Increasingly, educational institutions are being held accountable for the achievement of competence by their graduates. Public health and safety demand that graduates demonstrate safe and competent practice. In the United States, institutions receiving public educational funding and student financial aid are being required to demonstrate acceptable educational outcomes.

Accrediting agencies examine program outcomes as one measure of program quality. For example, the Accreditation Council for Graduate Medical Education is requiring specialty residency programs to report on student achievement of identified competencies and milestones in residency curricula (Green et al., 2009). U.S. nursing accreditation does not yet require data on individual student achievements, but looks at aggregate student outcomes for each program (Commission on Collegiate Nursing Education [CCNE], 2013). In addition, groups that certify graduates’ eligibility for licensure or advanced practice are requiring validation of graduates’ competence to practice.

Expectations for student performance occur at several levels: domains, competencies, and milestones. Domains are general categories of learning and performance (e.g., communication or leadership), while competencies are observable abilities demonstrated by health professionals that incorporate relevant knowledge, skills, values, and attitudes. Milestones, on the other hand, are observable developmental steps describing progression from beginning practice to proficient performance of a given competency.

The American Association of Colleges of Nursing (AACN) has identified essential domains of practice for baccalaureate, master’s, and doctoral (Doctor of Nursing Practice [DNP]) levels of education in its Essentials documents (AACN, 2006, 2008, 2011). These domains are depicted in Table 1. The domains of practice are similar, but include higher expectations of performance from one education level to the next. As we will see, this higher level of performance is reflected in the specific competencies to be achieved in each domain at progressively higher levels of education. Domains of practice have also been identified for a variety of specialty areas in nursing. For example, there are several core competency domains expected of all graduates of nurse practitioner (NP) programs (National Organization of Nurse Practitioner Faculties [NONPF], 2012). There are also specific domains related to specialty practice as an NP (e.g., pediatrics, women’s health, family practice). Practice domains have also been identified for other specialties, such as clinical nurse specialists (National CNS Competency Task Force, 2010) or community/public health nurses (Quad Council of Public Health Nursing Organizations, 2011).

The core domains of nurse practitioner practice are similar to those identified for the three levels of nursing education and include: (a) a scientific foundation for
practice, (b) leadership, (c) quality, (d) practice inquiry or scholarship, (e) technology and information literacy, (f) policy, (g) health care delivery systems, (h) ethics, and (i) independent practice (NONPF, 2012). Similar domains of practice have been identified for areas of NP specialization. For example, the identified practice domains for adult-gerontology NP practice include the following:

- Management of patient health status
- Nurse practitioner-patient relationships
- Teaching-coaching
- Professional role (e.g., advocacy, policy, evidence-based practice, safety, ethics, technology, etc.)
- Managing and negotiating health care systems
- Monitoring and assuring quality care, and
- Cultural sensitivity (AACN, John A. Hartford Foundation Institute for Geriatric Nursing, & NONPF, 2010).

In all of these documents, the domains identified are very global and do not lend themselves to assessment of specific student or graduate performance. For that reason, each domain includes several statements of competence to be demonstrated by graduates. Competence is the level of ability of a student or graduate in a particular domain. It is a trait or characteristic of an individual. A competency, on the other hand, is "an observable ability of a health professional integrating multiple components such as knowledge, skills, values, and attitudes (Frank et al., 2010, p. 641). Competencies are statements of expected final performance of graduates in a particular domain at the end of an educational program. Each identified practice domain typically includes several related competency statements.

The goal of health professions education is to foster development of a level of competence required for safe, high-quality practice. The achievement of a competency in a particular area does not, however, occur all at once. It is a progressive and incremental process that occurs with practice over time during the educational program. Milestones are developmental expectations that build toward competence in a particular area and reflect the spectrum of ability from novice to mastery of the competency. Milestones are defined as "observable developmental steps that describe progression from a beginning learner to the expected level of proficiency at the end of training" (Caverzagie et al., 2013, p. 557).

Milestones define the abilities expected of students as they progress through an educational curriculum and are directly linked to competencies and domains of practice. They are observable and are stated in behavioral terms, including descriptors of levels of performance, so they set the stage for assessing student/graduate competence. Finally, milestones lead to "entrustment decisions" (Caverzagie, 2012).

Entrustment decisions are a concept that has been

<table>
<thead>
<tr>
<th>Baccalaureate</th>
<th>Master’s</th>
<th>Doctoral (DNP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liberal education for generalist practice</td>
<td>Background for practice</td>
<td>Scientific underpinnings</td>
</tr>
<tr>
<td>Basic organizational and systems leadership</td>
<td>Organizational and systems leadership</td>
<td>Organizational and systems leadership</td>
</tr>
<tr>
<td>Scholarship for evidence-based practice (EBP)</td>
<td>Translating and integrating scholarship</td>
<td>Clinical scholarship and analytic methods for EBP</td>
</tr>
<tr>
<td>Information management and patient care technology</td>
<td>Informatics and health care technology</td>
<td>Information/systems technology and patient care technology</td>
</tr>
<tr>
<td>Policy, finance, regulation</td>
<td>Health policy and advocacy</td>
<td>Healthcare policy for advocacy</td>
</tr>
<tr>
<td>Interprofessional communication and collaboration</td>
<td>Interprofessional collaboration</td>
<td>Interprofessional collaboration</td>
</tr>
<tr>
<td>Prevention and population health</td>
<td>Clinical prevention and population health</td>
<td>Clinical prevention and population health (national)</td>
</tr>
<tr>
<td>Professionalism and professional values</td>
<td>Quality improvement and safety</td>
<td></td>
</tr>
<tr>
<td>Generalist nursing practice</td>
<td>Master’s level nursing practice</td>
<td>Advanced nursing practice</td>
</tr>
</tbody>
</table>

Table 1. AACN Domains of Practice by Educational Level.
specifically incorporated in medical education as “entrustable professional activities” or EPAs. EPAs describe a unit of work expected of a health care professional (Caverzagie, Hauer, Cornett, & Iobst, 2011), such as taking a medical history or performing a physical examination. An EPA indicates the point at which a student is judged capable of performing a specific activity without supervision (ten Cate & Scheele, 2007). For example, in nursing, we often trust prelicensure students to take blood pressures without supervision after the first clinical course, but do not allow them to insert an intravenous line independently until much later in the curriculum. Faculty can use the achievement of specific milestones to make entrustment decisions regarding specific activities critical to competent practice.

At the University of San Diego, Hahn School of Nursing, we have developed a set of domains for master’s and DNP level nurse practitioner practice based on the domains found in the work of several professional organizations. Within each domain, we have identified a set of competencies to be achieved during the curriculum, again based on the professional literature. Finally, for each competency, we have developed a set of milestones that describe exactly what the student should have accomplished with respect to the competency at specific points within the curriculum.

In developing the domains and related competencies, we incorporated several sets of professional nursing standards, including the AACN master’s and DNP Essentials, the NONPF core nurse practitioner competencies, and competencies developed for each of the nurse practitioner specialties offered in our program (adult-gerontology, family, pediatric, and psychiatric nurse practitioner). We then developed specific milestones related to each domain and competency across the master’s and doctoral curricula. The practice domains identified included: (a) independent practice, (b) evidence-based practice, (c) leadership, (d) technology and information literacy, (e) policy formation, (f) health delivery systems, (g) quality improvement, (h) ethics, and (i) communication.

Each domain includes several specific competencies to be accomplished throughout the NP education program, and each competency incorporates several designated milestones that represent expected levels of competence at different points in the curriculum. The competencies and milestones have been used to create grading rubrics or tools for standardized patient encounters (SPEs) in the nursing laboratory and for evaluating overall performance in clinical settings. SPEs are scripted interactions between students and actors portraying specific conditions. Students are evaluated on their ability to collect patient information, determine a diagnosis, and develop an appropriate management plan for the patient’s condition.

Table 2 presents milestones related to the development of assessment skills. The domain to be evaluated is that of independent practice as indicated at the top of the tool. The third column designates that the specific competency to be evaluated is the use of assessment skills to differentiate normal and abnormal findings. As indicated in the far left column, this competency arises from the independent practice competency IP-3b of the NONPF nurse practitioner core competencies (NPCC). In this case, as indicated in the third column, the competency includes several subcompetencies, the first of which reflects the ability to obtain a relevant health history. The remaining columns delineate the milestones or expected performance of the student related to history taking at specific points throughout the curriculum. The fourth column, for example, identifies the level of performance expected in the first semester of the program during the assessment and Primary Care I courses. Milestones in the fifth through eighth column define the level of performance expected in subsequent clinical courses (Primary Care IIA and IIB and Primary Care IIIA and IIIB). The eighth (PC IIIB) column reflects the highest level of competence expected of master’s graduates, but the final column reflects the higher level of competence in health assessment required of DNP graduates. The grading scale at the bottom of the table, allows the faculty member to rate the student’s performance with respect to this particular subcompetency. A zero indicates that the student is unable to demonstrate the subcompetency behavior at all.

The second (N/O) column can be used to indicate that the student has not yet had the opportunity to develop the particular competency delineated. This information might be used to arrange a subsequent clinical placement in which the student will have opportunities to demonstrate the competency.
Table 2. Sample Domain, Competencies, and Related Milestones.

<table>
<thead>
<tr>
<th>Domain: Independent practice</th>
<th>NPC</th>
<th>C</th>
<th>Competency</th>
<th>Assessment/Primary Care I</th>
<th>Primary Care IIA</th>
<th>Primary Care IIB</th>
<th>Primary Care IIIA</th>
<th>Primary Care IIIB</th>
<th>DNP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>IPg</td>
<td>Uses advanced health assessment skills to differentiate between normal, variations of normal, and abnormal findings</td>
<td>a. Obtains a comprehensive health history with few omissions and occasional prompting</td>
<td>a. Obtains a comprehensive health history with no prompting</td>
<td>a. Usually obtains a concise organized comprehensive health history without hesitation</td>
<td>a. Consistently obtains a concise organized comprehensive health history without hesitation</td>
<td>a. Has a consistent well-developed system for obtaining a comprehensive health history</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>b. Obtains collateral information as needed without prompting</td>
<td>b. Routinely identifies the need for and sources of collateral information as needed</td>
<td>b. Routinely identifies the need for and sources of collateral information as needed</td>
<td>b. Routinely obtains an appropriate focused health history in an organized manner</td>
<td>b. Routinely obtains an appropriate focused health history in an organized manner</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>c. Consistently obtains an appropriate focused health history with some prompting</td>
<td>c. Has a well-developed system for obtaining a comprehensive health history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 presents milestones for the second subcompetency related to assessment skills (assessing growth, development, and mental/behavioral health status). As depicted in the table, the milestones included in the four right hand columns are the same, indicating that the student should have mastered this subcompetency during the Primary Care IIB course and continues to exhibit the subcompetency throughout the rest of the curriculum. At the point of mastery of the subcompetency, the student would be judged capable of performing the activity without supervision. In other words, he or she has been “entrusted” with the responsibility for effectively performing the activity independently.

Milestones, such as those depicted in Tables 2 and 3, have been used to create specific grading tools or rubrics to assess student performance in a series of standardized patient encounters (SPEs), using live actors, that occur throughout the clinical course sequence. Multiple, specific identified competencies and milestones are incorporated into each SPE based on the intended focus of the exercise. Over the course of the NP program, students are evaluated on each competency in each domain, usually on multiple occasions, using similar rubrics or grading tools.

Effective assessment rubrics have several common characteristics. First, they specify precise expected student performance outcomes that ensure consistent assessment across all students. Second, they measure student outcomes based on real practice criteria. In addition, they provide documentation of student abilities and help to identify student weaknesses and areas for improvement. Finally, they assist faculty in making valid decisions regarding student progression and retention in the program.

Table 4 presents a partial grading rubric for an SPE related to care of a patient with asthma. This table represents milestones for student performance related to collection of subjective and objective data, as indicated in the left hand column. The remaining columns present milestones or levels of student performance with respect to the competency indicated at the top of the table: “Gathers and synthesizes essential and accurate information to define each patient’s clinical problem and management.” The “critical deficiencies” designation indicates the student is unable to demonstrate the expected behavior at all. The “heavy supervision” designation indicates that the student is able to demonstrate...
the desired behavior, but requires close supervision. “Light supervision” indicates that the student is able to demonstrate the behavior with limited supervision, and “no supervision” indicates that the student consistently demonstrates effective performance of the behavior and no longer requires supervision. This latter designation represents an entrustment decision. Finally, the “aspirational” rating reflects performance beyond the level of mastery of the behavior expected by the end of the educational program approaching expert performance.

Subsequent sections of the grading rubric evaluate the student’s ability to develop a differential diagnosis and a
plan of care. Other dimensions of competency (e.g., communication, professional demeanor, etc.) are also addressed using similar milestones and ratings.

The School of Nursing is currently testing the grading rubrics and comparing their usefulness to our prior global clinical assessment tools. At present, we are testing the rubric in SPEs in the nursing laboratory and will later expand the testing to the evaluation of students in clinical practice settings. During the SPEs, faculty have rated each student’s performance twice, once using the previous global assessment tool and once using the new grading rubrics. Thus far, the testing has extended over three semesters in the nurse practitioner curriculum. We also plan to conduct interrater reliability testing to determine the psychometric properties of the grading rubrics.

We have found that scores on the prior tool and the new grading rubric are highly correlated in the first semester of the program, but mean scores are consistently slightly lower on the milestone-based grading tool. In addition, the score ranges are larger on the new tool. These differences increase from the first semester to the second and from the second semester to the third. These findings suggest that the milestones-based rubrics are somewhat more effective in discriminating performance at the lower end of the grading spectrum and in identifying students who need assistance or who should not pass the SPE exercise or a whole course. This ability to discriminate between highly competent students and those with deficiencies increases with the increasing difficulty of the SPEs as the curriculum progresses. Further evaluation of the milestones-based tools is needed. We will continue to test the tools in the context of the SPEs, but this summer we will also begin to test the use of the tools in actual patient encounters in the clinical setting.

Competencies and milestones can also be used to facilitate overall program evaluation and to map curricular content to assure that essential content and learning experiences are include in curricula. Data on individual student performance can be entered into a central database that can be used to identify curricular weaknesses and foster educational program improvement. Such uses require the development of standardized computer platforms for data storage and retrieval, such as that being developed by MedBiquitous. Medbiquitous is a not-for-profit organization started by Johns Hopkins University that develops technology standards to “advance lifelong learning, continuous improvement, and better patient outcomes for the health professions” (MedBiquitous, 2014b).

Two of the authors of this paper have served as the nursing representatives to a MedBiquitous Competencies Working Group to develop a standardized XML data format for storing, retrieving, and sharing individual and group level student performance assessment data (MedBiquitous, 2014a). The MedBiquitous competency framework is described as a technical standard for representing competency frameworks in XML. Organizations that publish competency frameworks can do so in this standard format, making it easier to integrate competency frameworks into educational technologies like curriculum management systems. The standard allows medical schools and other health professions schools to connect their curriculum, learning resources, and assessment data back to a common set of competencies, ultimately enabling competency-based views of the curriculum and of learner performance (MediBiquitous, 2014a).

Once approved by the MedBiquitous membership, which includes representation from several health care disciplines, educational organizations, government agencies, software vendors, and others, the competency framework can be used to create assessment software programs that store student/program assessment data. The XML standard will allow presentation of performance levels or milestones in a standardized way that can be shared among multiple stakeholders for health professional education, such as licensing and certification groups, accreditors, program officials, and others.

Such a universal framework, based on competencies and milestones, will allow the standardization of assessment across disciplines and specialties. It can be used to compile data across courses, units, programs, and institutions, as well as serve as a potential data source for educational benchmarking and research (MedBiquitous, 2015). In order to use such a framework, however, nursing education programs need to identify the specific competencies required of their graduates and develop milestones that can be used to assess levels of performance in clinical practice. Our work constitutes a beginning in
that endeavor.

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