nature of this study, further tests were constructed to evaluate whether any groups changed significance from pre- to post-HSRT. Paired sample t-tests showed significant change by clinical instructor: $t(39) = 2.08, p = .045$, but no differences were found by staff nurse preceptor or collaborative supervision by both. Wilcoxon Signed Ranks Tests were used to confirm the paired-samples t-test due to non-normal data and showed non-significance, $p = 0.063$. Improvement in clinical reasoning from pre- to post-test was not significantly related to the number of student-supervisor clinical coaching interactions or higher cognitive-level questioning during those interactions.

Table 5. HSRT by supervision type/time

	Pre-HSRT score M (SD)	Post-HSRT score M (SD)
Clinical Instructor ¹	25.65 ^x (2.11)	26.28 ^y (2.18)
Nurse Preceptor	22.73 ^a (4.31)	23.00 ^a (4.32)
Both	23.33 ^b (5.15)	23.83 ^b (4.59)
Total	24.32 ^c (4.00)	24.84 ^c (3.81)

Discussion

These findings provide critical foundational evidence of how factors within the pre-licensure CLE influence the development of students' clinical reasoning skill, and are the impetus for design of clinical education capable of promoting the clinical reasoning needed to navigate today's complex patient situations (IOM, 2010; Benner, et al., 2010). The Integrated Theory of Clinical Education supports these findings and confirms a decade of evidence (Author, 2015) demonstrating that despite differences in type of CLE and type of supervision, most students report positive overall perceptions of the CLE. This lack of variability in perceptions of the CLE may explain the insignificant contribution of that factor on improvement in clinical reasoning skill level and warrants further investigation with a larger sample from multiple schools of nursing. This study advances nursing education from an

understanding of commonalities in perception of the CLE to an initial understanding of how that perception and other factors within the CLE contribute to clinical reasoning skill.

Characteristics of the student-supervisor clinical coaching interactions that occur within the CLE have recently been described, but have not previously been directly related to clinical reasoning skill. A study by McNelis, et al. (2014) used observation to describe the qualities of clinical coaching interactions and identified that university clinical instructors used primarily task and knowledge-focused questions, while students in this current study reported that university clinical instructors most often used questioning at the analysis and synthesis level, while staff nurse preceptors most often demonstrated skills or gave directions about how to provide care. Despite the difference in approach between the two studies, the finding that demonstration and providing directions were the primary coaching behaviors of staff nurse preceptors is congruent with their primary role of patient care, and may be attributed to the limited capacity of staff nurse preceptors to teach in addition to carrying a patient care load or a deficit in clinical teaching-questioning and feedback skills due to a lack of training (Henderson, et al., 2006; Luhanga, Billay, Grundy, Myrick, & Yonge, 2010; McClure & Black, 2013). Further, since teaching is the primary role of the university clinical instructor, the use of higher-order questioning as was found in this study would be expected. Although there was no significant difference in clinical reasoning skill based on the number or type of clinical coaching interactions, further study is warranted as the HSRT may not have the sensitivity to detect specific changes over time. Additionally, as only the overall HSRT score was used in this study, future study should examine for significant differences in any individual dimensions of the HSRT as a result of number or type of clinical coaching interactions.

Contrary to report by Raftery (2008), feedback during most interactions in this study was provided during or just after the patient encounter and often included specific feedback

about the student's level of knowledge and performance of psychomotor skills that has been shown to improve performance (Ericsson, 2004; Oermann, et al., 2011). However, feedback on decisions made about patient care was provided by only half of clinical instructors and 26% of staff nurse preceptors in this study, and may have limited students' ability to reflect on those decisions and incorporate new understandings into future practice (Ericsson, 2004). Feedback that is provided in a supportive manner, even if about something that needs to improve, has been reported to improve students' self-efficacy and performance (van de Ridder, Peters, Stokking, Alexander de Ru, & ten Cate, 2015). In this study, the majority of feedback was provided in a manner in which students felt supported. Engaging students in clinical coaching interactions that promote the use of higher-order thinking skills and provide timely feedback that is very specific about how to improve is supported by the Integrated Theory of Clinical Education as necessary for sound clinical reasoning and should be the goal of education to enhance the clinical coaching skills of those clinical supervisors.

This study was the first to seek identification of factors within the CLE that contribute to clinical reasoning skill. The sample in this study was from just two schools of nursing with all students reporting supervision by only a university clinical instructor in the Baccalaureate-equivalent level of the MSN school, and all students reporting supervision by only a staff nurse preceptor in the traditional BSN school. Accordingly, the finding that students supervised by only a clinical instructor had higher pre-test clinical reasoning skill may be an indicator that the school or the students themselves, not the supervision type is the factor associated with higher clinical reasoning skill. However, there were students at both schools who reported supervision in a collaborative manner by both a university clinical instructor and a staff nurse preceptor who had lower clinical reasoning skill. Further, the finding that analysis and synthesis questioning were the most representative teaching-questioning behaviors of university clinical instructors contributes to the likelihood that it is the clinical

coaching interactions with the clinical instructor, not affiliation with a certain school, that is associated with higher clinical reasoning skill.

Nursing education has not given necessary focus to the design of instruments to measure learning outcomes relevant to the provision of complex patient care (Tanner, 2011). The lack of significant differences in clinical reasoning related to factors within the CLE in this study may be a reflection that these factors do not actually contribute to change, or a result of the inability of the HSRT to detect that change. While the HSRT has detected significant change in clinical reasoning in a past study (Dreifuerst, 2012), future research should focus on the design of an objective measure that captures the dynamic, multifaceted nature of reasoning through multiple complex patient situations over time (Norman, 2005; Tanner, 2006). The ability to identify patterns and deficits in reasoning across time with multiple patient scenarios (Tanner, 2011) is essential to the development of targeted clinical teaching strategies to promote skillful clinical reasoning.

Limitations

This study is limited by the use of a convenience sample from only two schools of nursing. While the selection of study schools in different geographic regions and of different program types that utilized a variety of CLE types improves the generalizability of the study findings, future study should be multi-site. The high correlation between program type and supervision type limits the ability to determine which is more associated with improvement in clinical reasoning skill and warrants further study of a sample with more variability in CLE and supervision types within each school of nursing. Since all students reporting supervision by only a university clinical instructor were in the accelerated BSN-equivalent level of the MSN program and all students reporting supervision by only staff nurse preceptors were in the traditional BSN program, it is possible that this finding is a result of differences in the schools themselves and warrants further study at multiple schools of nursing. Further, the

type of supervision experienced by students in clinical rotations previous to the one in this study is unknown. Therefore the contribution of clinical coaching interactions during previous clinical rotations to the students' clinical reasoning skill at the start of the current clinical rotation is unknown. The current findings were student reports of their perceptions of the types of clinical coaching interactions on one clinical day. Although the CCII provided example types of questions to facilitate accurate student reporting, further study should examine consistency of student report with observed behaviors during clinical coaching interactions. The modification of the CLES+T from a 5- to a 4-point Likert scale may have limited the variability in perceptions of the CLE and therefore the ability to detect differences in perception related to CLE and supervision type.

Summary

This study provides the impetus for further study to more clearly identify the specific factors within the CLE that are associated with clinical reasoning skill in pre-licensure nursing students. Overall, students had positive perceptions of the CLE despite differences in CLE type and supervision type, and varied clinical coaching interactions from the different types of supervisors. The Integrated Theory of Clinical Education provides a framework for further investigation of how these and other factors within the CLE influence clinical reasoning skill. The variability in student reports of the clinical coaching behaviors of university clinical instructors and staff nurse preceptors provides evidence of the need for further multi-site study of clinical coaching behaviors of various types of supervisors to further evaluate how those behaviors are associated with the development of clinical reasoning skill. Hence, nursing education must develop instruments capable of measuring actual learning outcomes, develop targeted education for clinical supervisors, whether university clinical instructor or staff nurse preceptor, and design and evaluation of clinical teaching-learning strategies to promote clinical reasoning.

References

- Author (2015). Influences of the acute care clinical learning environment on undergraduate student nurses' perceptions of the clinical learning experience: An integrative review. Manuscript submitted for publication.
- Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park: Addison-Wesley.
- Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation*. San Francisco, CA: Jossey-Bass.
- Benner P, Tanner C, & Chesla C. (2009). *Expertise in nursing practice: Caring, clinical judgment, and ethics* (2nd ed.). New York: Springer.
- Berkow S, Virkstis K, Stewart J, & Conway L. (2008). Assessing new graduate nurse performance. *Journal of Nursing Administration*, 38(11), 468-474. doi: 10.1097/01.nna.0000339477.50219.06
- Casey K, Fink R, Jaynes C, Campbell L, Cook P, & Wilson V. (2011). Readiness for practice: The senior practicum experience. *Journal of Nursing Education*, 50(11), 646-652. doi: 10.3928/01484834-20110817-03
- Chuan O. & Barnett T. (2012). Student, tutor and staff nurse perceptions of the clinical learning environment. *Nurse Education in Practice*, 12(4), 192-197. doi: <http://dx.doi.org/10.1016/j.nepr.2012.01.003>
- Clynes, P.M., & Raftery, S.E. (2008). Feedback: An essential element of student learning in clinical practice. *Nurse Education in Practice*, 8(6), 405-411.
- Courtney-Pratt H, FitzGerald M, Ford K, Marsden K, & Marlow A. (2012). Quality clinical placements for undergraduate nursing students: a cross-sectional survey of undergraduates and supervising nurses. *Journal of Advanced Nursing*, 68(6), 1380-1390. doi: 10.1111/j.1365-2648.2011.05851.x

- DeVellis, R. (2012). *Scale development: Theory and applications* (3rd ed.). Thousand Oaks: Sage Publications, Inc.
- Dreifuerst, K. (2012). Using debriefing for meaningful learning to foster development of clinical reasoning in simulation. *Journal of Nursing Education*, 51(6), 326-333.
- Dreyfus, H. & Dreyfus, S. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer*. New York: Free Press.
- Dunn S & Hansford B. (1997). Undergraduate nursing students' perceptions of their clinical learning environment. *Journal of Advanced Nursing*, 25(6), 1299-1306. doi: 10.1046/j.1365-2648.1997.19970251299.x
- Edgecombe K., Wotton K., Gonda J., & Mason P. (1999). Dedicated education units: A new concept for clinical teaching and learning. *Contemporary Nurse: A Journal for the Australian Nursing Profession*, 8(4), 166-171. doi: 10.5172/conu.1999.8.4.166
- Ericsson, K.A. (2004). Deliberate practice and acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine*, 79(10Supl), S70-81.
- Facione NC, Facione PA, & Sanchez CA. (1994). Critical thinking disposition as a measure of competent clinical judgement: The development of the California Critical Thinking Disposition Inventory. *Journal of Nursing Education*, 33, 345-350.
- Facione, N., & Facione, P. (2006). *The health sciences reasoning test*. Milbrae, CA: The California Academies Press.
- Gubrud-Howe, P., & Schoessler, M. (2008). From random access opportunity to a clinical education curriculum. *Journal of Nursing Education*, 47(1), 3-4
- Hellström-Hyson E, Mårtensson G, & Kristofferzon M. (2012). To take responsibility or to be an onlooker. Nursing students' experiences of two models of supervision. *Nurse Education Today*, 32(1), 105-110. doi: 10.1016/j.nedt.2011.02.005

Henderson, A., Twentyman, M., Heel, A., & Lloyd, B. (2006). Students' perception of the psycho-social clinical learning environment: An evaluation of placement models.

Nurse Education Today, 26(7), 564-571. doi: <http://dx.doi.org/10.1016/j.nedt.2006.01.012>

Hickey, MT. (2009). Preceptor perceptions of new graduate nurse readiness for practice.

Journal for Nurses in Staff Development, 25(1), 35-41. doi:

10.1097/NND.0b013e318194b5bb

IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY:

IBM Corp.

Institute of Medicine. (2010). The Future of Nursing Leading Change Advancing Health,

from [http://iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-](http://iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx)

[Advancing-Health.aspx](http://iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx)

Ironside, P. & McNelis, A. (2010). Clinical education in prelicensure nursing programs:

Findings from a national survey. *Nursing Education Perspectives*, 31(4), 264-265.

Jacobson L. & Grindel C. (2006). What is happening in pre-licensure RN clinical nursing

education? Findings from the faculty and administrator survey on clinical nursing

education. *Nursing Education Perspectives*. 27(2): 188-189.

Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New

York: Cambridge.

Levett-Jones T, Hoffman K, Dempsey J, Jeong SY, Noble D, Norton CA, Roche J, 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): 515-20. doi: 10.1016/j.nedt.2009.10.020

Luhanga, F. L, Billay, D., Grundy, Q., Myrick, F., & Yonge, O. (2010). The one-to-one

relationship: Is it really key to an effective preceptorship experience? A review of the

literature. *International Journal of Nursing Education Scholarship*, 7(1), 1-15.

- McClure, E., & Black, L. (2013). The Role of the Clinical Preceptor: An Integrative Literature Review. *Journal of Nursing Education, 52*(6), 335-341. doi: <http://dx.doi.org/10.3928/01484834-20130430-02>
- McNelis, A., Ironside, P., Ebright, P., Dreifuerst, K., Zvonar, S., & Conner, S. (2014). Learning nursing practice: A multisite, multimethod investigation of clinical education. *Journal of Nursing Regulation, 4*(4), 30-35.
- Mulready-Shick J., Flanagan K., Banister G., Mylott L., & Curtin L. (2013). Evaluating dedicated education units for clinical education quality. *Journal of Nursing Education, 52*(11), 606-614. doi: 10.3928/01484834-20131014-07
- Mulready-Shick, J., Kafel, K.W., Banister, G., & Mylott, L. (2009). Enhancing quality and safety competency development at the unit level: An initial evaluation of student learning and clinical teaching on dedicated education units. *Journal of Nursing Education, 48*(12), 716-719.
- National League for Nursing. (2003). *Innovation in nursing education: A call for reform* [Position Statement]. Retrieved from www.nln.org/aboutnln/PositionStatements/innovation082203.pdf
- Newton J, Cross W, White K, Ockerby C, & Billett S. (2011). Outcomes of a clinical partnership model for undergraduate nursing students. *Contemporary Nurse: A Journal for the Australian Nursing Profession, 39*(1), 119-127. doi: 10.5172/conu.2011.39.1.119
- Newton J, Jolly B, Ockerby, C. & Cross W. (2012). Student centredness in clinical learning: the influence of the clinical teacher. *Journal of Advanced Nursing, 68*(10), 2331-2340. Doi:10.1111/j.1365-2648.2012.05946.x
- Norman, G. (2005). Research in clinical reasoning: Past history and current trends. *Medical Education, 39*, 418-427.

- Oermann M, Kardong-Edgren S, Odom-Maryon T, Hallmark B, Hurd D, Rogers N, Haus C, McColgan J, Snelson C, Dowdy S. et al. (2011). Deliberate practice of motor skills in nursing education: CPR as exemplar. *Nursing Education Perspectives*. 32(5), 311-315.
- Papp I, Markkanen M, & von Bonsdorff M. (2003). Clinical environment as a learning environment: student nurses' perceptions concerning clinical learning experiences. *Nurse Education Today*. 23(4), 262-268. doi: [http://dx.doi.org/10.1016/S0260-6917\(02\)00185-5](http://dx.doi.org/10.1016/S0260-6917(02)00185-5)
- Price, A. (2009). Using coaching interventions to develop clinical skills. *Nursing Standard*, 23(44), 48-55.
- Purling A, & King L. (2012). A literature review: Graduate nurses' preparedness for recognizing and responding to the deteriorating patient. *Journal of Clinical Nursing*, 21(23/24), 3451-3465.
- Ranse K, & Grealish L. (2007). Nursing students' perceptions of learning in the clinical setting of the Dedicated Education Unit. *Journal of Advanced Nursing*, 58(2), 171-179. doi:10.1111/j.1365-2648.2007.04220.x
- Rhodes M, Meyers C, & Underhill M. (2012). Evaluation Outcomes of a Dedicated Education Unit in a Baccalaureate Nursing Program. *Journal of Professional Nursing*. 28(4), 223-230. doi: <http://dx.doi.org/10.1016/j.profnurs.2011.11.019>
- Saarikoski M, Isoaho H, Warne T, & Leino-Kilpi H. (2008). The nurse teacher in clinical practice: Developing the new sub-dimension to the clinical learning environment and supervision (CLES) scale. *International Journal of Nursing Studies*, 45(8), 1233-1237. doi: <http://dx.doi.org/10.1016/j.ijnurstu.2007.07.009>
- Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological Assessment*, 8(4), 350-353.

Simmons, B. (2010). Clinical reasoning: Concept analysis. *Journal of Advanced Nursing*, 66(5), 1151-1158.

Tanner, C. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, 45(6), 204-211.

Tanner, C. (2011). The critical state of measurement in nursing education research. *Journal of Nursing Education*, 50(9), 491-492.

van de Ridder, J., Peters, C., Stokking, K., de Ru, J., Ten Cate, O. (2015). Framing of feedback impacts student's satisfaction, self-efficacy and performance. *Advances in Health Sciences Education*, 20(3): 803-16.

Warne, T., Johansson, U., Papastavrou, E., Tichelaar, E., Tomietto, M., den Bossche, K., . . . Saarikoski, M. (2010). An exploration of the clinical learning experience of nursing students in nine European countries. *Nurse Education Today*, 30(8), 809-815. doi: <http://dx.doi.org/10.1016/j.nedt.2010.03.003>

Chapter 6

Discussion

For decades, the CLE has influenced students' perceptions of learning in similar ways across the globe (Dunn & Hansford, 1997; Henderson, et al., 2009; Nishioka, Coe, Hanita, & Moscato, 2014; Warne et al., 2010). This dissertation affirms again the consensus that a CLE characterized by a friendly, welcoming atmosphere promotes positive student perceptions of the clinical learning environment (Chuan & Barnett, 2012; Dunn & Hansford, 1997; Papp, Markkanen, & von Bonsdorff, 2003), and that being considered an integral part of the healthcare team is critical to positive learning experiences in the CLE (Chan, 2002, Courtney-Pratt, et al., 2012; Ranse & Grealish, 2007; Roxburg, 2014). Students place high value on the relationships developed with preceptor and faculty supervisors in the CLE (Chuan & Barnett, 2012; Dimitriadou, Papastavrou, Efstathiou, & Theodorou, 2015; Lofmark & Wikblad, 2001; Warne, et al., 2010) and consistently identify the supervisory relationship as the most important aspect of the clinical learning experience (Sundler, et al., 2014; Warne et al., 2010).

The variability in student perceptions of the overall sociocultural atmosphere of the CLE, how students are welcomed as members in the healthcare team, characteristics of clinical coaching within supervisory relationships, and the structure of clinical education indicate that these perceptions may be improved with intervention and evaluation. This dissertation demonstrated that a purposeful amalgamation of multiple theoretical perspectives (Ericsson, 2004; Dreyfus & Dreyfus, 1986; Lave & Wenger, 1991; Tanner, 2006) supports that learning to reason through patient situations during clinical education may be best achieved with a combination of three key components: 1) direct interaction with other participants in the complex sociocultural context of nursing practice (Lave & Wenger, 1991; McNelis, et al., 2014; Mulready-Shick, Flanagan, Banister, Mylott, & Curtin, 2013), 2) multiple opportunities to practice reasoning through patient situations within that context

(Benner, Sutphen, Leonard, & Day, 2010; Ericsson, 2004; Lasater & Nielsen, 2009; Nielsen, 2009; Tanner, 2006), and 3) participation in an effective instructor-student coaching relationship characterized by collaborative discourse and meaningful feedback about students' reasoning within those patient situations (Benner, Sutphen, Leonard, & Day, 2010; McNelis, et. al. 2014; Tanner, 2006).

Since the complexity of clinical education and the development of clinical reasoning are not well supported by a single theoretical perspective, the Integrated Theory of Clinical Education was presented as a comprehensive theoretical framework that supports the centrality of context, multiple practice opportunities, and discourse with meaningful feedback as key components in the development of clinical reasoning during clinical education. Hence, the tenets of the Integrated Theory of Clinical Education are 1) clinical learning occurs in a supportive sociocultural context of clinical practice, 2) clinical learning experiences are purposefully designed to provide multiple practice opportunities with essential psychomotor and cognitive skill-sets that support understanding, and 3) in-time discourse that promotes reflection in action, and feedback are integral to meaning making in clinical learning experiences. The melding of SLT (Lave & Wenger, 1991), EP (Dreyfus & Dreyfus, 1986), DP (Ericsson, 2004) and the TCJM (Tanner, 2006) creates a comprehensive theoretical framework grounded in the centrality of context, multiple practice opportunities, and discourse with meaningful feedback. The Integrated Theory of Clinical Education is well-situated to undergird the design and implementation of clinical education that advances students' clinical reasoning skill.

Because new-graduate nurses are expected to enter the workforce with reasoning skill to navigate the complex patient situations in current healthcare settings, students must have the opportunity to engage in learning that requires students to reason in the same manner required in the practice environment (Benner, et al., 2010; Tanner, 2006). Clinical education

pedagogy must prioritize strategies that promote discourse (Lave & Wenger, 1991), part of which may include coaching, which is situated – pointing out and discussing salient aspects of a situation and providing corrective feedback in a supportive manner during or just after an encounter. However, this study identified a gap in understanding of the characteristics of student-supervisor clinical coaching interactions in the CLE.

Clinical coaching provides an essential framework for engagement of students in deliberate practice (Ericsson, 2004) of reasoning skills and the opportunity to receive feedback on that practice, and is particularly important for helping students to notice and respond appropriately to changing patient situations (Tanner, 2006). Therefore, the Clinical Coaching Interactions Inventory was developed to describe and quantify the construct of clinical coaching, defined as the one-to-one teaching, verbal questioning, and feedback behaviors used by a clinical supervisor (school of nursing faculty or staff nurse preceptor) with a student in the context of patient care situations to promote student identification of salient aspects of nursing practice. The instrument enables students to identify the 1) teaching behaviors and levels of questioning demonstrated by their clinical supervisors, 2) characteristics of feedback provided by their clinical supervisors during student-supervisor clinical coaching interactions, and 3) provide an initial quantitative understanding of questioning and feedback characteristics used by clinical supervisors during one to one clinical coaching interactions with students in the CLE.

Students in this dissertation study reported that university clinical instructors most often used questioning at the analysis and synthesis level, while staff nurse preceptors most often demonstrated skills or gave directions about how to provide care. A study by McNelis, et al. (2014) identified through the use of observation of student-supervisor interactions that university clinical instructors used primarily task and knowledge-focused questions. The finding that demonstration and providing directions were the primary coaching behaviors of

staff nurse preceptors is congruent with their primary role of patient care, and may be attributed to the limited capacity of staff nurse preceptors to teach due to patient care load or a lack of training in clinical teaching-questioning and feedback skills (Luhanga, et al., 2010; McClure & Black, 2013). Similarly, the primary role of university clinical instructors is teaching, making the use of higher cognitive level questioning a reasonable expectation of individuals in that role. However, some students completing the index at multiple time points reported more analysis, synthesis, and reflective levels of questions by staff nurse preceptors, which could be reflective of increased education on clinical teaching pedagogy provided for staff nurses in the DEU (Mulready-Shick, et al., 2009; Mulready-Shick, et al., 2013).

While teaching and questioning strategies are essential to identifying the current state of a student's knowledge and the ability to use that knowledge, advancement toward expertise of any skillset must also be accompanied by immediate, detailed feedback on performance (Ericsson, 2004). Often, feedback is not consistently provided during clinical experiences, but instead is provided far after the clinical encounter or is not specific enough to facilitate learning (McNelis, et al., 2014; Raftery, 2001). Further, feedback should be provided in a supportive manner to increase student self-efficacy for clinical practice (van de Riddler, Peters, Stokking, de Ru, & Ten Cate, 2015). In this current study, feedback during most interactions was provided during or just after the patient encounter and often included specific feedback about the student's level of knowledge and performance of psychomotor skills. However, feedback on decisions made about patient care was given by a remarkably low number of supervisors: only half of university clinical instructors and 26% of staff nurse preceptors. The group of students who completed the index multiple times and were supervised by either a staff nurse preceptor only or in a collaborative manner by both a university faculty and a staff nurse preceptor, reported receiving feedback on decisions made about patient care more often by staff nurse preceptors than by university faculty at all time

points. This is not unexpected given that the staff nurse preceptor was the primary instructor in this group of students and the university faculty was likely not present for most of the encounters in which decisions were made. The decision to take action is a critical point in the reasoning process and warrants specific feedback to facilitate student understanding of why each decision is plausible.

This dissertation was the first to seek identification of factors within the CLE that contribute to clinical reasoning skill. The sample in this study was from just two schools of nursing with all students reporting supervision by only a university clinical instructor in the Baccalaureate-equivalent level of the MSN school, and all students reporting supervision by only a staff nurse preceptor in the traditional BSN school. Accordingly, the finding that students supervised by only a clinical instructor had higher pre-test clinical reasoning skill may be an indicator that the school or the students themselves, not the supervision type is the factor associated with higher clinical reasoning skill. However, there were students at both schools who reported supervision in a collaborative manner by both a university clinical instructor and a staff nurse preceptor who had lower clinical reasoning skill. Further, the finding that analysis and synthesis questioning were the most representative teaching-questioning behaviors of university clinical instructors contributes to the likelihood that it is the clinical coaching interactions with the clinical instructor, not affiliation with a certain school, that is associated with higher clinical reasoning skill.

Nursing education has not given necessary focus to the design of instruments to measure learning outcomes relevant to the provision of complex patient care (Tanner, 2011). The lack of significant differences in clinical reasoning related to factors within the CLE in this study may be a reflection that these factors do not actually contribute to change, or a result of the inability of the HSRT to detect that change. While the HSRT has detected significant change in clinical reasoning in a past study (Dreifuerst, 2012), future research

should focus on the design of an objective measure that captures the dynamic, multifaceted nature of reasoning through multiple complex patient situations over time (Norman, 2005; Tanner, 2006). The ability to identify patterns and deficits in reasoning across time with multiple patient scenarios (Tanner, 2011) is essential to the development of targeted clinical teaching strategies to promote skillful clinical reasoning.

Summary and Implications

Clinical reasoning is an essential skill required of nurses and practitioners in other practice disciplines. The development of clinical reasoning is influenced by many factors within the CLE. Unfortunately, the deficit seen in new graduate nurses persists despite calls for change of clinical education to promote the development of clinical reasoning. It is clear that there are limitations to current clinical education models and that widespread improvement is warranted. In effort to support the needed changes, this body of work proposes the Integrated Theory of Clinical Education as a comprehensive framework for the development of clinical education models that are capable of promoting the development of students' clinical reasoning skill. The context of practice, regardless of the discipline, influences what practitioners learn, how they learn it, and how they incorporate that learning into future practice. Students consistently report that their learning is better in CLEs where they are valued as members of the team and are afforded multiple opportunities to engage in the cognitive work of nursing. Nursing education and CLE leadership must collaborate in intervention research to improve the attitudes of staff toward inclusion of students as members of the healthcare team, improve preparation of staff nurse preceptors, and design a structure of supervision by staff nurse preceptors that minimizes focus on tasks and ensures ample time for each to teach while engaged in the practice setting. The first step toward improving both university instructors' and staff nurse preceptors' ability to engage students' higher order thinking skills is widespread description of the teaching, questioning, and

feedback behaviors that occur within student-supervisor clinical coaching interactions through use of the CCII. Results from these studies can be used to design and implement targeted education to meet the specific clinical coaching learning needs of university faculty and staff nurse preceptors.

This dissertation was the first to seek identification of factors within the CLE that contribute to clinical reasoning skill. However, the use of a convenience sample from only two schools of nursing, despite different geographic regions, program types, and a variety of CLE types, limits the generalizability of the study findings. Further, the high correlation between program type and supervision type limits the ability to determine which is more associated with improvement in clinical reasoning skill. Further study should include a larger, multi-site sample with more variability in CLE and supervision types within each school of nursing. Although the CCII provided example types of questions to facilitate accurate student reporting, further study should examine consistency of student report with observed behaviors during clinical coaching interactions. Further, the measure of clinical reasoning may have been unable to detect significant change, or change over time. As such, better measures that can detect patterns of reasoning are needed.

The findings from this body of work are transferrable to other practice professions characterized by participant interaction within a sociocultural context and the need for expert practice (e.g. occupational or physical therapy, medicine, dentistry). Though deficits in pre-licensure clinical education in nursing was the impetus for development of The Integrated Theory of Clinical Education, this framework articulates the ideals of clinical learning, not necessarily one discipline, type of clinical learning (e.g. acute-care, community, primary care), or level of student (e.g. pre-licensure or advanced practice), and is therefore transferrable across a variety of clinical education arenas. The theory provides a comprehensive framework for the design, implementation, and evaluation of intervention

research in nursing and other disciplines to examine the effect of modification of factors within the CLE on clinical reasoning skill.

Appendix A
Institutional Review Board Approvals

1. OHSU
 - a. IRB Approval
 - b. Authorization Agreement
2. Vanderbilt
 - a. IRB Approval
 - b. Consent Form
3. University of Massachusetts Boston
 - a. IRB Approval



Research Integrity Office, L106-RI

3181 SW Sam Jackson Park Road

Portland, OR 97239-3098

(503) 494-7887

Memo

Date: 12/23/2014

To: Paula Gubrud-Howe, EDD, BS, MS

From: Kathryn Schuff, MD, MCR, Chair, Institutional Review Board
Elizabeth Haney, MD, Vice-Chair, Institutional Review Board
Lynn Marshall, ScD, Vice-Chair, Institutional Review Board
Penny Hogarth, MD, Vice-Chair, Institutional Review Board
Kara Manning Drolet, PhD, Associate Director, OHSU Research Integrity Office
Andrea Johnson, JD, CIP, Assistant Research Integrity Officer, Institutional Review Board
David Holmgren, MS, IRB Manager, Institutional Review Board
William Hoffman, PhD, MD, VA IRB Co-Chair

Subject: IRB00011199, Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment

Initial Approval

The above submission was reviewed and approved for three years effective 12/23/2014.

Review category: Exempt Category #1 and #2.

Copies of all approved documents are available in the study's Official Documents list in the eIRB.

Ongoing IRB submission requirements:

- Six to ten weeks before the expiration date, you are to submit a continuing review to request continuing approval.
- Any changes to the project must be submitted for IRB approval prior to implementation.
- Unanticipated problems and protocol deviations must be submitted per OHSU policy.
- You are required to submit a termination request when your research is completed.

Guidelines for Study Conduct

In conducting this study, you are required to follow the guidelines in the document entitled, "[Roles and Responsibilities in the Conduct of Research and Administration of Sponsored Projects](#)," as well as all other applicable [OHSU IRB Policies and Procedures](#).

Requirements under HIPAA

If your study involves the collection, use, or disclosure of Protected Health Information (PHI), you must comply with all applicable requirements under HIPAA. See the [HIPAA and Research website](#) and the [Information Privacy and Security website](#) for more information.

**Institutional Review Board (IRB)
Authorization Agreement**



Use this form when OHSU is waiving IRB oversight. An agreement template from the reviewing institution may be used instead of this form.

Name of Institution or Organization Providing IRB Review (Institution/Organization A):

Yanderbilt University

IRB Registration#: IORG# 000282

Federalwide Assurance (FWA) #: FWA# 00005756

Name of Institution Relying on the Designated IRB (Institution B):

Oregon Health & Science University

FWA #: FWA0000161

The Officials signing below agree that Oregon Health & Science University may rely on the designated IRB for review and continuing oversight of its human subjects research (described below): *(check one)*

This agreement is limited to the following specific protocol(s):

OHSU eIRB #: _____

Name of Research Project: Skillful Clinical Reasoning: Influences of the Clinical Learning Environment

Name of Principal Investigator: Mary Jesse, MSN

Sponsor or Funding Agency: _____ Award Number, if any: _____

Other *(describe):* _____

The review performed by the designated IRB will meet the human subject protection requirements of Institution B's OHRP-approved FWA. The IRB at Institution/Organization A will follow written procedures for reporting its findings and actions to appropriate officials at Institution B. Relevant minutes of IRB meetings will be made available to Institution B upon request. Institution B remains responsible for ensuring compliance with the IRB's determinations and with the Terms of its OHRP-approved FWA. This document must be kept on file by both parties and provided to OHRP upon request.

Signature of Signatory Official (Institution/Organization A):

Todd W. Rice Date: 1/27/14

Print Full Name: Todd W. Rice, MD, MSc Institutional Title: Institutional Official

Signature of Signatory Official (Institution B):

_____ Date: _____

Print Full Name: _____ Institutional Title: _____

Form developed from OHRP template agreement at <http://www.hhs.gov/ohrp/assurances/forms/irb/irbauthor.pdf>.

**Vanderbilt University**

Institutional Review Board

504 Oxford House Nashville, Tennessee 37232-4315
(615) 322-2918 Fax: (615) 343-2648
www.mc.vanderbilt.edu/irb

December 12, 2014

Mary Jessee
Nursing
481 21st Avenue South, 305 Godchaux Hall 37240**RE: IRB# 141906 "Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment"**Dear **Mary Jessee**:

A sub-committee of the Institutional Review Board reviewed the research application identified above. The sub-committee determined the study poses minimal risk to participants, and the application is approved under 45 CFR 46.110 (F)(7).

The Consent Form(s) have been stamped with the approval and expiration date and this copy should be used when obtaining the participant's signature. Federal regulations require that the original copy of the participant's consent be maintained in the principal investigator's files and that a copy be given to the subject at the time of consent. An additional record (i.e., case report form, medical record, database, etc.) of the consent process should also be maintained in a separate location for documentation purposes.

As the Principal Investigator, you are responsible for the accurate documentation, investigation and follow-up of all possible study-related adverse events and unanticipated problems involving risks to participants or others. The IRB Adverse Event reporting policy III.G is located on the IRB website at <http://www.mc.vanderbilt.edu/irb/>.

If this trial requires registration as a clinical trial, accrual cannot begin until this study has been registered at clinicaltrials.gov and a National Clinical Trial Number (NCT) provided. Please provide the NCT# to the IRB as soon as it is obtained. If an approval is required from an additional source other than the Vanderbilt IRB, this must be obtained prior to study initiation. These approvals may include, but are not limited to CRC, SRC, IND, IDE.

Please note that approval is for a 12-month period. Any changes to the research study must be presented to the IRB for approval prior to implementation.

DATE OF IRB APPROVAL: 12/12/2014**DATE OF IRB EXPIRATION: 12/11/2015**

Sincerely,

A handwritten signature in cursive script, appearing to read "David G. Schlundt".

David G. Schlundt, Ph.D., Chair

**Vanderbilt University Institutional Review Board
Informed Consent Document for Research (Student Participant)**

Principal Investigator: **Mary Ann Jesse**

Version Date: 11/30/14

Study Title: **Skillful Clinical Reasoning: Influences of the Pre-licensure Clinical Learning Environment**

Institution/Hospital: **Vanderbilt University School of Nursing**

This informed consent document applies to adult student study participants.

Name of participant: _____ Age: _____

The following information is provided to inform you about the research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have about this study and the information given below. You will be given an opportunity to ask questions, and your questions will be answered. Also, you will be given a copy of this consent form.

Your participation in this research study is voluntary. You may choose not to participate and receive alternative treatments without affecting your education or grades. You are free to withdraw from this study at any time. In the event new information becomes available that may affect the risks or benefits associated with this research study or your willingness to participate in it, you will be notified so that you can make an informed decision whether or not to continue your participation in this study.

1. Purpose of the study:

The purpose of this study is to identify factors within the pre-licensure clinical learning environment that influence nursing students' clinical reasoning skill. You are being asked to participate in this research study because you are a student in the course in which this study is being conducted.

2. Procedures to be followed and approximate duration of the study:

Eligible students will be informed about the study and invited to participate. Those who consent to participate will complete study measures in addition to their usual clinical experience requirements. All students consenting to participate in the study will create a personal identification number comprised of their birthdate and mother's maiden name that will be used on all study documents.

Data collection will begin at the start of the clinical rotation with collection of student demographics and clinical reasoning skill level. At two random time points within the clinical rotation, students will receive an email/tweet/Facebook reminder with a link to a survey requesting that they record the instructor-student clinical coaching interactions that occurred during the most recent clinical day. Upon completion of the clinical experience we will collect students' a) perceptions of the clinical learning environment, b) a third report of the most recent instructor-student clinical coaching interactions, and c) clinical reasoning skill level. Students will complete these study measures in an existing classroom setting either during, or just after completion of a class session.

	Pre-clinical rotation	Random time during clinical rotation	Random time during clinical rotation	End of clinical rotation
Demographic Questionnaire	X			
Clinical Reasoning Skill Measure	X			X
Perception of Clinical Learning Environment				X
Characteristics of Clinical Coaching Interactions		X	X	X
Total time	1.5 hours	20 minutes	20 minutes	2 hours

Date of Approval: 12/12/2014
Date of Expiration: 12/11/2015

1 of 3



VANDERBILT UNIVERSITY
Institutional Review Board

IRB+

<http://www.irbplus.com/LetterPrint.asp>

OFFICE OF RESEARCH AND SPONSORED PROGRAMS
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF MASSACHUSETTS BOSTON

January 21, 2015

100 Morrissey Boulevard
Boston, MA 02125-3393
P: 617.287.5374
F: 617.287.5396
<http://www.umb.edu/research>

JoAnn Mulready-Shick
Nursing

RE: Your followup submission of 1/20/2015 regarding study number 2014265: Determinants of clinical reasoning skill in pre-licensure nursing clinical learning environments

Dear Ms. Mulready-Shick:

Thank you for your response to requests from a prior review of your application for the new study listed above. Your study is eligible for expedited review under DHHS (OHRP) 7. Individual or group behavior designation.

This is to confirm that your application is now fully approved. The protocol is approved through revised application. You must obtain informed consent from all subjects; however, signed written consent is not required.

This research has been reviewed and approved by the University of Massachusetts Boston IRB, Assurance # FWA00004634.

As Principal Investigator you are responsible for the following:

1. Submission in writing of any and all changes to this project (e.g., protocol, recruitment materials, consent form, etc.) to the IRB for review and approval prior to initiation of the change(s).
2. Submission in writing of any and all unexpected event(s) that occur during the course of this project.
3. Submission in writing of any and all unanticipated problems involving risks to subjects or others.
4. Use of only IRB date stamped copies of the consent form(s), questionnaire(s), letter(s), advertisement(s), etc. in your research.
5. Submission of a continuation prior to the IRB expiration date.
6. Submission of a final report upon completion of this project.

The IRB can and will terminate projects that are not in compliance with these requirements.

You are granted permission to conduct your study as most recently described effective immediately. The study is subject to continuing review on or before 1/21/2016, unless closed before that date.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review.

Contact Kristen Kenny (617-287-5374) if you have any questions or require further information.

Sincerely,

A handwritten signature in black ink, appearing to read 'Kristen Kenny'.

Kristen Kenny, BFA

Appendix B

Measure Descriptions

Clinical Reasoning

The 33 question version of the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2006) is a multiple-choice test that measures high-stakes reasoning and decision-making processes in the health-science context across the domains of analysis, inference, evaluation, induction, and deduction, which are integral components of the complex problem solving process of clinical reasoning. The overall clinical reasoning score is calculated by summing the individual domain scores, and was used as the measure of clinical reasoning in this study. The HSRT is the only reasoning test that targets health-science related contextual situations and is specifically calibrated for health-sciences students and practitioners. Therefore, it is more appropriate for this study than traditional critical thinking measures typically used as proxy measures of clinical reasoning skill.

Students' Perceptions of the Clinical Learning Environment

A modified version of the Clinical Learning Environment Scale + Teacher (CLES+T) (Saarikoski, et al., 2008) (Cronbach's $\alpha=.95$; .79-.95 individual domains) was used to measure students' perceptions of the CLE. The CLES+T is a 34 item instrument that measures overall student perceptions of the CLE in the domains of pedagogical atmosphere (9 items), supervisory relationship with staff nurse preceptor (8 items), role of the faculty member (9 items), leadership style of the CLE management staff (4 items), and premise of nursing on the CLE (4 items). Students educated only by university clinical instructors or only by staff nurse preceptors completed only the student-faculty or student-preceptor relationship domain as applicable. The measurement scale was modified from a 5-point to a 4-point Likert scale for this study to promote student commitment to a meaningful rating (strongly disagree, disagree, agree, strongly agree) (DeVellis, 2012). In this study, the modified scale demonstrated Cronbach's α of .96 overall and .79-.91 for individual dimensions.

Characteristics of Instructor-Student Clinical Coaching Interactions

The Clinical Coaching Interactions Inventory (CCII) is a 26 item index developed for this study to facilitate student report of characteristics of student-supervisor interactions in the clinical setting along two important dimensions of clinical coaching: (1) Teaching-Questioning: type and quantity of teaching and questioning strategies used, and (2) Feedback: qualities of feedback provided on student performance. The index, which consists of primarily binary items, demonstrated an overall Kuder-Richardson of .70. The teaching-questioning domain demonstrated a KR of .70 overall, .63 for the clinical instructor version, and .71 for the preceptor version. The feedback domain demonstrated a KR of .70 overall, .53 for the clinical instructor version and .57 for the preceptor version. This index provides essential coverage of the questioning and feedback domains of clinical coaching that warrants use of the measure despite lower reliability values (Schmitt, 1996).

Program and CLE Characteristics

Program and CLE Characteristics Questionnaire: This is a researcher-developed checklist designed to categorize the nursing program type and types of CLEs. This checklist will be completed by nursing program director at each study site one time at the start of the clinical rotation using an online checklist.

Student Demographics

Student Demographic Questionnaire: This is a researcher developed tool designed to facilitate description of the participant sample. The tool will be completed by each student who consents to participate in the study.

Table: Study Measures

Concept	Measure	Reliability/validity	Scale range/scoring	Timeline/Format	Aim
Clinical Reasoning	Health Sciences Reasoning Test (HSRT)	Cronbach's alpha=.81; 78-.84 individual domains ¹ KR-20 .68-.70 ²	33 items 5 subscales Total score 0-33	<ul style="list-style-type: none"> • Pre- and post-clinical rotation • 50 minutes each • Paper and pencil 	1,2
Students' Perceptions of Clinical Learning Environment	Clinical Learning Environment Scale+Teacher (CLES+T) (Modified: Likert scale changed from 5-point to 4-point to promote respondent commitment to meaningful perception)	Original Instrument: Cronbach's alpha=.95 overall; .79-.95 individual domains ² , .83-.98 individual domains ³ Modified Instrument used in this study: Cronbach's alpha = .96 overall and .79-.91 individual domains	Original Instrument: 27 statements 5 subscales 5-point Likert scale Modified Instrument: 27 statements 5 subscales 4-point Likert scale	<ul style="list-style-type: none"> • Post-clinical rotation • 15 minutes • Paper and pencil or online survey 	1,2
Characteristics of Instructor-Student Clinical Coaching Interactions	Characteristics of Clinical Coaching Tool	Tool developed by researcher for this study, Content Validity determined by sample of 25 practicing pre-licensure clinical instructors	Identify characteristics and record number of instructor-student clinical coaching interactions	<ul style="list-style-type: none"> • Three times during clinical rotation • 15 minutes each time • Online survey 	1,2
Program and CLE Characteristics	Program and CLE Demographics	N/A-Checklist developed by researcher for this study	Select appropriate item; fill in the blank	<ul style="list-style-type: none"> • Once at start of clinical rotation • 10 minutes • Paper and pencil 	1,2
Student Demographics	Student Demographic Questionnaire	N/A-Checklist developed by researcher for this study	Select appropriate item; fill in the blank	<ul style="list-style-type: none"> • Once at start of clinical rotation • 5 minutes • Paper and pencil • 	1,2

References for Appendix B

- Dreifuerst K. (2012). Using debriefing for meaningful learning to foster development of clinical reasoning in simulation. *Journal of Nursing Education*; 51(6), 326-333.
- Facione NC & Facione PA (2006). The health sciences reasoning test. Milbrae, CA: The California Academies Press.
- Saarikoski M, Isoaho H, Warne T, & Leino-Kilpi H. (2008). The nurse teacher in clinical practice: Developing the new sub-dimension to the clinical learning environment and supervision (CLES) scale. *International Journal of Nursing Studies*, 45(8), 1233-1237. doi: <http://dx.doi.org/10.1016/j.ijnurstu.2007.07.009>
- Warne T, Johansson U, Papastavrou E, Tichelaar E, Tomietto M, den Bossche K, . . .
Saarikoski M. (2010). An exploration of the clinical learning experience of nursing students in nine European countries. *Nurse Education Today*; 30(8), 809-815. doi: <http://dx.doi.org/10.1016/j.nedt.2010.03.003>