Published in final edited form as:

J Nurse Pract. 2017 ; 13(7): e301–e310. doi:10.1016/j.nurpra.2017.04.012.

Progressive Assessment and Competency Evaluation Framework for Integrating Simulation in Nurse Practitioner Education

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Abstract

Competencies for nurse practitioner students have been published with the goal of preparing graduates who are ready to meet the challenges of an increasingly complex health care system. Standardized preclinical assessment of graduate-level competencies have been suggested as a means to optimize the student experience in clinical rotations and maximize the preceptor's time toward preparing students for the transition to independent practice. The main objectives of this study are to describe progressive assessment and competency evaluation as an integral framework for integration of simulation in graduate-level curriculum and present the feasibility and challenges to consider during implementation of Progressive Assessment and Competency Evaluation-directed simulations.

Keywords

clinical; competencies; nurse practitioner students; preceptors; simulation

Nurse practitioner (NP) education has evolved over the past decade with nationally based competencies published by the American Association of Colleges of Nursing,¹ National League of Nursing,² National Organization of Nurse Practitioner Faculties,^{3,4} as well as other specialty organizations. These competencies were written to level programmatic outcomes across institutions and prepare a workforce empowered to meet the challenges of an increasingly complex health care system while also providing graduates with the capacity to practice within the full scope of their educational preparation.⁵ With the expectation that NP students demonstrate nationally based competencies prior to graduation, new approaches are necessary for assessing clinical knowledge and skills along the educational trajectory. The main objectives of this study are to describe progressive assessment and competency evaluation (PACE) as an integral framework that may be used by graduate nurse faculty to conceptualize the integration of simulation in graduate-level curriculum and discuss the feasibility and challenges to consider during implementation of PACE-directed simulations.

QUALITY ASSESSMENT AND REVIEW OF GRADUATE NURSING CURRICULUM

Quality assessment and curriculum improvement has become a significant topic in higher education because it strives to maximize effectiveness and efficiency in attaining the intended education outcomes by ensuring that each educational activity contributes to achieving them.⁶ An important aspect of the curriculum improvement process is that each learning activity and the resources required to make it successful has budget implications. This is a particularly important consideration for state-funded institutions, which are under increasing pressure to demonstrate cost containment and sustainability. Through the curriculum quality assessment and review process, nursing programs can address the cost to run an NP program while providing evidence of high-quality education that leads to graduates who are effective and safe to practice as well as leaders prepared to address the challenges of our increasingly complex health care system. The quality assessment and review process for the program described in this article was the beginning of a series of decisions to strengthen and enhance the efficiency in which our NP students were meeting the learning goals and outcomes of the program. An assessment plan of formative and summative evaluations were put in place to ensure that graduates of the program attained the knowledge, skills, attitudes, and values described in the program outcomes.

CHALLENGE OF PRELOADING WHILE ENHANCING PSYCHOMOTOR SKILL DEVELOPMENT

Historically, NP programs across the nation have struggled with the challenges of having to preload foundational knowledge, level learning objectives throughout the curriculum, and apply appropriate sequencing of didactic and clinical courses while remaining competitive in terms of the cost and time commitment for students. Ultimately, the assessment plan, through formative and summative evaluation, should address these aspects by measuring how each component of the curriculum contributes to the established competencies and program outcomes. A particular challenge for nurse educators, as well as other health care

disciplines, is ensuring that the psychomotor and problem-solving skills required for safe and high-quality provision of care are achieved along the educational trajectory.

Didactic courses are an essential part of the students' learning process and can be intertwined with active learning strategies, such as case studies and objective structured clinical examinations that require psychomotor and problem-solving skills. Yet, even when these pedagogies are implemented, the transition to practice is often difficult. This is particularly true when there is a heavy reliance on the clinical rotation as the only venue for students to translate theory and didactic knowledge into context-specific practice situations. Experiential variability is an inherent part of the clinical rotation, ranging from the diversity of diagnoses that students are exposed to, differences in preceptor time, and ability to proactively assess and address student deficiencies, to incongruence in the opportunities to interact with diverse patient populations and perform complete health assessments and a variety of clinical procedures. Thus, reliance on the clinical rotation as the only means of summative evaluation can lead to detrimental amounts of variation in student learning, poorer performance in the clinical setting, and less frequent attainment of programmatic outcomes.

Another challenge when education programs rely heavily on clinical rotations is that, although a minimum number of student clinical practice hours has been set nationally at 500 hours for the master's and 1,000 hours for the doctor of nursing practice,⁷ there is a lack of evidence on the number of clinical practice hours required to establish competency.⁸ Because competency is not based on the number of clinical hours achieved, evaluations of clinical performance and mastery of core- and specialty-based competencies are left to individual institutions that educate NPs.

ONE POTENTIAL SOLUTION: STANDARDIZED PRECLINICAL ASSESSMENTS

Given the limited number of clinical practice hours, variation in student preparation, and a decreasing number of clinical sites, there has been a call for standardized preclinical preparation.⁹ This may entail study demonstration of core and selected specialty competencies prior to starting the clinical experience. Although simulations have been used more often as a pedagogy for teaching and learning psychomotor skills and clinical judgment,¹⁰ they can also be designed as a preclinical assessments, or evaluations of readiness to attend clinical rotations. A preclinical simulation assessment can provide an opportunity to demonstrate and receive feedback on the student's ability to integrate professionalism and psychomotor skills, problem solving, critical thinking, and documentation. In addition, it provides a means for the faculty to evaluate the student's ability to apply knowledge of physical assessment, prescribing, communication, and patient/family teaching, as well as quality improvement, evaluation of ethical dilemmas, and leadership. Preclinical assessments of clinical skills can help to ensure that students are prepared to enter the clinical setting, use the clinical time to practice to the full extent of their educational preparation under their preceptor's guidance, and reduce preceptor burden.

Integrating simulation within the curriculum provides an additional level of experiential learning consistent with the 4 stages of the learning cycle presented in Kolb's theory¹¹: conceptualization; planning; experience; and reflection. Students are provided with a simulated experience and reflection (via debriefing) prior to gaining more experience through the clinical rotation. In addition, simulation can serve as a standardized method to expose students to key clinical diagnoses and/or patient populations and an opportunity to evaluate advanced nursing skill development and clinical judgment.¹² The Nursing Skill Development and Clinical Judgment Model developed by the International Nursing Association for Clinical Simulation and Learning Standards Committee¹³ suggests there are 4 levels of cognitive skills: psychomotor skills; problem-solving; clinical reasoning/critical thinking; and clinical judgment. These cognitive skills can be evaluated by designing a simulation curriculum that provides increasingly complex scenarios in which individual students must demonstrate quality and safety standards of practice as well as core- and specialty-based competencies.¹⁴ The Quality and Safety Education for Nurses (QSEN) graduate competencies provide a list of specific skills and attitudes that can be used to guide the key topics of the simulation as well as the debriefing discussion.¹⁵ The QSEN competencies include Quality Improvement, Safety, Patient-centered Care, Teamwork and Collaboration, Evidence-based Practice, and Health Informatics, providing a way to assist students in viewing each patient interaction within the larger picture of advanced nursing practice.

The integration of simulation in graduate nursing education is no small task, however, and the faculty may choose a gradual approach to get the process started rather than a complete overhaul of the curriculum. Our program accomplished the integration of simulation by piloting simulation formats in different courses. This provided us with the time and experience to work through the challenges and then step-back to develop a curriculum-wide simulation plan. Herein we present a framework for implementing the assessment of cognitive and clinical skills and evaluation of competencies via simulation activities during the educational trajectory that was used to guide when and how simulation could be implemented most effectively.¹⁶

RATIONALE FOR DEVELOPMENT OF THE PROGRESSIVE ASSESSMENT AND EVALUATION FRAMEWORK

In recognizing the current educational challenges for NP programs, our team of educators developed a framework that offers a unique approach to preclinical assessment and implementation of formative and summative evaluation using simulation, which we referred to as Progressive Assessment and Competency Evaluation (PACE). One of the major shifts in the curriculum was made because the original sequencing of courses placed didactic courses along with clinical rotations. Although this format has advantages in providing more time during the program to accomplish clinical hours, students did not have the knowledge base to accomplish the goals of the rotation. Thus, the courses were re-sequenced and a systematic method of assessment was put into place. To do this, the program faculty established "core" courses that all specialties attend, while also threading core competencies throughout the curriculum (organizational leadership, interprofessional practice, use of

technology, quality improvement, and safety), including in the specialty-based courses (see Figure 1).

Core courses were sequenced so that formative evaluations in the course were followed by a specialty-based course in which summative evaluation of programmatic learning outcomes could take place. For instance, the learning outcomes of the evidence-based practice course, in which students work in teams to develop an evidence-based project and presentation, were then applied in a subsequent clinical course where individual students develop, implement, and evaluate a clinical project. The clinical project incorporates several core competencies, including organizational and systems leadership; quality improvement and safety; translating and integrating scholarship into practice; interprofessional collaboration for improving patient and population health outcomes; and advanced nursing practice skills, values, and attitudes (as well as others as appropriate).

For many years, the simulations used for preclinical assessments were based within the clinical rotation courses, providing a way to evaluate student performance and progression over the semester. As we have continued with this format, the faculty saw a need to begin simulated assessments earlier in the program, thus topic-based formative simulation-based evaluations within the specialty didactic courses were implemented. Currently, the specialty courses are delivered in a hybrid format in which didactic content is delivered online and then students schedule a simulation session to evaluate their ability to apply the knowledge that the faculty expected them to obtain in the didactic course.

This is a particularly relevant format for student-centered learning and provides students with the ability to demonstrate the “soft skills” of practice, such as establishing a therapeutic relationship with the client. Although this is often tested on exams by selecting the most appropriate response to a clinical scenario, the process of establishing a therapeutic relationship is highly contextual, requiring students to address multiple factors at once in their response. This kind of multidimensional evaluation cannot fully take place using unidimensional exams. In addition, characteristics that faculty seek to strengthen in students, such as adaptability and emotion regulation, require exposure to different contexts in which the skills are applied. Using simulation, learning is enhanced through providing immediate feedback and faculty guidance concerning how the student may approach certain clinical issues in the future. Standardized patients can be particularly useful to evaluate interviewing skills, yet the costs may be prohibitive.¹⁷ Trained undergraduate nursing students or simulation personnel can serve as an alternative resource for providing a realistic experience for demonstrating interviewing or other interpersonal skills. As students demonstrate achievement of basic-level clinical competencies that require psychomotor skills and problem-solving, they progress to simulations with a higher complexity in which clinical reasoning/critical thinking and clinical judgment are evaluated. The strategy of using simulations earlier in the program, in their didactic courses, has also been beneficial for preparing students to engage in interprofessional simulations that are placed during their clinical courses, as they are already familiar with the simulation environment.¹⁸

Although the PACE framework described here was integrated within the didactic courses using a hybrid format, it may also be useful for programs that are completely online if

faculty are willing to delegate time within the course for coordinating off-campus simulation activities for students. As an example, students could be evaluated in a simulation lab through videotaping the session; however, they would not receive the immediate feedback and debriefing that are so important for their development. Other possible hybrid formats include using synchronous videoconferencing during simulation sessions or having students come to campus for a day of simulation evaluation. Herein we describe the integration of PACE during the implementation of didactic specialty courses, which required at least 3 on-campus evaluations using simulation.

OVERVIEW OF THE PACE FRAMEWORK

The PACE framework was formulated based on Benner's work describing the development of one's expertise from novice to expert¹⁹; Kolb's experiential learning theory¹¹; Jeffries's simulation framework²⁰; graduate-level QSEN competencies¹⁵; and the theory of deliberate practice, as described by Ericsson and colleagues.²¹ Aligned with the "Standards of Best Practice: SimulationSM," the model includes 6 major components with relevant variables and their relationships toward achieving outcomes-based evaluation criteria.¹³ The definition of simulation is based on Jeffries's framework,²⁰ which emphasizes the need to simulate the clinical environment as students demonstrate competency in procedures, decision-making, and critical thinking.

In the PACE framework (see Figure 2), the facilitator/evaluator is the faculty guiding the simulation activity and providing the debriefing and evaluation process. The faculty facilitator should be an expert performer of the simulation curriculum objectives, thereby allowing faculty to identify mechanisms (behaviors or skills) that mediate the student's performance.²² The faculty facilitator should also have confirmed proficiency in the use and implementation of simulation for evaluation through faculty development and practice runs using the evaluation forms to establish adequate reliability and demonstration of best practices in education.¹³

The student is the participant in the simulation whose performance is being evaluated by the faculty facilitator/evaluator. The student's level of learning depends on their enrollment in the course sequence of the curriculum and the expected level of knowledge attainment based on course learning objectives. This information provides the basis for the simulation design. An underlying premise of this relationship is that the curriculum of the simulation program is aligned with the course learning outcomes so that didactic knowledge attained in the course can be directly applied in the simulation.

IMPLEMENTATION OF PACE: OUR EXPERIENCE

Prior to designing simulations according to course learning objectives, the faculty started by designing a prebriefing session in the simulation lab at the start of the student's first specialty didactic course. The student's prebriefing preparation is an important aspect of achieving outcomes-based evaluation criteria and includes familiarity with the simulator and simulated environment, information regarding how the simulation scenario will be run, and evaluation criteria.¹³ The student's level of deliberative practice with the simulator and

simulated environment enhances their level of comfort with the equipment and the process of evaluation. This is also an optimal time to instruct students on expectations while they are in the simulation environment, such as professional appearance and behavior as well as maintaining a realistic clinical environment.

Faculty specialty (track) coordinators worked with the simulation staff to design the simulations based on the students' specialty population, expected level of knowledge attainment, and the competencies to be evaluated. The faculty agreed to design simulations for the first specialty course focused on demonstrating foundational competencies of safe practice, whereas the simulations in the second specialty course focused on critical thinking and clinical judgment using more complex scenarios and patients with multiple comorbidities (see Table 1). Once the simulations were written, the faculty specialty coordinators trialed the simulations with the simulation staff to ensure that necessary equipment was available and that the staff members were comfortable with the requested set-up of the simulation lab. We used this time to provide an itemized list of the equipment and supplies required to run each of the simulations and to plan how the faculty would schedule students for the scenarios.

Leveling Competencies

As we began to map out the competencies that the faculty wanted the students to demonstrate, we aligned content delivered in the specialty courses with simulation evaluation criteria (see Table 2). For instance, in the first few weeks of the specialty course, mental health issues and management were covered, thus faculty developed a simulation focused on professional introduction, clinical interviewing, and documentation. Scenario details were added to broaden coverage of competencies, such as identifying incompatible medications during medication reconciliation, which fed into debriefing discussions on quality improvement and safety. After addressing mental health issues, the didactic course covered cardiovascular management, for which a simulation was created to evaluate competencies on developing a differential diagnosis, recognition of irregular heart rhythms, and interpretation of an electrocardiogram, while upholding criteria for the professional introduction, clinical interviewing, and documentation skills. In this way, we leveled the competencies for each simulation in the curriculum in order of increasing complexity.¹³

Resource Utilization

In our experience, it has been most effective to evaluate psychomotor and problem-solving skills on an individual basis until the competency level of foundational skills has been demonstrated. This is especially the case when evaluating interpersonal skills such as making a professional introduction; developing a therapeutic relationship; developing interviewing skills; dealing with difficult patients, family members, or interprofessional team members; and when breaking bad news to a patient and family. However, the faculty required to perform individual assessments forced us to evaluate several options for efficiently scheduling students for the simulation sessions and to consider designating time in the simulation lab for clinical faculty assigned to clinical courses.²³

We addressed this in 2 ways: by designing self-learning activities in the simulation lab (such as assessment of heart murmurs on a high-fidelity mannequin, or watching and then practicing procedures), and getting buy-in from our clinical faculty to schedule 9 hours of their time over the semester as simulation evaluators. The self-learning activities enabled faculty to schedule student groups (4 students per faculty), run the simulation for each individual student (15 minutes each) while other students were engaged in self-learning activities, and perform debriefing with the group once all students were through the simulation (15 minutes). Clinical faculty who were assigned a clinical group agreed to take part in this process as simulation evaluators because they were invested in making sure that students were prepared for their clinical rotations. This required coordination in training the clinical faculty on the simulations, evaluation criteria, and debriefing.²⁴

Faculty Training

As part of the faculty training process, we developed guidelines for the faculty evaluator's response to student errors, how much and what type of prompting of the student could take place, criteria for terminating the scenario before its completion, as well as appropriate actions to take thereafter.¹³ Evaluation forms were developed by the faculty to easily document demonstration of competencies during the simulation using ordinal variables and then tested to ensure that scoring was consistent across faculty evaluators (intraclass correlation = .96, unpublished data). We also developed remediation plans to follow when student performance was inadequate. Immediately after the simulation, each student was provided with direct feedback from the faculty member. If the student did not demonstrate the minimum levels of competency (< 80% of evaluation criteria), he or she had a chance to repeat the simulation during the session. If the student missed the minimum level on the second try, they were evaluated by another faculty member the following week. After 3 attempts, the highest score was recorded as the evaluation. Simulations are part of the grade for the didactic courses; thus, if the student did not pass the course, they were not allowed to proceed to clinical rotations.²⁵

After providing each individual student with immediate feedback from faculty, we conduct group-based debriefing sessions. This creates an opportunity to discuss the application of the graduate-level QSEN competencies to the simulation scenario, such as topics on benchmarks that would be used to evaluate their performance in clinical practice and strategies to improve safety during patient interactions. This discussion provides a wider lens for the student to be able to view the importance of their own personal clinical practice within the context of the health care system.

Evaluation is ideally a "360 process," where the student receives an evaluation of their performance and provides an evaluation of the faculty and the simulation experience. For the student, evaluation outcomes are outcome-driven and based on the core and specialty competencies that are being assessed. The student's evaluation of the faculty and simulation experience help to provide formative feedback on process issues that can be improved. In addition, formative evaluations from the student over time can be used to measure changes in attitudes and behaviors, including confidence level and knowledge attainment.

Enhancing Program Efficiency and Student Outcomes

Through the quality assessment and review process, the faculty decided to remove 2 courses from the curriculum that were not contributing to the program outcomes. This allowed us to redistribute faculty teaching assignments and, ultimately, reduce the cost of curriculum implementation. In addition, we engaged clinical faculty in the process of preparing and evaluating students during didactic courses, which ultimately increased their satisfaction with their teaching role and facilitated their experience with students as they had first-hand knowledge of student competency levels when starting their clinical rotations. Preceptors were also more satisfied with accepting students for clinical rotations, because the students were accustomed to performing under pressure, prepared for performing a complete assessment and documentation, and developed skills in presenting and discussing a differential diagnosis list and diagnostic evaluation plan. This resulted in a greater number of preceptor volunteers and less preceptor turnover.

Ongoing Quality Assessment Process

With the goal of transforming the clinical rotation from being the sole source of experiential learning to an opportunity for providing a summative evaluation of program outcomes, we integrated the simulation curriculum into the specialty-based didactic courses. Simulation scenarios were developed to incorporate both core- and specialty-based competencies, and evaluation forms were created to determine whether the student met the competency criteria during the simulation. Each set of competencies are folded into the next simulation as a means of increasing the complexity of the subsequent simulation experience. Faculty continued the quality assessment process by having the simulation scenarios analyzed by clinical experts and nurse educators on an annual basis. The evaluation forms and scoring methods have been tested and refined over time so that our program could implement a standardized preclinical assessment process, thereby ensuring student readiness to enter the clinical setting. Ongoing analysis of this process is being undertaken through the collection of data on student outcomes, preceptor evaluations, and retention and costs associated with simulation.

CONCLUSION

The quality assessment process applied to a graduate nursing program provided the impetus to examine innovative strategies for teaching/learning and alignment of the evaluation process with program outcomes. The goals of strengthening summative evaluation of student learning, improving student preparation for clinical rotations, and decreasing preceptor burden stimulated faculty interest in adopting simulation pedagogy for evaluation of specialty competencies early in the program. The PACE framework provided a way for the faculty to conceptualize a progressive simulation program that was subsequently integrated within the graduate curriculum.

The design and implementation of the PACE-directed simulation program involved reaching faculty consensus on the key clinical competencies to be evaluated, ensuring that didactic instruction preceded simulation evaluations, and creating the simulations and evaluation forms. Additional preparation required working with the simulation staff on the logistics of

scheduling and ensuring that necessary equipment and supplies were available, training faculty on the simulations and evaluation process, designing self-directed learning activities, and reallocating clinical faculty effort as simulation evaluators.

The hybrid format of delivering didactic content online and evaluating the application of knowledge and psychomotor skills in the simulation lab provides a strategy that is consistent with best practices in adult learning, including immediate feedback, repetition, reflection, and debriefing. Faculty may use the PACE framework to design preclinical simulation evaluation of core and specialty competencies along the educational trajectory to ensure attainment of program outcomes. Equally important, preclinical simulation assessments provide the ability to optimize the clinical rotation experience and maximize the preceptor's time toward refining student clinical skills. The quality assessment and review process as well as faculty dedication toward improving student clinical preparation can be a driving force behind curricular innovation. The PACE framework is one product of this experience that has helped to improve the delivery of our NP educational program through the ability to evaluate nationally based competencies prior to graduation and facilitate the transition of graduates to independent practice.

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Figure 1.

Progressive assessment and competency evaluation integrated in the curriculum. Formative evaluation is ideally a continuous process within didactic courses to provide ongoing feedback that can be used by faculty to improve their teaching and by students to improve learning. Summative evaluation of learning in the didactic course (midterm/final exams, culminating project) serves as a formative evaluation of the student's advancement toward established competencies and programmatic learning objectives. As students enter into the specialty courses (depicted in the figure as acute care courses) simulations were designed to cover specific psychomotor, problem-solving, and clinical reasoning skills covered in the course. Each simulation enables an evaluation of the student's progress toward the program outcomes.

Figure 2.

Progressive assessment and competency evaluation framework. The 6 main components of the framework and the associated variables are depicted. Relationships between the faculty facilitator/evaluator and student, the student and simulation design, implementation, and debriefing/evaluation contribute to achievement of the outcomes-based evaluation criteria.

Table 1.

Examples of Simulation Topics for Acute Care Nurse Practitioner Students

Simulation Level I	Simulation Level II	Simulation Level III
Cognitive skills:		
Psychomotor skills/problem solving		
During first specialty course:		
• Simulation prebriefing		
• Simulation I: Patient with major depression	• Simulation IV: Patient with abdominal pain	• Simulation VI: Patient with traumatic brain injury and sepsi
• Simulation II: Patient with chest pain	• Simulation V: Patient with burn injury	
• Simulation III: Patient with allergic reaction		
	During clinical courses:	
		• Simulations designed to enhance interprofessional education

Table 2.
Simulation Levels With Graduate QSEN Skills Integrated in Debriefing Discussions

Simulation Level I	Simulation Level II	Simulation Level III
Cognitive skills:		
Psychomotor skills/problem solving		
• Interpersonal skills/communication	• Clinical reasoning/critical thinking	• Clinical judgment
• Obtain patient problem/history	• Recognize key information	• Address multiple comorbidities
• Leadership skills	• Identify psychological and physiologic instability	• Prioritize diagnostic and treatment plan
• Develop differential diagnosis	• Critical thinking	• Work through issues of team dynamics and leadership
• Presentation format	• Discuss options for treatment approach	• Handle ethical concerns
• Documentation	• Develop a plan of care with complex patient psychosocial issues	• Quality improvement
• Safety	• Quality: Identify useful measures that can be acted on to improve outcomes and processes	• Coding and reimbursement
• Quality: Translate aims for quality improvement efforts	• Patient-centered care: Assess patients' understanding of their health issues and create plans with the patients to manage their health	• Quality: Lead improvement efforts, taking into account context and best practices based on evidence
• Patient-centered care: Based on active listening to patients, elicit values, preferences, and expressed needs as part of the clinical interview, diagnosis, implementation of care plan, as well as coordination and evaluation of care	• Teamwork: Guide the team in managing areas of overlap in team member functioning; use effective practices to manage team conflict	• Patient-centered care: Assess level of patient's decisional conflict and provide appropriate support, education and resources
• Teamwork: Demonstrate awareness of personal strengths and limitations as well as those of team members	• Safety: Encourage a positive practice environment of high trust and high respect	• Teamwork: Use patient-engagement strategies to involve patients/families in the health care team; use communication practices that minimize risks associated with hand-offs among providers and across transitions of care
• Safety: Integrate strategies and safety practices to reduce risk of harm to patients, self, and others	• Evidence-based practice: Role model clinical decision-making based on evidence, clinical expertise, and patient/family/community preferences	• Safety: Report errors and support members of the health care team to be forthcoming about errors and near misses
		• Evidence-based practice: Implement care practices based on strength of available evidence
		• Health informatics: Search, retrieve, and manage data to make decisions using information and knowledge management systems

QSEN = Quality and Safety Education for Nurses.