



Integrating Quality and Safety Competencies to Improve Outcomes

Application in Infusion Therapy Practice

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ABSTRACT

Despite intense scrutiny and process improvement initiatives, patient harm continues to occur in health care with alarming frequency. The Quality and Safety Education for Nursing (QSEN) project provides a roadmap to transform nursing by integrating 6 competencies: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. As front-line caregivers, nurses encounter inherent risks in their daily work. Infusion therapy is high risk with multiple potential risks for patient harm. This study examines individual and system application of the QSEN competencies and the Infusion Nurses Society's 2016 *Infusion Therapy Standards of Practice* in the improvement of patient outcomes.

Key words: competency, evidenced-based practice, infusion therapy safety, medication error, QSEN, quality improvement, patient-centered care, patient harm, patient safety, reflective practice, root cause analysis

CASE STUDY

An 85-year-old woman was admitted with sudden onset of dyspnea, pleuritic chest pain, and right upper arm edema. She had a peripherally inserted central catheter (PICC) placed 3 weeks previously for treatment of osteomyelitis of the left hand. A caretaker had been infusing her antibiotics and managing her PICC with the oversight of a home care nurse. A chest computerized tomography scan confirmed the presence of a pulmonary embolism. She was admitted to the inpatient floor at change of shift, and orders were

received for a weight-based heparin bolus and infusion. The bolus was administered, and the infusion was initiated. During report to the next shift, the pump alarm sounded. In responding to the alarm, the oncoming primary nurse discovered that the entire bag of heparin (25 000 units) had infused in less than 30 minutes. She discovered that the rate on the pump was set by the previous nurse at 600 mL/hour rather than the weight-adjusted 600 units/hour.

Preventable medical harm is an all-too-common event. In fact, a new report places medical error as the third leading cause of death in the United States,¹ estimating that 252 454 people lose their lives each year as a result of medical errors. Other reports are much higher. James² estimated that medical errors are responsible for 400 000 patient deaths each year. These staggering statistics have resulted in the development of a plethora of safety regulations, evidence-based practices, and process guidelines for safe care. However, the pernicious nature of medical errors raises serious questions: What factors are key to the continued threat of patient harm? Why do health care providers continue to take risks? What systems issues contribute to these errors? Is there a framework that can guide exploration of patient care issues to identify and correct factors that contribute to patient harm? What does this mean for the safety and quality practices related to particular areas of nursing practice such as infusion therapy?

When the Institute of Medicine (IOM) first reported the magnitude of the problem of patient deaths attributable to preventable harm in 1999,³ there was swift response. The IOM⁴ issued a comprehensive study on health professions

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education with the 6 essential competencies for all health professionals to be able to change practice and improve outcomes: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics (see Table 1). The Quality and Safety Education for Nurses (QSEN) project expanded that work with knowledge, skills, and attitude objective statements for each of these competencies. These statements, integrated into nursing education and nursing practice,⁵⁻⁷ can provide a framework to explore and prioritize education and process improvement in nursing practice.

As illustrated in the opening case study, infusion therapy carries significant potential for patient harm. As many as 90% of patients receive some form of infusion therapy, that is, medication administered via an injection device or a catheter.⁸ When considering the variation in infusion devices currently available, the large volume of solutions and medications that may be infused, and the many settings in which this practice occurs, it is clear that safe infusion therapy requires significant training and competency development. To guide this process, the Infusion Nurses Society has developed the *Infusion Therapy Standards of Practice* (the *Standards*)⁹ and resources to guide both competency development and safe infusion practices. This article seeks to provide guidelines to improve patient safety outcomes through the application of QSEN competencies and the *Standards* in the exploration of 2 infusion-related patient scenarios.

QUALITY AND SAFETY: INDIVIDUAL AND SYSTEM PERSPECTIVES

The imperative to improve quality and safety is chronicled in numerous reports from the IOM^{2,3,10,11} and examined throughout the professional literature.^{12,13} Preventable deaths are linked to human factors including poor communication among providers, fatigue, time pressures,

and system breakdowns.¹² Patient safety risks increase when nurses are overly focused on their list of tasks, when there are intense time pressures, and when limited resources or poorly designed protocols create work-arounds.¹⁰ Because of the incredible complexity inherent in health care, patient safety requires both individual- and system-level commitment to ensure prevention and early recognition of active and latent factors that increase the risk of patient harm.¹⁴

Defining Quality and Safety

Improvement in patient safety outcomes begins with a deeper awareness of how quality and safety are intertwined into daily practice routines. Safety can be defined as the elimination of risk. Safe nursing practice is focused on a consistent awareness of the potential risks for patient harm in a given setting. It is also reliant on specific nursing actions designed to reduce that risk, such as the use of the independent double check of a high-risk medication administration. These activities require consistent use by all staff, despite adverse conditions such as fatigue or work load.¹⁵ Quality determines effectiveness by examining how well something is completed. Through quality improvement processes, existing practice can be compared with evidence-based standards or best practices to identify gaps that may have contributed to unsatisfactory outcomes.¹⁶

Safety is compromised in process breakdowns and inadequacies in systems that contribute to gaps in quality, such as inadequate training for high-risk infusion therapy, broken equipment, and failure to support best practices. Quality improvement seeks to close identified gaps to achieve recognized benchmarks. An organization committed to safety focuses both on continuous quality improvement and on methods to identify and alleviate the risks inherent in practice. This process enables nurses and other staff to prevent errors by creating well-designed work flows, effective staff

TABLE 1

Quality and Safety Education for Nursing Competency Definitions

QSEN Competency	Definition
Safety	Minimize risk of harm to patients and providers through both system effectiveness and individual performance
Quality Improvement	Use data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems
Evidence-Based Practice	Integrate best current evidence with clinical expertise and patient/family preferences and values for delivery of optimal health care
Teamwork and Collaboration	Function effectively in nursing and interprofessional teams, fostering open communication, mutual respect, and shared decision-making to achieve quality patient care
Patient-Centered Care	Recognize the patient or designee as the source of control and full partner in providing compassionate and coordinated care based on respect for patient's preferences, values, and needs
Informatics	Use information and technology to communicate, manage knowledge, mitigate error, and support decision making

Data from Cronenwett, Sherwood, and Barnsteiner et al⁵; Cronenwett, Sherwood, and Pohl et al⁶; and Quality and Safety Education for Nurses.⁷

education, and triggers that increase awareness of certain high risks, such as using the drug library to support safe infusion therapy.

Building a Safety Culture to Improve Outcomes

A safety culture consists of the collective attitudes, beliefs, and behaviors of every worker in the organization regarding safety. A critical requirement is the development of a nonpunitive environment that enables the reporting of near misses and adverse events. Everyone in the organization must be committed to place safety at the center of all decisions despite obstacles.¹⁷ In addition, it is important to acknowledge that patient harm is rarely a result of the action(s) of a single individual. Patient harm is generally triggered by an adverse event that then triggers a cascade of subsequent events. This process typically is generated by the interaction of system weaknesses, an example of latent factors becoming active in the absence of preventive action.¹⁷

An important emphasis in a patient safety culture is an effective reporting system that encourages staff to report unusual incidents, process breakdowns, and other inadequacies. This ensures that appropriate actions can be taken to assure safe practice. Individual accountability is upheld, but the focus is placed on uncovering system flaws rather than placing blame on a single individual. Situations are examined for what can be learned to prevent future occurrences.¹⁵ When patient harm occurs, a sense of transparency allows trained experts to work with staff and the patients and their families to disclose the trajectory of what happened. Through analysis, disclosure, and redesign, this investigation results in the discovery and mitigation of the root causes that led to the critical event.¹⁴ This illustrates how responsibility for safety culture is intertwined between the organization and its workers. With a safety reporting system and a systematic process to investigate the event, such as a root cause analysis, latent factors in the procedural pathway can be discovered and redesigned to prevent future occurrences.

HEPARIN SCENARIO CONTINUED

The primary nurse who discovered the heparin error immediately disconnected the infusion, assessed the patient for signs of bleeding and notified the physician of the error. Appropriate precautions were enacted. She later filed an incident report. The subsequent investigation was conducted by the unit supervisor and the risk manager by interviewing involved staff. They found that the patient's admitting nurse, who administered the heparin bolus and infusion, was a traveling nurse who had been in the organization for 3 weeks and had been floated to the telemetry unit for the first time. She had been trained on an orthopedic unit and had not initiated a heparin infusion at this facility. She had not been assigned a buddy on the

unit, and because there had been several admissions and dismissals that shift, she became increasingly frustrated with the pace. The facility used an infusion pump that included a drug library, with medication-specific infusion limits for patient safety. She had been trained to use the infusion pump drug library in a brief orientation, but she had witnessed several nurses bypass this safety measure. In addition, although she had her heparin bolus and infusion calculations double checked by another nurse, she was not aware and was not prompted that this double check included review of pump settings. Finally, because of the influx of patients, change of shift report was hurried and did not include a bedside report to review infusions and patient status with the oncoming nurse. What appeared to be a serious individual error was in fact a complex series of failures in the facility's safety culture that placed a nurse in the very difficult position of making an error that placed a patient at risk of harm. Fortunately, no significant bleeding events occurred as a result of the error.

Applying the QSEN Competencies to Infusion Therapy

Historically, health professionals have focused more on knowledge (content) and psychomotor skill acquisition and less on shaping attitudes. The QSEN competencies integrate all 3: knowledge, skills, and attitudes. The goal of QSEN is to help nurses transform their practice by developing a mindset that integrates quality and safety into their daily work.⁵ This is the first step to recognize the active and latent flaws in health care that allow errors to occur. One tool that can be used to foster this transformation is reflective practice, defined as a systematic, mindful approach that encourages the exploration of one's actions and responses.¹⁸ Nurses advance their practice through reflection, analyzing events in their practice in the context of knowledge (what one knows), skills (what one can do), and attitudes (what one believes and values). By rethinking an event in the context of alternative actions for the future, nurses individually and collectively identify how they can improve their practice and feel more effective and satisfied. Improvements emerge from a mindset that continually questions attitudes, actions, and decisions in patient care and recognizes threats to safety. The heparin administration scenario demonstrates the threat to patient safety when attitudes about safety are relaxed and actions designed to promote safety are circumvented.

Infusion Therapy: Integrating the QSEN Competencies to Improve Practice Outcomes

Quality and safety begin with inquiry: asking questions about practice to recognize gaps in care, finding and applying current evidence applicable to each patient, and debriefing on what happened to determine improvements for future care. Medication errors are a leading factor in health care errors.¹¹ Medication administered via the intravenous (IV) route puts patients at higher risk as medication reaches the bloodstream immediately, leaving

TABLE 2

High-Risk Heparin Administration Scenario: Applying the QSEN Competencies^a with the *Infusion Therapy Standards of Practice*^b

Heparin 25,000 units delivered rapidly as a result of practice deviations in use of drug library and failure to perform full double check of high-risk medication.	
QSEN Competency	Scenario Application
Safety	<ul style="list-style-type: none"> The incident report was placed by the primary nurse and the event was reported in the facility-wide daily safety huddle. The unit supervisor met with staff to review investigation, debrief on circumstances that led to the error, and stress that the investigation was system focused rather than punitive.
Quality Improvement	<ul style="list-style-type: none"> The root causes analysis of the error found: <ul style="list-style-type: none"> Poor compliance with use of the drug library and with high-risk medication double checks, not only on this unit but on similar units. Both practices had been monitored, but inconsistently. Compliance rates had not been shared with staff. Orientation of traveling nursing staff was found to be inconsistent and outdated. Floating expectations were present but not adhered to.
Evidenced-Based Practice	<ul style="list-style-type: none"> The medication management team reviewed the high-risk medication policy and drug library settings for heparin to assure they met with current guidelines. Revisions were made with an education plan formed.
Teamwork and Collaboration	<ul style="list-style-type: none"> The unit nursing staff re-engineered the high-risk medication delivery process to include proactive scheduling with a coworker to be present at bedside and to perform the double check with independent calculations and the presence of the actual order and the pump settings at the bedside. The unit supervisor interviewed and worked with travelers and preceptors to identify gaps and redesign traveler orientation and floating guidelines. A thorough debriefing was performed to assist the traveling nurse to recognize not only her role, but the system gaps that contributed to the error.
Patient-Centered Care	<ul style="list-style-type: none"> A carefully crafted “lessons learned” was then shared with the nursing department to put a “face” to patient safety.
Informatics	<ul style="list-style-type: none"> Arrangements were made to post drug library compliance rates on the unit to assist staff in monitoring their progress. An electronic prompt was placed on the electronic medical record to prompt the bedside double check of heparin dosing. This also allowed for an automated report to more closely monitor the practice.
<p>Abbreviation: QSEN, Quality and Safety Education for Nurses. ^aData from Quality and Safety Education for Nurses.⁷ ^bData from the Infusion Nurses Society’s <i>Infusion Therapy Standards of Practice</i>.⁹</p>	

Related Standard

- Standard 11.1: The clinician reports and documents adverse events or serious adverse events (sentinel events) associated with infusion therapy. (S31)
- Standard 11, Practice Criteria E: Immediately investigate serious adverse events to ensure prompt action and improve safety. (S31)
- Standard 13, Practice Criteria C: Perform an independent double check by 2 clinicians for the organization’s high-risk medications that pose the greatest risk of harm. (S34)
 - Practice Criteria D.2: Regular education and training and assessment of use [of electronic infusion devices] are recommended for both routine users and new members (S34)
- Standard 5.1: As a method of public protection to ensure patient safety, the clinician is competent in the safe delivery of infusion therapy and vascular access device insertion and management within her or his scope of practice. (S18)
- Standard 6, Practice Criteria F: Analyze technology analytics, such as smart pumps and barcode medication administration, for errors, overrides, and other alerts so that improvements may be considered. (S22)
- Standard 11, Practice Criteria E.2: The clinician actively participates in the development, implementation, and evaluation of the improvement plan. (S31)
- Standard 5, Practice Criteria B: Use a standardized approach to competency assessment and validation across the health care system to accomplish the goal of consistent infusion practices. (S18)
 - Practice Criteria B.2: Link continuing competency assessment programs to meet patient needs and improve clinical outcomes. (S18)
- Standard 11, Practice Criteria F.1: Focus on fixing the system(s) and processes rather than blaming the clinician. (S31)
- Standard 11, Practice Criteria G: Communicate unanticipated outcomes and lessons learned to organizational leadership and clinicians. (S31)
- Standard 6, Practice Criteria C: Analyze infusion therapy practice processes and outcomes to determine when remediation, additional education, or other performance improvement action is needed for clinician(s). (S21)

TABLE 3

Central Line-Associated Bloodstream Infection (CLABSI): Applying the QSEN Competencies^a With Infusion Therapy Standards of Practice^b

Development of CLABSI/severe sepsis and ultimately death of a vulnerable patient due to breaches in central catheter care.		Related Standard
QSEN Competency	Scenario Application	
Safety	<ul style="list-style-type: none"> An RCA was performed. Questionnaires were designed to guide staff to reflect on their practices related to central catheter care. Throughout, a nonpunitive message was conveyed. Environmental tests of the patient rooms on the unit displayed high contamination on surfaces (IV pumps and poles). The RCA discovered multiple breaches in CVAD care when compared with infusion therapy standards of practice: <ul style="list-style-type: none"> very low hand hygiene compliance rates; omitting use of personal protective equipment; failure to change gloves when soiled; inadequate cleansing of needleless connectors before accessing IV tubing connector; inconsistent practices in central catheter dressing change and site assessment; lack of knowledge of the relevance of PICC distal tip malposition to patient safety and TPN delivery. Documentation on insertion indicated that 1 cm of catheter was exposed. Unit documentation failed to clarify when the catheter had migrated to 8 cm of catheter exposed. 	<ul style="list-style-type: none"> Standard 11, Practice Criteria E.3: Consider using an RCA or other systematic investigation or analysis for complex, recurrent problems and for "near misses." (S31) Standard 21, Practice Criteria B: Clean and disinfect durable medical equipment (DME) surfaces when visibly soiled, on a regular basis (eg, at a frequency defined in organizational policies and procedures) and at established interval during long-term single patient use. (S43) Standard 19, Practice Criteria C: Perform hand hygiene immediately in between each step of removing PPE (personal protective equipment) if the hands become contaminated, immediately after removing all PPE, and before leaving the patient's environment. (S41) <ul style="list-style-type: none"> Practice Criteria E.1: Change gloves during patient care when torn or heavily contaminated, or in moving from a contaminated body site to a clean body site. (S41) Standard 34, Practice Criteria F: Perform a vigorous mechanical scrub for manual disinfection of the needleless connector prior to each VAD access and allow it to dry. (S68) Standard 41, Practice Criteria H.4: Change the dressing immediately to closely assess, cleanse, and disinfect the site in the event of drainage, site tenderness, other signs of infection, or if the dressing becomes loose/dislodges. (S82) Standard 41, Practice Criteria D: Measure external CVAD length and compare with the external length documented at insertion when catheter dislodgement is suspected. (S82)
Evidenced-Based Practice	<ul style="list-style-type: none"> With bedside clinician input, the above variations were used to develop an educational program based on standards of practice guidelines and to revise departmental orientation of new hires and ongoing competency. Ongoing measures of unit-based CLABSI scores were posted to share unit process improvement progress. 	<ul style="list-style-type: none"> Standard 5, Practice Criteria D: Identify procedures, skills, tasks for ongoing competency validation by using clinical outcome data; adverse events, serious safety events, and sentinel events; changing patient populations served; and patient satisfaction data. (S19) Standard 6, Practice Criteria D: Evaluate the incidence of CLABSI regularly by: (3) Reporting results regularly to clinicians and leadership. (S21)
Teamwork and Collaboration	<ul style="list-style-type: none"> Throughout the analysis and process improvement, input was sought from the PICC team, the home care staff, and physicians. 	<ul style="list-style-type: none"> Standard 3, Practice Criteria D.2: Collaborate with members of the health care team toward the universal goal of safe, effective, and appropriate infusion therapy. (S13)
Patient-Centered Care	<ul style="list-style-type: none"> Patient-specific factors that contributed to the CLABSI were identified and reviewed with staff to improve care and to appreciate the patient cost of CLABSI. Based on family request, risk management fully disclosed outcomes of the investigation and actions taken to the patient's family. 	<ul style="list-style-type: none"> Standard 1.4: Infusion therapy is provided with attention to patient safety and quality. Care is individualized, collaborative, culturally sensitive, and age appropriate. (S11) Standard 11, Practice Criteria H: Ensure responsible disclosure of errors to patients. (S31)
Informatics	<ul style="list-style-type: none"> Revisions to the electronic medical record included prompts for evidence-based central catheter interventions, readily available resources for decision support, and a central catheter handoff tool to manage discharge communication to receiving facilities. Staff training was provided and outcomes monitored. 	<ul style="list-style-type: none"> Standard 11, Practice Criteria F.2: Advocate for teamwork interventions, including training and education (eg, focus on communication, leadership); work redesign (eg, change interactions such as multidisciplinary rounds); and use of structure tools and protocols (eg, handoff communication tools and checklists). (S31)

Abbreviations: CVAD, central vascular access device; IV, intravenous; PICC, peripherally inserted central catheter; RCA, root cause analysis; TPN, total parenteral nutrition; VAD, vascular access device.

^aData from Cronenwett, Sherwood, and Barnsteiner et al⁵; Cronenwett, Sherwood, and Pohl⁶; and Quality and Safety Education for Nurses.⁷

^bData from the Infusion Nurses Society's *Infusion Therapy Standards of Practice*.³

no room for error. Protocols must be followed precisely to ensure proper medication levels, to promote patency of the tubing or catheter, and to prevent infections.¹⁹ In addition, the wide diversity of Infusion therapy adds exponential risks with respect to practice aspects that occur in an endless variety of practice settings such as ambulatory care, home health, and long-term care. Because of the prevalence and risks involved in infusion nursing practice, this is an effective area of practice to demonstrate how the QSEN framework can be used to improve infusion therapy and contribute to safer patient care. The high-risk heparin case is a classic example (Table 2). It further illustrates how an individual nurse's error might be a symptom of larger process issues and how collaborative process improvement can be deployed to improve patient safety and quality care.

SECOND CASE SCENARIO: CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION

A 57-year-old woman with a complex history of bowel resection, complicated by dehiscence and infection, is admitted for wound debridement. She has had repeated admissions for wound infections. She previously had a tunneled central vascular access device (CVAD) that required removal because of suspected central line-associated bloodstream infection (CLABSI). Once cleared by infectious diseases, a nontunneled PICC was placed for IV antibiotics and total parenteral nutrition to be managed by a home care service. She stabilized, and arrangements were made for her to return to home with home health to follow. In reviewing the dismissal record, the home care nurse was unable to establish when the last PICC dressing change was performed, and could not determine initial insertion measurements (arm circumference and amount of catheter exposed). She noted that 8 cm of catheter was exposed, there was redness at the insertion site, and the dressing over the insertion site was loose. She also noted that the patient was febrile and complained of tenderness in the area of the PICC. She notified the primary physician of the concerns. The patient was seen in the clinic and readmitted for probable PICC-related infection. The home care nurse reported the incident to her supervisor, who in turn reported identified deviations to the director of the dismissal inpatient unit. The patient developed severe sepsis attributed to a confirmed CLABSI and ultimately died from multisystem failure.

Safety in Action: Infusion Therapy Standards of Practice

Preventable deaths are an unexpected result of the treatment and actions of caregivers, not from the course of the disease itself. Third-party payers are increasingly requiring health care systems to report quality and safety data and may deny reimbursement for patient interventions

resulting from poor care that harms patients, such as hospital-acquired infections, pressure ulcers, or medication errors.²⁰ The Centers for Disease Control and Prevention²¹ reports that although there has been a 46% decrease in CLABSIs in hospitals across the United States in recent years, an estimated 30 100 CLABSIs still occur in U.S. acute care facilities every year.

To improve CVAD outcomes, it is crucial for infusion therapists to recognize the inherent risks in CVAD management, how their individual actions match best practice standards, and how they have an impact on the CLABSI rate on their unit and in their facility.⁹ In the event of a CLABSI, performance of a gap analysis compares current care in the unit in question with existing standards of practice to identify deviations (Table 3). This enables redesign of existing protocols, implementation of a quality improvement processes to develop and deploy practice changes, and continual monitoring of infection rates to determine if outcomes improve.^{9,21}

QUALITY AND SAFETY IN INFUSION THERAPY

A patient safety culture is more than just knowledge and skill. It is a powerful framework that guides actions, decisions, and communication. It is a mindset shaped by the attitudes of nurses and other health professionals and fostered by thoughtful reflection. Every health care worker is accountable for quality and safety. Although safety improvements are approached from a systems perspective, each individual worker is responsible for developing the competencies that can reduce patient risk. As front-line caregivers, nurses are accountable for the essential knowledge, skills, and attitudes to improve care processes, to coordinate health care team communication, and to prevent patient harm. New generations of nurses in all settings are helping transform health care delivery to ensure it is safe, patient-centered, collaborative, based on evidence-based standards, and subject to continuous quality improvement and technologic advances. Systems with a culture of quality and safety support infusion nurses as they develop and apply their individual competencies to reduce the inherent risks in all of nursing but, in particular, improving infusion therapy by applying best practices with each and every patient every time.

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