Patient Safety in the Intensive Care Unit

Joint Commission Resources

Joint Commission International

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Contents

Contents

Introduction

Intensive care, also known as *critical care*, refers to the level of medical treatment provided to patients with acute life-threatening illnesses or injuries. These patients frequently have sustained or are at risk of suffering the failure of one or more vital systems, functions, or organs. As a result, these patients require intensive care and monitoring to support them while they recover from the underlying disease or injury. This care may be necessary over a period of hours, days, or weeks. Although intensive care may be provided at the scene of an accident; in an ambulance or medivac helicopter; in a hospital trauma center or emergency room; or in the operating room, it is most often provided in specialized intensive care units within a health care organization.

History and Background

The intensive care unit came into existence during the second half of the twentieth century. During World War II, isolated rooms in the hospital (known at the time as "shock wards") were set up as a place in which to resuscitate and care for injured soldiers before and after surgery. Following the war, a nurse shortage necessitated that postoperative patients be placed together in recovery rooms to ensure that they would receive the appropriate care and attention.

Using the recovery room as a model, hospitals began establishing intensive care units in the 1950s. Throughout the decade, the development of life-support technology and the realization that patients who required monitoring by trained specialists could be efficiently and effectively cared for if grouped and located together spawned the growth of intensive care units.[1]

The advent of life-support techniques, such as mechanical ventilation; prolonged endotracheal intubation; continuous electrocardiogram monitoring, bedside intravascular catheterization; analysis of respiratory gases in arterial and venous blood, closed-chest cardiac massage and defibrillation, and modern anesthesia, have contributed to the development of the intensive care unit and improved patient outcomes.[2] Specialized intensive care units were later developed to treat specific patient populations. For example, the use of mechanical ventilation to address the polio epidemic of the 1950s led to the establishment of respiratory intensive care units. Similarly, advances in cardiac medicine resulted in the development of specialized coronary care units.

By the late 1950s, approximately 25% of all U.S. community hospitals with more than 300 beds had an intensive care unit. By 1960, nearly every hospital had a recovery room, and by the end of that decade, most hospitals had at least one intensive care unit. In Europe, pediatric intensive care units were also being established (*see* Sidebar I-1, page vi, for current data on intensive care units and workers).

Leadership's Role in an Intensive Care Unit's Culture of Safety

This book's central theory is that patient safety and a culture of safety should be commonplace within the intensive care unit structure. All individuals should focus on maintaining a level of excellence in providing care, treatment, and services as a part of their daily performance, as high-quality performance takes on the identity of being personally responsible for a patient's outcome. Leaders demonstrate this commitment to high-quality performance by taking the appropriate actions toward developing teamwork structures, opening doors to discussions and communication, and encouraging internal and external reporting of concerns. The focus then turns toward systems and processes—not toward the individual providing care.

The focus should always remain on improving patient care and perfecting processes and systems to prevent adverse events rather than on placing blame or fixing problems after the fact. By creating such an environment, leaders can ensure that patients feel safe and that caregivers feel comfortable reporting errors and suggesting patient safety–related improvements.

Sidebar I-1: Global Intensive Care Facts

- More than 5 million patients are admitted to intensive care units each year in the United States.[1] Nearly 80% of all Americans will experience a critical illness or injury, as either the patient, family member, or friend of a patient.
- Mortality rates in patients admitted to the intensive care unit average 10% to 20% in most hospitals.[2]
- Overall, approximately 200,000 patients die in U.S. intensive care units each year.[4]
- The number of intensive care units in a hospital increases with the hospital's overall size. Small hospitals with fewer than 100 beds typically have just one intensive care unit, whereas larger hospitals, particularly those with more than 300 beds, typically have multiple intensive care units, most commonly designated as medical, surgical, and coronary care.[4] One study found that 167 intensive care units in Australia were composed of more than 3,000 beds and included 1,228 ventilator beds.[5] In India fewer than 10% of hospitals have properly equipped and staffed intensive care units; however, the number of nursing homes and small medical facilities with intensive care units is on the rise.[6]
- Patients in U.S. acute care hospitals receive more than 18 million days of care in intensive care units each year, with related health care costs estimated to be almost 1% of the U.S. gross domestic product.[7]

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Overview of This Book

Chapter 1, "Characteristics of the Intensive Care Unit and Improving Performance," describes the intensive care units of today, including the types of intensive care units, the levels of care provided in these units, and the typical profile of the patients treated in these units. This chapter also includes information on using performance improvement techniques to take a proactive approach to error reduction, and to help find solutions to problem areas in the intensive care unit.

Chapter 2, "Challenging Patient Care Issues in the Intensive Care Unit," discusses the challenges associated with providing safety in the intensive care unit, such as medication-related incidents; infection prevention and control; communication with patients, families, and friends; communication with other caregivers; and morbidity and mortality. Also addressed are some solutions to these challenges, including evidence-based guidelines and advanced training for critical care providers.

Chapter 3, "The Intensivist-Directed Critical Care Unit and Organizational Models for Patient Safety," explains the role of the critical care specialist physician (also known as the intensivist) and how the intensivist's responsibilities interconnect with those of the attending physician, critical care nurses, and others in the intensive care unit. This chapter also includes information about shortages of certain categories of critical care staff and strategies for overcoming these obstacles.

Chapter 4, "Patient Safety and the Multidisciplinary Approach to Care," discusses intensive care unit multidisciplinary teams that include the unit director, intensivist, critical care nurse, intensive care unit pharmacist, and respiratory care practitioner, as well as social workers, dietitians/nutritionists, pastoral care workers, and others. It also describes benefits and challenges of forming multidisciplinary teams.

Chapter 5, "Patient Safety and Telemedicine in the

Intensive Care Unit," addresses the pros and cons of telemedicine in the intensive care unit, including issues of confidentiality, credentialing and privileging, and liability.

Chapter 6, "Patient Safety Success Stories in the Intensive Care Unit," provides real-world examples from organizations throughout the world that have used some of the strategies outlined in this book to successfully improve patient safety and care in the intensive care unit.

Each chapter also includes special sidebars titled "Tracking Compliance." These sidebars discuss requirements and compliance information associated with The Joint Commission and Joint Commission International standards that organizations can use to ensure that they meet these requirements. Also available at the end of each of the first four chapters is the "Intensive Care Resources" section that provides information on models, principles, or techniques to use in the provision of care for the intensive care unit.

This book contains content and resources for readers outside of the United States (as well as readers who wish to benchmark international and domestic methods and techniques), where Joint Commission International has accredited more than 260 health care organizations in 37 countries. Accredited in 2007 by the International Society for Quality in Health Care, Joint Commission International focuses on improving the safety of patient care and helping organizations implement practical and sustainable solutions that include the intensive care unit. Readers around the world will be able to use the patient safety concepts and practical advice provided in this book in their hospitals, no matter their size or location.

Online Extras for *Patient Safety in the Intensive Care Unit* are available on our Web site at http://www.jcrinc.com/PSICU09/extras. The Online Extras consist of real-world examples provided by organizations around the world demonstrating successes in providing excellence in patient safety in the intensive care unit. In addition, Internet links to other helpful resources are provided to help guide enhanced care efforts in the intensive or critical care setting.

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- Porter Valparaiso Hospital Campus, Valparaiso, Indiana
- Severance Hospital, Seoul, South Korea
- Thailand's Ministry of Public Health

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Chapter 1
Characteristics of the Intensive Care Unit and Improving Performance

Intensive care as it is practiced today is a distinct medical discipline. Care is provided by teams of specially trained and experienced physicians, nurses, respiratory care technicians, pharmacists, and other allied health professionals who use their expertise and highly sophisticated care technologies to care for patients as they recover from serious illnesses or injuries.

Types of Intensive Care Units

Although smaller hospitals typically have one intensive care unit for all types of intensive care needs, many larger hospitals—particularly teaching organizations—often have a number of specialized intensive care units. Overall, these special units group together patients who are deemed recoverable but need special attention, or are likely to need specialized care by professional staff. Intensive care units have the following major characteristics:

- Space
- Equipment
- Specialized staff
- Continuous around-the-clock service and care

These settings are not available anywhere else within a hospital. Some of the likely conditions or patients to be treated in the intensive care unit include, but are not limited to, the following:

- Myocardial infarction patients who need continuous cardiovascular monitoring
- Patients who need artificial ventilation
- Patients with uncontrolled diabetes mellitus
- Patients who receive major abdominal surgery
- Patients with major trauma, such as head, chest, or multiple injuries
- Patients with severe infections

The following sections address various kinds of intensive care units.

Medical/Surgical/Respiratory Intensive Care Unit

The most common type of intensive care unit is the medical/surgical/respiratory unit where a variety of monitoring and treatment activities is performed. Patients who have various medical, surgical, and respiratory conditions may be admitted to this kind of unit. Hospitals may have separate medical, surgical, and respiratory intensive care units or some combination thereof.

Medical intensive care units primarily treat patients who require intensive care, such as sepsis, renal problems, or other conditions that would not be treated in another specialized intensive care unit. Surgical intensive care units and respiratory intensive care units treat critical surgical patients. A medical/surgical/respiratory intensive care unit may serve as the main intensive care unit, or there may be other specialty intensive care units, depending on the individual hospital's patient care needs.

Cardiac Intensive Care Unit

The cardiac unit, also called the coronary care unit or cardiac intensive care unit (CICU), provides heart rhythm monitoring and treatment for cardiac patients. Cardiac unit patients are afflicted with such conditions as myocardial infarction, angina, congestive heart failure, arrhythmias, and cardiomyopathy. Patients recovering from cardiac surgeries, such as cardiac angioplasty or the placement of stents, may also be admitted to this intensive care unit.

In addition, the CICU provides heart rhythm monitoring and treatments specialized for cardiac patients. For example, continuous monitoring of detailed electrocardiograms or thrombolytic therapy treatment is also available.

Neonatal Intensive Care Unit

A neonatal intensive care unit provides care for babies within the first 28 days of life. Infants might be admitted because they are premature, full-term but small for their age, in need of surgery, or in need of high-technology care—such as ventilators, incubators, or other specialized equipment.

Pediatric Intensive Care Unit

These dedicated units can improve survival, speed recovery, minimize disability, and relieve pain and suffering from critical illness and injury of the pediatric patient. Treatment for young patients, particularly in critical care situations, can be quite different from treatment for adults. Therefore, many hospitals have a pediatric intensive care unit (PICU)—an intensive care unit specializing in critical care for children from birth through their teenage years. (For more information on treating pediatric patients, *see* "Challenges in the Pediatric and Neonatal Intensive Care Units" in Chapter 2.)

Neurological Intensive Care Unit

The neurological intensive care unit (sometimes abbreviated as NICU, but not to be confused with the neonatal intensive care unit) provides monitoring and treatment of brain and spinal cord conditions. Patients with conditions such as head injuries or cerebrovascular accidents (such as stroke), those who have had neurovascular surgery, and patients who have infections of the central nervous system are among those who might be admitted to a neurological intensive care unit.

Neurological specialists are considered the last line of protection against neurological damage, including the following conditions:

- Subarachnoid hemorrhage
- Ischemic stroke
- Status epilepticus
- Traumatic brain injury
- Certain serious neuromuscular disorders (for example, myasthenia gravis or Guillain-Barré, which can cause life-threatening paralysis)
- Tumors or infections of the brain or spinal cord

The primary goal of the neurological intensive care unit is to preserve as much brain function as possible.

Trauma/Burn Intensive Care Unit

This unit provides major injury and wound care as well as treatments for patients with burns. Patients who have been involved in motor vehicle accidents, who have penetrating wounds (such as gunshot injuries), or who have severe burns are typically admitted to the trauma/burn intensive care unit.

Infection prevention and control is another primary concern, particularly for burn patients (*see* pages 49–53). Organisms can be found in the patient's skin from sources in the environment and from staff. Critical care professionals, such as physical and occupational therapists, dietitians, respiratory therapists, pastoral counselors, and social workers, collaborate as a team to tackle the various complications and needs associated with this unit.

Intermediate Intensive Care Unit

Also called step-down, telemetry, transitional care, or progressive care units, intermediate intensive care units provide treatment and/or monitoring for patients who do not need intensive care but need more care than can be provided on the general floors. These patients may require frequent monitoring of vital signs and/or nursing interventions but usually do not require invasive monitoring. Sidebar 1-1, pages 3–4, details the recommended criteria for admitting a patient to an intermediate care unit.

Other Uses for Intensive Care Units

In some smaller hospitals, the intensive care unit might be used as a recovery room after hours or on weekends, requiring the nurses to have the necessary competencies to help patients recovering from surgery. In addition, new technology frequently is introduced in an intensive care unit before staff members are trained in

Sidebar 1-1: Guidelines on Admission to Adult Intermediate Intensive Care Units

I. Admission Criteria

- **Cardiac System**
  - —Low-probability myocardial infarction; rule out myocardial infarction
  - —Hemodynamically stable myocardial infarction
  - —Any hemodynamically stable dysrhythmia
  - —Any hemodynamically stable patient without evidence of myocardial infarction but requiring temporary or permanent pacemaker
  - —Mild-to-moderate congestive heart failure without shock (Killip Class I, II)
  - —Hypertensive urgency without evidence of end-organ damage

- **Pulmonary System**
  - —Medically stable ventilator patients for weaning and chronic care
  - —Hemodynamically stable patients with evidence of compromised gas exchange and underlying disease with the potential for worsening respiratory insufficiency who require frequent observation and/or nasal continuous positive airway pressure
  - —Patients who require frequent vital signs or aggressive pulmonary physiotherapy

- **Neurologic Disorders**
  - —Patients with established stable stroke who require frequent neurologic assessments, frequent suctioning, or turning
  - —Acute traumatic brain injury patients who have a Glasgow Coma Scale above 9 but require frequent monitoring for signs of neurologic deterioration
  - —Stable severe traumatic brain injury patients who require frequent positioning and pulmonary toilet
  - —Subarachnoid hemorrhage patients postaneurysm clipping who require observation for signs of vasospasm or hydrocephalus
  - —Stable neurosurgical patients who require a lumbar drain for treatment of cerebrospinal fluid leak
  - —Stable cervical spinal cord injured patients
  - —Patients with chronic but stable neurologic disorders, such as neuromuscular disorders, who required frequent nursing interventions
  - —Grade I–II subarachnoid hemorrhage patients awaiting surgery
  - —Patients with ventriculostomies who are awake and alert awaiting ventriculo-peritoneal (V-P) shunt

- **Drug Ingestion and Drug Overdose**
  - —Any patient requiring frequent neurologic, pulmonary, or cardiac monitoring for a drug ingestion or overdose who is hemodynamically stable

- **Gastrointestinal (GI) Disorders**
  - —GI bleeding with minimal orthostatic hypotension responsive to fluid therapy
  - —Variceal bleeding without evidence of bright red blood by gastric aspirate and stable vital signs
  - —Acute liver failure with stable vital signs

- **Endocrine**
  - —Diabetic ketoacidosis patients requiring constant intravenous infusion of insulin or frequent injections of regular insulin during the early regulation phase after recovery from diabetes ketoacidosis
  - —Hyperosmolar state with resolution of coma
  - —Thyrotoxicosis hypothyroid state requiring frequent monitoring

- **Surgical**
  - —The postoperative patient who, following major surgery, is hemodynamically stable but may require fluid resuscitation and transfusion due to major fluid shifts
  - —The postoperative patient who requires close nurse monitoring during the first 24 hours. Examples include, but are not limited to, patients who have had a carotid endarterectomy, peripheral vascular reconstruction, or renal transplant; patients requiring V-P shunt revision; and neurosurgical patients requiring frequent neurological exams.

- **Miscellaneous**
  - —Appropriately treated and resolving early sepsis without evidence of shock or secondary organ failure

(continued on page 4)

Sidebar 1-1: Guidelines on Admission to Adult Intermediate Intensive Care Units (continued)

—Patients requiring closely titrated fluid management

—Obstetrical patients admitted at any point in their pregnancy and postpartum period for treatment of pre-eclampsia/eclampsia or other medical problems

—Any patient requiring frequent nursing observation or extensive time requirement for wound management who does not fall under the above categories may be considered for admission (for example, Addison's disease, renal failure, delirium tremens, hypercalcemia).

II. Patients Who Are Usually *NOT* Appropriate for Admission to Intermediate Intensive Care

- Complicated acute myocardial infarction with temporary pacemaker, angina, hemodynamic instability, significant pulmonary edema or significant ventricular dysrhythmias
- Patients requiring heavy nursing loads and titrated patient care of 12 to 24 hours per day
- Patients with acute respiratory failure who are recently intubated or at imminent risk of requiring intubation
- Patients requiring invasive hemodynamic monitoring with a pulmonary artery, left atrial catheter, or an intracranial pressure monitor
- Patients in status epilepticus
- Patients with catastrophic brain illness or injury who are not to be resuscitated and are not candidates for organ donation
- Patients from whom aggressive modalities of care are being withheld or have been withdrawn, such that they are receiving only comfort measures

These guidelines were developed by the U.S.–based Society of Critical Care Medicine, an association of 14,000 members in 80 countries.

Source: American College of Critical Care Medicine of the Society of Critical Care Medicine: Guidelines on admission and discharge for adult intermediate care units. *Crit Care Med* 26(3):607–610. Mar. 1998. Used with permission.

its use. For example, epidural pain management might be introduced in the intensive care unit, where the nurse-to-patient ratio might be more favorable than in other departments, before the entire staff is trained. After a comfort level is reached, the technology is implemented hospitalwide. Thus, the intensive care unit serves as a training ground for the use of new technology.

Levels of Critical Care

To help hospitals optimally match critical care services and personnel with community needs, the U.S.–based Society of Critical Care Medicine (SCCM), an association of 14,000 members in 80 countries, developed definitions for three levels of critical care that can be provided. (*See* the "Intensive Care Resources" section for additional information on Level I, II, and III critical care centers on pages 26–31.)

Level I Critical Care

These critical care centers have intensive care units that provide comprehensive care for a wide range of needs. Level I critical care requires continuous availability of sophisticated equipment, specialized nurses, and physicians with critical care training. Support services include pharmacy services, respiratory therapy, nutritional services, pastoral care, and social services. Although most of these centers fulfill an academic mission in a teaching hospital setting, some may be community hospital based. Level I critical care patients are at risk of their condition worsening and may need a higher level of care.

Level II Critical Care

Level II critical care centers have the capability to provide comprehensive critical care but may not have resources to care for specific patient populations (for example, cardiothoracic surgery, neurosurgery, or trauma). Although these centers may be able to deliver a higher quality of care to most critically ill patients, transfer agreements must be established in advance for patients with specific problems. The intensive care units in Level II centers may or may not have an academic mission.

Level III Critical Care

Hospitals that have Level III capabilities can provide initial stabilization of critically ill patients but are limited in the ability to provide comprehensive critical care. These hospitals require written policies addressing the transfer of critically ill patients to critical care centers that are capable of providing the comprehensive critical care required (Level I or Level II). These facilities may continue to admit and care for a limited number of intensive care unit patients when care is routine and consistent with hospital and community resources.[1]

Cooperation among hospitals and professionals is essential to ensure that appropriate numbers of Level I, II, and III intensive care units are designated within a given geographic region. A duplication of services may lead to underutilization of resources and underdevelopment of skills by clinical personnel, and it could be costly. State and federal governments should be encouraged to enforce the appropriate distribution of critical care services within a region and to participate in the development of referral and transfer policies.

Levels of Care and Patient Safety

Multiple studies have shown that the process of describing trauma centers according to resource-dependent levels has led to improvements in outcomes, including mortality and length of stay. One reason for these improvements is the changes in field triage and the early transport of trauma patients to such centers. When the patient is admitted, staff are specially trained and, consequently, proficient in treating injured patients. Staff are able to provide rapid and definitive care to patients after transport, and are able to provide ongoing intensive care to the patient during recovery.

Profile of the Intensive Care Unit Patient

Individuals of all ages suffer from critical illnesses and injuries when conditions lead to life-threatening malfunctions. Those who undergo major surgery have the potential to experience life-threatening problems as well, and thus are likely to be admitted to the intensive care unit.

Typical life-threatening illnesses include, but are not limited to, the following:

- Cardiovascular dysfunction (very high or very low blood pressure, myocardial infarction, severe heart failure, and shock)
- Pulmonary problems (pneumonia, severe asthma, and acute respiratory distress syndrome)
- Neurologically compromising conditions such as brain trauma, brain tumors, stroke, Reye's syndrome, and Guillain-Barré syndrome
- Endocrine disorders
- Metabolic disorders
- Neonatal complications (premature birth, low birth weight, and congenital abnormalities)
- Complications from infection (sepsis)
- Complications from extensive surgical procedures

Typical life-threatening injuries include, but are not limited to, the following:

- Brain injuries and other serious injuries to the head
- Trauma, such as motor vehicle accidents, penetrating wounds (gunshot or stab wounds), severe burns, falls, poisoning, overdoses, and industrial accidents

Indicators for Admission Criteria to the Intensive Care Unit

Patients are usually not admitted directly to the intensive care unit. Most of the time, patients are admitted from the emergency department or trauma center, the medical or surgical department, the operating room, or another facility. Admittance ranges as follows:

- *Emergency department:* Among U.S. patients who are admitted to the hospital from the emergency department, 14.8% are admitted to the intensive care unit. These are frequently patients who have suffered a trauma or serious burn, or who experienced medical complications at home and arrived at the hospital via the emergency department.[2]
- *Medical/surgical/respiratory unit:* These are intensive care unit patients admitted from general hospital units and may include patients who were stable earlier but who developed respiratory distress, shock, cardiopulmonary arrest, or other deterioration while being cared for elsewhere in the hospital. Because these patients require more invasive monitoring, as well as aggressive resuscitation or treat-

ment, they are sent to the intensive care unit where they can receive closer observation, more frequent measurement of their vital signs, mechanical ventilation, or other invasive interventions, such as pulmonary artery catheters or continuous venovenous hemofiltration. A recent study found there is significant variability in academic medical intenseive care units regarding how admission decisions are made because many of the organizations do not strictly apply the admission guidelines recommended by the SCCM and the American Thoracic Society.[3]

- *Operating room or postanesthesia care unit (PACU):* Patients admitted to the intensive care unit from the operating room or PACU are generally surgical patients who require invasive monitoring, mechanical ventilation, or resuscitation as they recover from surgery. Some patients are admitted to the intensive care unit before surgery because they require special preparation or monitoring before the procedure. In addition, some physicians place patients in the intensive care unit for preoperative and postoperative surgical care because invasive procedures can be performed there and because the intensive care unit offers more intensive nursing coverage than is available on the floors.[3]
- *Other facilities:* Smaller hospitals or health care facilities may transfer patients to a larger hospital for intensive care unit care simply because the smaller organization does not have the resources to provide the necessary level of care.[3]

Organization Policies and Procedures

Admission of adults to the intensive care unit is influenced by a number of factors. Among them are the severity and prognosis of acute and/or underlying illness or injury, current staff work load, the patient's treatment preferences, the type and location of the hospital, and the bed census.[4]

The primary indicator is whether the patient will benefit from the type of care provided in the intensive care unit. As a rule, based on data about predicting outcomes in intensive care units, only patients with reversible medical conditions and who, with the help of life-saving technology, have a reasonable chance of recovering should be admitted to the intensive care unit.[5] However, there is still some uncertainty as to exactly which patients should be intensive care patients. Consequently, many patients are admitted to the intensive care unit for observation, to facilitate intervention if they begin to deteriorate, or if they develop complications.

According to a number of studies, patients who are admitted to critical care units can be categorized into the following three groups[6]:

1. The first group is at low risk for mortality and requires minimal intervention. This group is estimated to constitute 30% to 40% of all intensive care unit admissions. Low-risk patients, who are typically admitted for metabolic disorders, trauma, and respiratory observation, are likely to get better without being admitted to the intensive care unit.
2. The second group, which makes up 10% to 20% of intensive care unit patients, is comprised of patients who have extremely long lengths of stay. These patients frequently have poor outcomes despite the best efforts of caregivers and use of considerable intensive care unit resources.
3. The third group is the majority of intensive care unit patients who will likely benefit from intensive care. Patients who seem to benefit the most from intensive care unit admission are moderately ill and unstable.

The hospital's policies and procedures should be designed in such a way as to ensure that admission criteria are followed so that intensive care unit beds are available to those patients who truly need them. In addition, policies should address how to handle any concerns about staff hierarchy or conflict of interest involving licensed independent practitioners and/or staff that may affect the safety or quality of care, treatment, and services, and hospitals should implement those policies when necessary.

Admission Criteria

Sound admission criteria can identify patients who will receive the most benefit from intensive care, ensuring that the hospital has the appropriate resources for those patients who truly need them. One study on per-

formance improvement initiatives in critical care reported that the use of appropriate admission criteria has been shown to contribute to a reduction in the number of low-risk patients admitted to critical care units by as much as 20% to 35%.[7] According to another study, many intensive care units have admission criteria that are vague, lack specific information, and are not enforced.[8]

Therefore, hospitals and their patients would be better served if the criteria in the intensive care unit admission policy included physiological parameters wherever possible. Physiologic parameters include vital signs, new laboratory values, new radiography/ultrasonography/tomography findings, electrocardiogram results, and the acute onset of physical symptoms. Examples of physiologic parameters for vital signs might include the following[8]:

- Pulse < 40 or > 150 beats/minute
- Systolic arterial pressure < 80 mm Hg or 20 mm Hg below the patient's usual pressure
- Mean arterial pressure < 60 mm Hg
- Diastolic arterial pressure > 120 mm Hg
- Respiratory rate > 35 breaths/minute

Models of Admission Criteria

The intensive care unit admission policy may be based on several models using prioritization, diagnosis, and objective parameters. The "Intensive Care Resources" section on pages 21–22 features models developed by the SCCM that can serve as guidelines for organizations looking to develop their own admission criteria.

Pediatric Admission Criteria

Because clinical criteria for treatment of pediatric patients are different from those for adults, the SCCM and American Academy of Pediatrics developed guidelines for organizations developing admission policies for the PICU. The "Intensive Care Resources" section, pages 23–25, provides those guidelines, which should be adapted and modified to each organization's policies and procedures about the nature and scope of the critical illnesses handled at the organization, as well as about the arrangements for interhospital transfer. In addition, physiologic parameters should be included to ensure that patients are appropriately triaged in and out of the PICU.

Improving Performance

There is always room for improvement in procedures and systems associated with patient care—and this includes the intensive care unit setting. Goals such as eliminating ventilator-associated pneumonia, decreasing incidents of central line–associated bloodstream infections, reducing methicillin-resistant *Staphylococcus aureus*, or selecting the patient conditions to be addressed by medical emergency teams are attainable when the organization incorporates performance improvement strategies within the intensive care unit.

More than ever, hospitals are challenged to provide high-quality, cost-effective care and to document and continuously improve care. As providers pursue health care economic resources, they must also demonstrate efficient care, treatment, and services that result in sustainable outcomes, improved health, and increased patient, family, and staff satisfaction. Using performance improvement methods in the intensive care unit is one way to address these challenges.

No matter the level of sophistication, improvements require a systematic and proactive approach—one that guides staff through the stages of improvement to ensure that improvements are based on sound data, thorough analysis, and the desired result. When striving for improvements in the intensive care unit, data measurement and assessment result in making the necessary improvements in this environment.

Performance Measurement

The goal of performance measurement is to collect valid, reliable data that will be used to assess how well a process in the intensive care unit is working and to find where specific improvements may be needed. Ongoing performance measurement can result in the creation of a database that contains information about outcomes, satisfaction, cost, and judgments about quality and value.

As with any process, certain elements, such as the following, need to be in place in order for performance measurement to function effectively[9]:

- A clear vision of what is being measured and why
- A team that is knowledgeable about measurement and improvement, as well as the process being addressed
- Effective data management
- Reliable tools for data collection, analysis, and presentation
- Comparative data on which to base improvement goals

Without these elements, a great deal of time and resources may be expended for little or no reason. Using these elements, begin identifying high-risk, high-volume, or problem-prone areas, based on the following definitions:

- *High-risk* refers to areas that are particularly vulnerable, fragile, or unstable. Consider the risk involved in caring for the population of the intensive care unit and the potential consequences of failing to provide correct treatment.
- *High-volume* refers to services that provide a specialized type of care or a service that is offered frequently, such as pediatric surgery, head trauma, or burns.
- *Problem-prone* refers to areas where procedures or processes have historically produced unsatisfactory results. Pay special attention to areas where processes break down or where outcomes are inconsistent.

Assessment

The goal of assessment involves translating data collected during measurement into information that can be used to draw conclusions about performance and to improve processes in the intensive care unit. Assessment should compare historical performance of the intensive care unit in addition to looking at an outside intensive care unit setting as a source for objective comparison. Benchmarking in the intensive care unit can be very helpful in assessment because it leads to continuous and comparative measurement of a process to determine or identify opportunities for improvement.[9]

Improvement Actions

Improvement actions should be based on the results of measurement and assessment. To improve a process in the intensive care unit, a team creates, tests, and implements specific innovations that may involve a rework of the process or the design of a new process.

The intensive care unit staff consists of skilled specialists using advanced technologies and treatments to care for a hospital's sickest patients. It is also an area that is high risk for occurrences of adverse events, system failures, or unforeseeable circumstances—adverse events can result in minor harm, serious harm, or even death. In addition, intensive care units tend to have high rates of "near misses" and potentially harmful errors.

Hospital leaders should provide the framework necessary to ensure safe performance and prevention techniques in the intensive care unit by incorporating planning, direction, and coordination of care for patient needs to improve health care outcomes. These techniques should be the cornerstone of the entire organization—the illustration of a culture of safety.

Identifying and Eliminating System Failures

Because of their serious medical conditions, intensive care patients are more susceptible to harm due to errors or other unexpected events. Therefore, a process for identifying system failures so they can be eliminated is vital to the operation of an intensive care unit.

Reporting Sentinel Events

One way to identify and eliminate system failures is to provide an anonymous method for hospital staff to report errors and other serious events. The Joint Commission maintains a Sentinel Event Database for that purpose. The Joint Commission defines a *sentinel event* as an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof.[10] Joint Commission International describes a sentinel event as an unanticipated occurrence involving death or major permanent loss of function.[11] *Serious injury* specifically includes loss of limb or function. The phrase "or the risk thereof" includes any process varia-

tion for which a recurrence would carry a significant chance of a serious adverse outcome. Such events are called "sentinel" because they signal the need for immediate investigation and response. The terms *sentinel event* and *medical error* are not synonymous; not all sentinel events occur because of an error, and not all errors result in sentinel events.

The Joint Commission's and Joint Commission International's Sentinel Event Policies are designed to improve patient safety in all health care organizations by working with and learning from organizations that experience serious adverse events in care. The policies encourage the self-reporting of sentinel events to promote learning about the relative frequencies and underlying causes of sentinel events and to share lessons learned with other health care organizations, thereby reducing the risk of future sentinel events in other organizations.

There are several advantages to reporting a sentinel event, such as the following:

- Early reporting provides an opportunity for consultation with The Joint Commission or Joint Commission International staff during the development of the root cause analysis (RCA) and action plan.
- The organization's message to the public that it is doing everything possible to ensure that such an event will not happen again is strengthened by its acknowledged collaboration with The Joint Commission or Joint Commission International to understand how the event happened and what can be done to reduce the risk of such an event occurring in the future.
- In the United States, reporting the event enables the addition of the lessons learned from the event to be added to The Joint Commission's Sentinel Event Database, thereby contributing to the general knowledge about sentinel events and the reduction of risk for such events in other organizations.

The Joint Commission's database of reviewed sentinel events categorizes the most common underlying causes of these events and the strategies that accredited organizations have used to reduce risk to patients. The Joint Commission, through its *Sentinel Event Alert,* regularly distributes to health care organizations information about specific types of sentinel events and how they can be prevented. The Sentinel Event policy, statistics from the Sentinel Event Database, and *Sentinel Event Alert*s are available on The Joint Commission's Web site at http://www.jointcommission.org/SentinelEvents.

When a sentinel event occurs, the accredited organization is required to complete a thorough and credible RCA, implement improvements to reduce risk, and monitor the effectiveness of those improvements. In addition, every 18 months Joint Commission–accredited health care organizations must choose a high-risk process on which to conduct a proactive risk assessment to attempt to uncover and resolve any potential system problems before a sentinel event occurs. Joint Commission International–accredited organizations must conduct and document use of a proactive risk reduction tool on one of its selected priority risk processes at least annually.

Sidebar 1-2, page 10, and Sidebar 1-3, page 11, address how a hospital can ensure that the requirements on this issue are being met. Sidebar 1-4, pages 12–13 , provides recommendations and risk reduction strategies from *Sentinel Event Alert* Issue 36 for preventing tubing misconnections.

Quality Assessment and Improvement in the Intensive Care Unit

To maintain high-quality practices and make improvements when necessary, it is important to have a process in place to track the quality of care in the intensive care unit, as well as in other care units in the organization. Many hospitals use a set of quality indicators, checklists, and other tools to ensure that staff follow best practices and to prevent major system problems before they result in sentinel events.

One such quality indicator set can be seen in Table 1-1, page 14. Maartje DeVos and other researchers who developed this set, based on recommendations from an expert panel and a feasibility study, note that such indi-

Sidebar 1-2: Tracking Compliance—Reporting Failures

The Joint Commission encourages organizations to provide and encourage the use of blame-free internal processes whereby staff can report a system or process failure, or the results of a proactive risk assessment. The following are some ways an organization can ensure its compliance with requirements:

- The hospital develops and disseminates a definition of a sentinel event. At a minimum, the definition should include the events that are subject to review by The Joint Commission. It may also include "near misses," (for example, any process variations that do not necessarily affect the outcome or result in an adverse event, but which could result in a serious adverse event if the process variation occurs again).
- The hospital should communicate to staff the processes for identifying and reporting sentinel events, both within the hospital and to relevant external agencies in accordance with appropriate laws and regulations.
- When sentinel events are reported and proactive risk assessments are conducted, the hospital should use the information gathered to make changes to processes and prevent further problems.

United States

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

cators should be considered dynamic: If an indicator does not seem to offer opportunities for improvement, it can be dropped; if other areas seem to require quality measurement, they may be added, depending on the needs of the unit and the organization.

To ensure that staff follow the practices set to maintain quality care, some organizations have instituted checklists of prophylactic measures, such as those seen in Table 1-2 on page 15. Instituting best practices is particularly challenging in high-volume units, but organizations using the checklist as part of the study saw improvement in every measure that was not already at greater than 95% compliance. They also found that completing this checklist required only a few minutes per patient and, therefore, that it was cost-effective and did not harm staff efficiency.

Root Cause Analysis

When an error or other adverse event occurs, an RCA can help determine exactly what happened. The goal of an RCA is to identify the cause of the incident so that processes can be changed to prevent the error in the future.

When a sentinel event occurs (*see* "Reporting Sentinel Events" earlier in this chapter), Joint Commission–accredited organizations are required to complete a thorough and credible RCA.[10] Starting in 2010, Joint Commission International–accredited hospitals and accredited ambulatory care organizations must also complete an RCA following a sentinel event. The Joint Commission has the following tools that can be used to help conduct an RCA:

- *Framework for Conducting a Root Cause Analysis and Action Plan:* This template aids in organizing the steps in an RCA and developing an action plan. A modified electronic version (Sentinel Event Root Cause Analysis Tool) is provided on Joint Commission–accredited organizations' extranet site when "Direct Submission" is chosen in response to a sentinel event.
- *RCA Matrix:* This matrix outlines detailed inquiry areas for more frequently reported types of events; it does not include every event type.

Both tools can be found at The Joint Commission's Web site at http://www.jointcommission.org/SentinelEvents/Forms/.

In addition, the following key activities are associated with each major milestone of conducting an RCA[12]:

- Organize a team.
- Define the problem.

Sidebar 1-3. Tracking Compliance—Sentinel Event Standard

Joint Commission International standard requirements state that each accredited hospital should establish an operational definition of a sentinel event. The organization's definition of a sentinel event may include other events as may be required by law or regulation or viewed by the organization as appropriate to add to its list of sentinel events. All events that meet the definition are assessed by performing a credible root cause analysis (RCA) *see* "Root Cause Analysis," beginning on page 10, for more information on RCAs). When the RCA reveals that systems improvements or other actions can prevent or reduce the risk of such sentinel events recurring, the organization redesigns the processes and takes whatever other actions are appropriate.

International

It is important to note that the term *sentinel event* does not always refer to an error or mistake or suggest any particular legal liability. The following are some ways an organization can ensure its compliance with sentinel event requirements:

- The hospital leaders establish a definition of a sentinel event that at least includes (1) unanticipated death unrelated to the natural course of the patient's illness or underlying condition; (2) major permanent loss of function unrelated to the natural course of the patient's illness or underlying condition; and (3) wrong-site, wrong-procedure, wrong-patient surgery.
- The organization conducts an RCA on all sentinel events during a time specified by the hospital's leaders.
- Events are analyzed when they occur.
- Hospital leaders take action on the results of the RCA.

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

—Choose the area(s) for analysis.
—Develop a plan.

- Determine what happened and why (proximate cause).
  —Identify process problem(s).
  —Determine which patient care processes are involved.
  —Determine factors closest to the event.
  —Extract measurement data.
- Identify root causes.
  —Determine which systems are involved.
- Design and implement an action plan for improvement.
- Identify risk reduction strategies.
  —Formulate actions for improvement (considering actions, measures, responsible party, and desired completion date).
  —Consider the impact of the improvement action.
- Design improvements.
- Implement action plan.
- Measure effectiveness.
  —Develop measures of effectiveness.
  —Assure success of measurement.
- Evaluate implementation efforts.
- Communicate results.

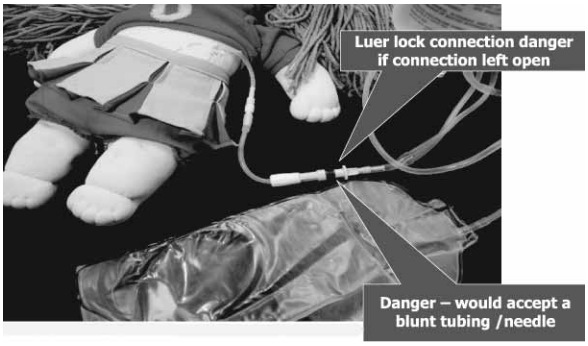
In preparing an RCA in response to a sentinel event that is reviewable by The Joint Commission or Joint Commission International, remember that the analysis must be completed no more than 45 days after the event's occurrence or after becoming aware of the event.

Benefits of Root Cause Analysis

Why conduct RCAs in the intensive care unit? All hospital units experience problems of varying magnitude. The intensive care unit can improve its operations and care provided through probing and addressing the roots of any problems that arise. Individual accountability should not be the focus when a problem occurs. The focus should be on system processes, how to improve the system, and how to reduce the risk of reoccurrence.

RCA helps the intensive care unit identify risks or

Sidebar 1-4: *Sentinel Event Alert* Issue 36: Tubing Misconnections



Tubing and catheter misconnection errors are an important and underreported problem in health care organizations. In addition, these errors are often caught and corrected before any injury to the patient occurs. Given the reality of and potential for life-threatening consequences, increased awareness and analysis of these errors—including averted errors—can lead to dramatic improvement in patient safety.

Many misconnection cases involve *luer connectors*—small devices used in the connection of many medical components and accessories. There are two types of luer connectors: slips and locks. A luer slip connector consists of a tapered "male" fitting that slips into a wider "female" fitting to create a secure connection. The luer lock connector has a threaded collar on the "male" fitting and a flange on the "female" fitting that screw together to create a more secure connection.

Examples of misconnections involving luer connectors include the following:
- Capnography sampling tube to an intravenous cannula
- Enteral feeding set to a central venous catheter
- Enteral feeding set to a hemodialysis line
- Noninvasive blood pressure insufflation tube to a needleless intravenous (IV) port
- Oxygen tubing to a needleless IV port
- Sequential compression device hose to needleless "piggy-back" port of an IV administration set

Root Causes Identified
Luer connectors contribute to errors because they enable functionally dissimilar tubes or catheters to be connected. Another identified cause is the routine use of tubes or catheters for unintended purposes, such as using IV extension tubing for epidurals, irrigation, drains, and central lines or to extend enteric feeding tubes. Functionally dissimilar tubes used in patient care can be in close proximity to one another.

Risk Reduction Strategies
Broad ranges of medical devices that have different functions and that access the body through different routes are often outfitted with luer fittings that can be easily misconnected. Organizations in Europe and the United States are now developing standards to restrict the types of devices that use luer fittings in an attempt to mitigate misconnection hazards.

The Joint Commission offers the following recommendations and strategies to health care organizations to reduce tubing misconnection errors:
- Do not purchase nonintravenous equipment that is equipped with connectors that can physically mate with a female luer IV line connector.
- Conduct acceptance testing (for performance, safety, and usability) and, as appropriate, risk assessment (for example, failure mode and effects analysis) on new tubing and catheter purchases to identify the potential for misconnections and take appropriate preventive measures.
- Always trace a tube or catheter from the patient to the point of origin before connecting any new device or infusion.
- Recheck connections and trace all patient tubes and catheters to their sources on the patient's arrival to a new setting or service as part of the handoff process. Standardize this "line reconciliation" process.
- Route tubes and catheters that have different purposes in different standardized directions (for example, IV lines routed toward the head; enteric lines toward the feet). This is particularly important in the care of neonates.
- Inform nonclinical staff, patients, and patients' families that they must get help from clinical staff whenever there is a real or perceived need to connect or disconnect devices or infusions.
- For certain high-risk catheters (for example, epidural, intrathecal, or arterial), label the catheter and do not use catheters that have injection ports.

Sidebar 1-4: *Sentinel Event Alert* Issue 36: Tubing Misconnections (continued)

- Never use a standard luer syringe for oral medications or enteric feedings.
- Emphasize the risk of tubing misconnections in orientation and training curriculum.
- Identify and manage conditions and practices that may contribute to health care worker fatigue and take appropriate action.

In addition, The Joint Commission urges product manufacturers to implement "designed incompatibility," as appropriate, to prevent dangerous misconnections of tubes and catheters.

Source: The Joint Commission: Tubing misconnections—A persistent and potentially deadly occurrence. *Sentinel Event Alert* 36, Apr. 3, 2006. http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_36.htm (accessed Nov. 15, 2009).

weak points in processes, determine underlying or system causes, and implement corrective actions. Moreover, information from RCAs that is shared between units may help to prevent future errors and may contribute to proactive improvement efforts in the intensive care unit.

Failure Mode and Effects Analysis

The failure mode and effects analysis (FMEA) technique is based on aptly studied engineering principles and approaches to designing systems and processes. Included in engineering approaches are human factors, formal systems analysis, and team training (*see* Chapter 4 for more information on team training). The goal is to achieve optimal performance and to proactively eliminate the possibility of errors. The ultimate goal of FMEA, when used in the intensive care unit, is to prevent bad outcomes and ultimately to prevent harm to patients. The greatest strength of FMEA lies in its ability to focus on the process of redesigning potentially problematic processes to prevent the occurrence of failures.[13]

FMEA is performed as follows:

- The FMEA team identifies each step in an intensive care unit process or subprocess and the relationships between those process steps.
- The team identifies potential failures involved in each process step in terms of failure modes or symptoms.
- For each failure mode, the team studies the effect(s) on the total process.
- When potential effects are intolerable, the team devises and implements actions to eliminate the possibility of error, stop an error before it reaches the patient, or minimize the consequences of an error.
- The team reviews and revises, as necessary, the action or actions being taken or planned to minimize the probability or effect of failure.

The FMEA process can be further broken down into the following eight steps:

1. Select a high-risk process and assemble a team.
2. Diagram the process.
3. Brainstorm potential failure modes and determine the effects of the failure modes.
4. Prioritize failure modes.
5. Identify root causes of failure modes.
6. Redesign the process.
7. Analyze and test the new process.
8. Implement and monitor the redesigned process.

Benefits of Failure Mode and Effects Analysis

Fundamental reasons the intensive care unit should conduct an FMEA are that FMEAs have been proven to reduce the risk of error and increase the performance of a process, enhance the quality of care, improve financial performance, and bring a team approach to increase creativity, knowledge, and experience in intensive care process improvement.

To ensure successful use of FMEA, the following elements are essential:

- *Leadership support:* Leaders must be committed to

Table 1-1: Quality Indicators for the Intensive Care Unit

Indicator	
Structure	
Availability of intensivists (per hour)	The average couple of hours per day that an intensivist is available within 5 minutes at the intensive care unit, including weekends
Patient-to-nurse ratio (measured 3 times daily)	Number of intensive care unit patients present compared to the number of qualified intensive care unit nurses who are available in day shift, evening shift, and night shift. Student nurses are not included.
Strategy to prevent medication errors	Strategy to prevent medication errors measured by 10 items, yes or no
Measurement of patient/family satisfaction	Whether or not a registration of patient/family satisfaction is present
Process	
Length of intensive care unit stay	Days of intensive care unit stay in a particular period compared to the total number of discharged patients at the intensive care unit in the same time period
Duration of mechanical ventilation	Days of mechanical ventilation of the intensive care unit patients compared to the total number of mechanically ventilated patients
Percentage of days with all intensive care unit beds occupied	Days of 100% bed occupation compared to the total number of days in the same period
Percentage glucose measurements greater than 8 mmol/L or lower than 2.2 mmol/L	Number of measurements greater than 8 mmol/L or lower than 2.2 mmol/L compared to the total number of glucose measurements
Outcome	
Standardized mortality (APACHE II)	(A) Mortality rate in the intensive care unit compared to the total number of intensive care unit patients (B) Mortality rate in the hospital compared to the expected mortality rate based on average
Number of unplanned extubations	Number of unplanned extubations (per 100 ventilation days) in a period compared to the total days of mechanical ventilation in the same period
Incidence of decubitis	Number of intensive care unit patients with incidence of decubitis, level 3 or 4, compared to the total number of treated patients in the same period

This is a list of several quality indicators that organizations can measure within their intensive care units.

Source: De Vos M., et al.: Quality measurement at intensive care units: Which indicators should we use? *J Crit Care* 22:267–274, Dec. 2007. Used with permission.

using the FMEA process in the intensive care unit. Leadership approval and guidance help in obtaining the necessary resources, responding to findings, and encouraging the regular use of FMEA with staff—not just as extra work.

- *A focus on and commitment to safety:* The ultimate goal is to provide services to the intensive care patient at the highest possible level of care. FMEA ensures the identification of improvement so that processes do not present a safety risk to the patient.
- *Continuous and strategic performance improvement:*

Table 1-2: Quality Rounds Checklist

Age	
Gender	
Intensive Care Unit Day	
Peptic Ulcer Disease Prophylaxis	
Deep Vein Thrombosis/Pulmonary Embolism Prophylaxis	
Central Line Day	
Sedation Holiday	
Glucose Control Type	
Low Blood Glucose Level for 24 Hours	
High Blood Glucose Level for 24 Hours	
Intubated Only:	
Vent Day	
Intubation Method	
Low Tidal Volume	
Assessed for Weaning Protocol	
Gross Contamination of Respirator Circuit	
Continuous Subglottic Suctioning	
Code Status	
Head of Bed Elevation at Least 30 Degrees	
Nutrition Evaluated	
Antibiotic Need/Culture Evaluation	
Invasive Device Need Considered	

Source: DuBose J.J., et al.: Measurable outcomes of quality improvement in the trauma intensive care unit: The impact of a daily quality rounding checklist. *J Trauma* 64:22–27, Jan. 2008. Used with

It is imperative that the intensive care unit maintain an environment that values performance improvement and uses FMEA results to help direct future improvement goals in the unit. FMEA must be an integral part in measurement systems in the intensive care unit.

- *Effective information management:* The intensive care unit must be committed to obtaining, managing, and using information to help improve outcomes. FMEA depends on reliable and available data about the performance of processes in the intensive care unit to produce timely and accurate procedures and processes that are well documented.
- *Trained and qualified staff:* FMEA teams include individuals who are trained in the use of FMEA and other performance improvement techniques and tools and who are knowledgeable about the intensive care unit processes under study.

Six Sigma

Another proactive approach to reducing errors in the intensive care unit is Six Sigma, a quality improvement methodology that reduces variation in a given process to get as close to zero defects as possible (*see* Chapter 4 for more information on zero defects). *Sigma* is another word for standard deviation. The higher the sigma number, the fewer the defects. At Six Sigma, the level of defects is 3.4 in 1 million. Because of the complexities in health care, sigma levels in many processes are currently 1 to 2 sigma, with organizational goals and targets of 3 to 4 sigma quality.

Six Sigma methodology is a data-driven, problem-solving approach that enables multidisciplinary teams to systematically address the root cause of a process problem, determine measurement systems that are accurate, systematically determine solutions based on root cause, and initiate a control system that is effective in the elimination of future errors or defects. If you can measure how many defects are in a process, you can then figure out how to eliminate the defects in a systematic way. A defect in the intensive care unit could mean that you are failing to meet a patient's needs.

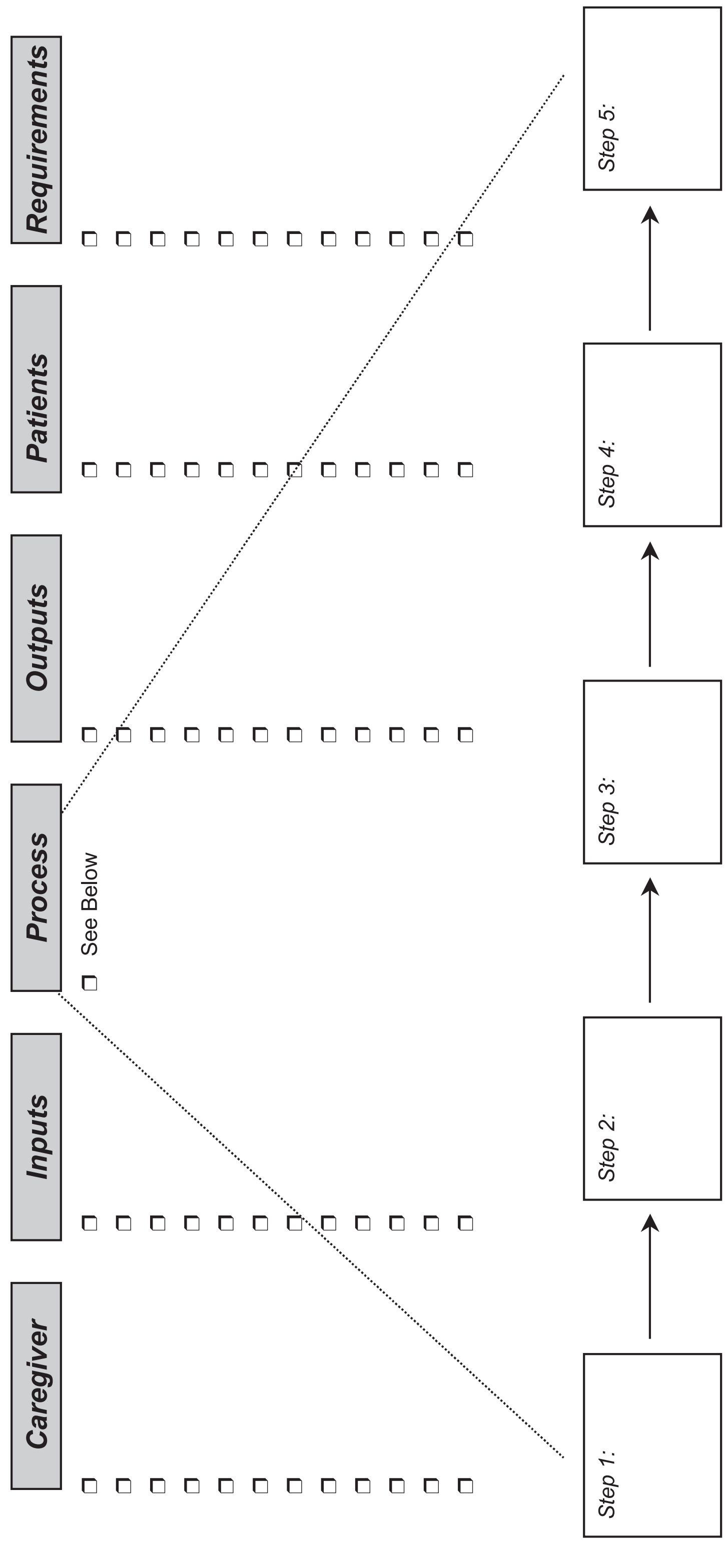
The following are the five basic steps involved in Six Sigma methodology[14]:

1. *Define the problem:* This step involves identifying the process, the goals and objectives of the process, the current knowledge about the process, the benefits of the process, and a time line for process completion. Tools that can be used to define a given process problem are the Caregivers, Inputs, Process, Outputs, Patients (CIPOP) diagram (*see* Figure 1-1, page 16); process map (*see* Figure 1-2, page 17); and affinity diagram (*see* Figure 1-3, page 18).
2. *Measure:* This step uses flowcharts, cause-and-effect diagrams, and other quality improvement tools to

Figure 1-1: Sample Caregivers, Inputs, Process, Outputs, Patients (CIPOP) Diagram

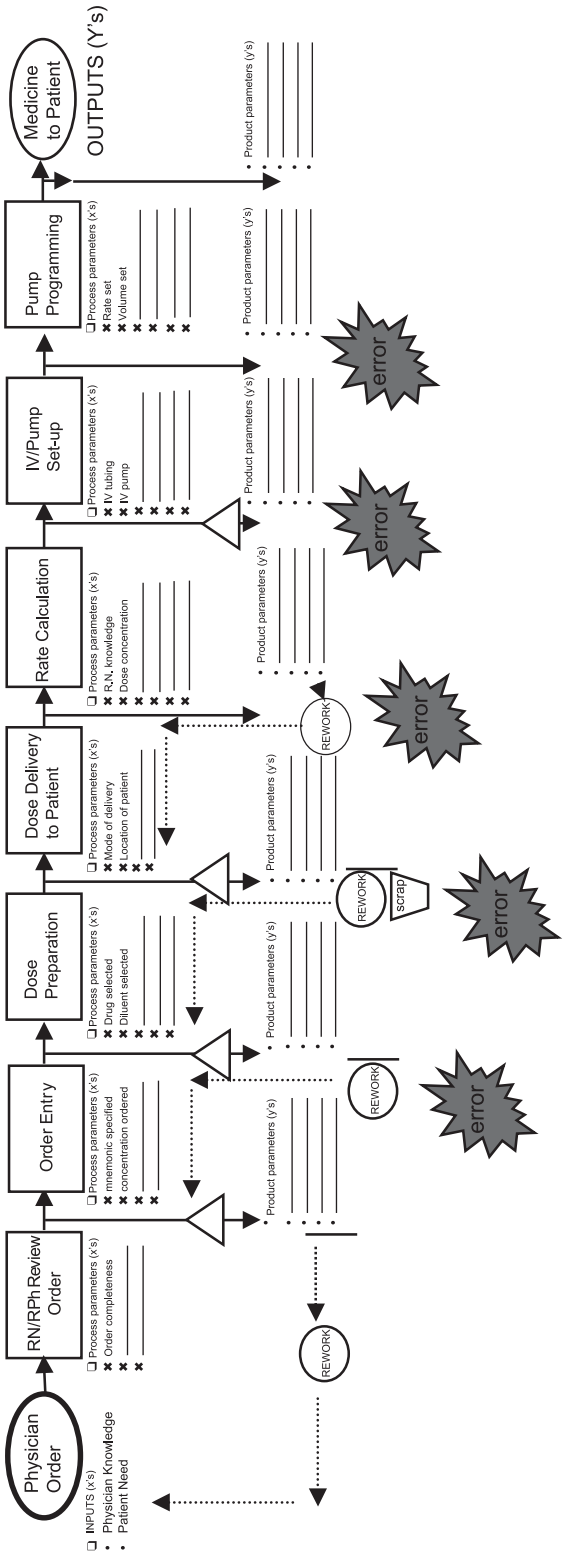
The CIPOP diagram is very easy to complete when following these steps:

- Create an area that will allow the intensive care team to post any additions to the CIPOP diagram. This could be a transparency sheet (to be used with an overhead projector) with the CIPOP model as a template, a flip chart of page headings with the initials CIPOP written on each page, or the CIPOP initials written on separate adhesive notes that are posted on a wall.
- Begin with the process. Map it in four to five high-level steps.
- Identify the outputs of this process.
- Identify the patients who will receive the output(s) of this process.
- Identify the inputs required for the process to function properly.
- Identify the caregivers of the inputs that are required by the process.
- Identify the preliminary requirements of the patients, which will be verified during a later step of the Six Sigma measurement phase.



Source: Joint Commission Resources, 2009.

Figure 1-2: Sample Process Map



This mapping method uses general symbols to show the flow of a process. MD, physician; RN, nurse; RPh, pharmacist; IV, intravenous; pt, patient.

Source: Joint Commission Resources, 2009.

To create an affinity diagram, sort a brainstormed list by moving ideas from the brainstorm list into affinity sets and creating groups of related ideas.

As you sort ideas, do the following:

☑ Group together ideas that appear to belong in the same group.
☑ Clarify any ideas in question.
☑ Place an idea into more than one affinity set if appropriate.
☑ Look for small sets. Should they belong in a larger group?
☑ Do large sets need to be broken down?
☑ When most of the ideas have been sorted, enter titles for each affinity set.
☑ Discuss ideas with all involved, including stakeholders, for verification.

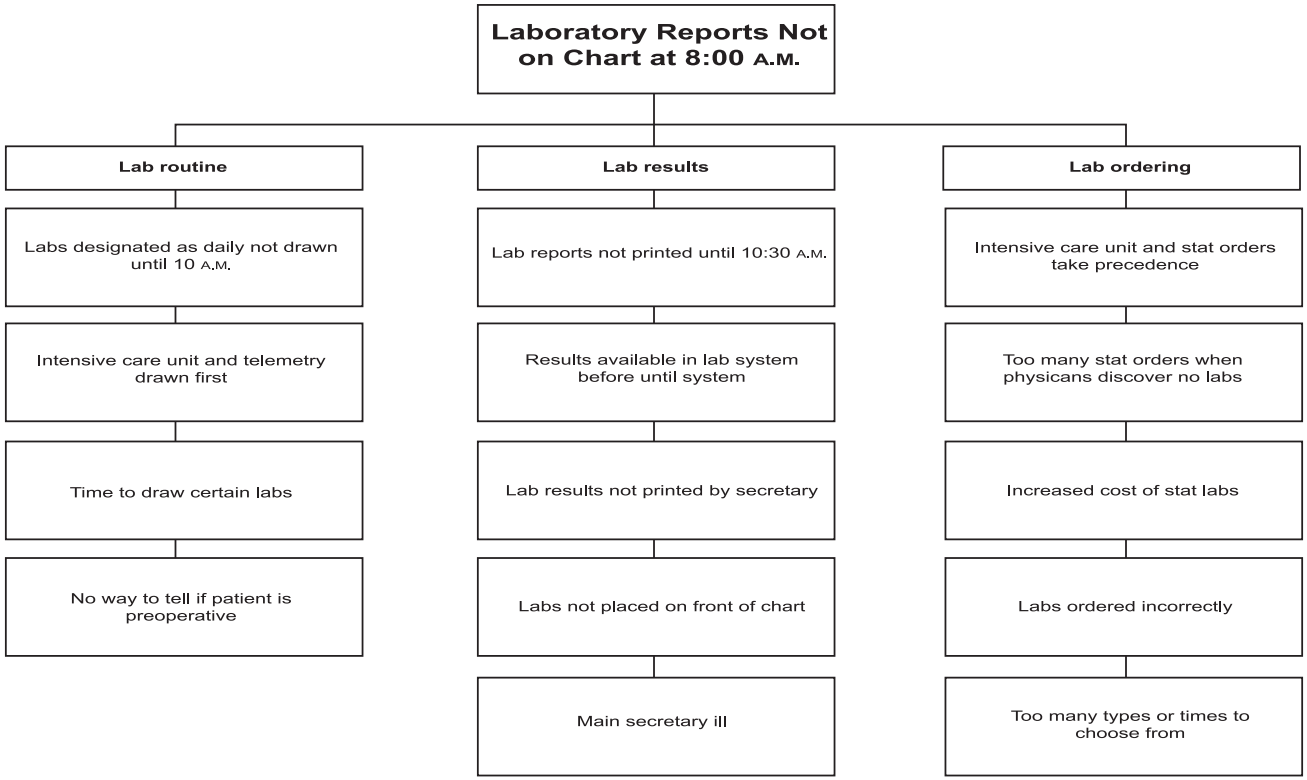


Figure 1-3: Sample Affinity Diagram

Source: The Joint Commission: *Root Cause Analysis in Health Care: Tools and Techniques,* Fourth Edition. Oakbrook Terrace, IL: Joint Commission Resources, 2010.

identify contributions to a process that can cause problems. The primary outcome of the measure phase is a data collection plan and a measurement system analysis that determines that the data collected are accurate and reliable.

3. *Analyze:* This step requires teams to look at how a process is currently being performed and to identify potential areas of failure. This stage also involves determining how potential issues should be addressed and how difficult it will be to address them. The primary outcome of the analyze phase is the determination of the critical few variables that are significant to the root cause(s) of the problem.
4. *Improve:* In the improve phase, teams must show evidence-based improvement as a result of implemented ideas. The improve phase targets improvements focused on the critical few variables that impact performance. Solutions are typically pilot tested and refined prior to full deployment.
5. *Control:* In this phase, any improvements are sustained. The primary deliverable of the control phase is a control plan that documents the outcome measures over time for performance monitoring. A common tool used in this phase is a statistical process control chart (*see* Figure 1-4, page 20).

Robust Process Improvement™

Robust Process Improvement™ (RPI) is the Joint Commission's systematic methodology for improving processes, which seeks to increase the quality and efficiency of processes and services in a continuous manner. The successful adoption of RPI techniques can produce substantial improvements in quality of care for the intensive care patient.

RPI consists of a set of strategies, tools, methods, and training programs aimed at achieving the following:

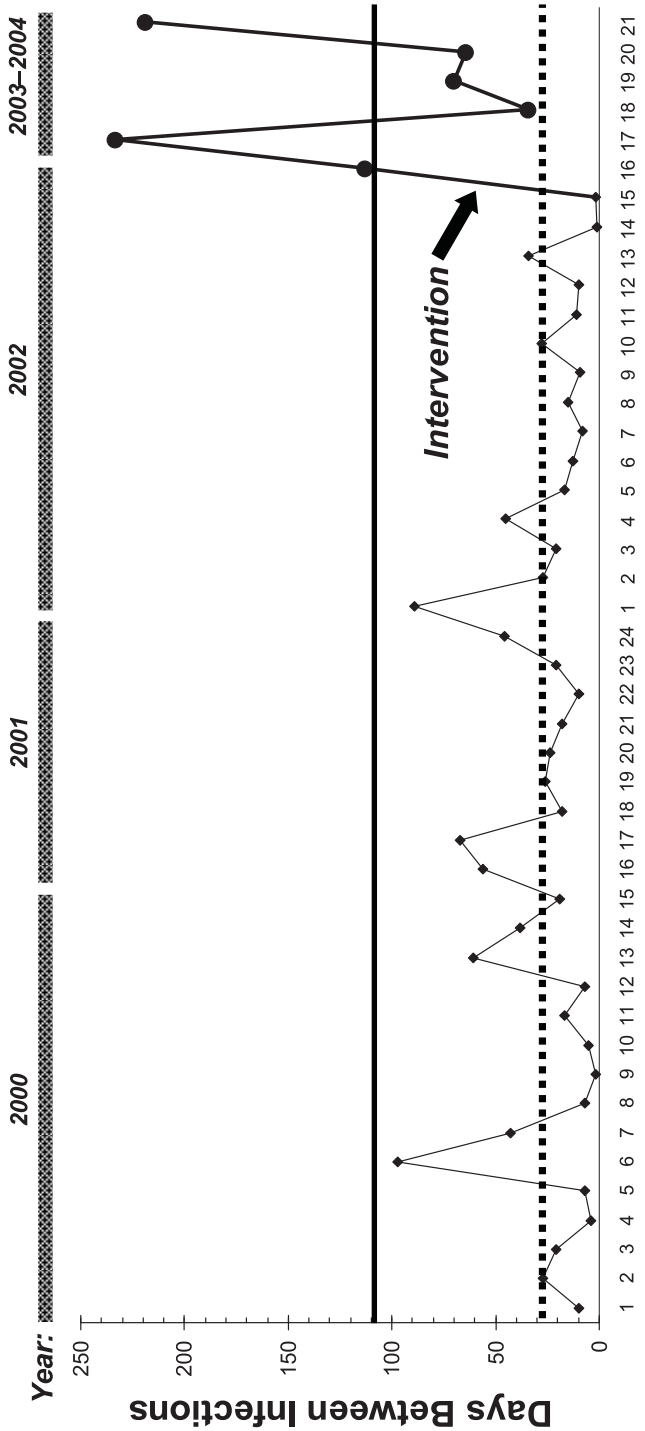
- Recognizing and seeking the voice of the patient
- Defining factors critical to quality
- Using data and data analysis to design improvement
- Enlisting stakeholders and process owners in creating and sustaining solutions
- Eliminating defects and waste
- Drastically decreasing failure rates
- Simplifying and increasing the speed of processes
- Partnering with staff and leaders to seek, commit to, and accept change

By incorporating methodologies such as RPI, or other similar methods such as Six Sigma, Lean, and RPI's change management process, the intensive care unit can achieve dramatic improvements in quality and cost of providing care. The following three fundamental questions for each improvement effort should be considered:

1. What goal are we trying to reach?
2. How will we know that the improvement is warranted (specific, measurable, attainable, relevant, and timely)?
3. What changes can we make that will result in an improvement (issue, problem, purpose)?

Organizations have implemented patient safety improvements through a greater emphasis on teamwork and communication. For more detail on these strategies, *see* Chapter 2 as well as the case studies in Chapter 6.

Figure 1-4: Sample Statistical Control Chart



Days between catheter-related bloodstream infections. The goal is to increased time between infections; hence higher points indictate better performance.

Source: Joint Commission Resources, 2009.

INTENSIVE CARE RESOURCES

Prioritization and Diagnosis Models

Prioritization Model

This system defines a spectrum of patients from those who will benefit most from the intensive care unit (Priority 1) to those who will not benefit at all (Priority 4) from intensive care unit admission.

Priority 1

These are critically ill, unstable patients in need of intensive treatment and monitoring that cannot be provided outside of the intensive care unit. Usually these treatments include ventilator support, continuous vasoactive drug infusions, and so on. Priority 1 patients generally have no limits placed on the extent of therapy they are to receive. Examples of these patients may include postoperative or acute respiratory failure patients requiring mechanical ventilatory support and shock or hemodynamically unstable patients receiving invasive monitoring and/or vasoactive drugs.

Priority 2

These patients require intensive monitoring and may potentially need immediate intervention. No therapeutic limits are generally stipulated for these patients. An example would be patients with chronic comorbid conditions who develop acute severe medical or surgical illness.

Priority 3

These unstable patients are critically ill but have a reduced likelihood of recovery because of underlying disease or the nature of their acute illness. Priority 3 patients may receive intensive treatment to relieve acute illness, but limits on therapeutic efforts may be set, such as no intubation or cardiopulmonary resuscitation. An example would be patients with metastatic malignancy complicated by infection, cardiac tamponade, or airway obstruction.

Priority 4

These are patients who are generally not appropriate for intensive care unit admission. Admission of these patients should be on an individual basis, under unusual circumstances, and at the discretion of the intensive care unit director. These patients can be placed in the following categories:

- Little or no anticipated benefit from intensive care unit care based on low risk of active intervention that could not safely be administered in a non–intensive care unit setting (too well to benefit from intensive care unit care). Examples include patients with peripheral vascular surgery, hemodynamically stable diabetic ketoacidosis, mild congestive heart failure, conscious drug overdose, and so on.
- Patients with terminal and irreversible illness facing imminent death (too sick to benefit from intensive care unit care). For example, patients with severe irreversible brain damage, irreversible multiorgan system failure, metastatic cancer unresponsive to chemotherapy and/or radiation therapy (unless the patient is on a specific treatment protocol); patients with decision-making capacity who decline intensive care and/or invasive monitoring and who receive comfort care only; brain-dead patients who are not organ donors; patients in a persistent vegetative state; patients who are permanently unconscious; and so on.

Diagnosis Model

This model uses specific conditions or diseases to determine appropriateness of intensive care unit admission.

- Cardiac system
  - —Acute myocardial infarction with complications
  - —Cardiogenic shock
  - —Complex arrhythmias requiring close monitoring and intervention
  - —Acute congestive heart failure with respiratory failure and/or requiring hemodynamic support
  - —Hypertensive emergencies
  - —Unstable angina, particularly with dysrhythmias, hemodynamic instability, or persistent

(continued on page 22)

INTENSIVE CARE RESOURCES

Prioritization and Diagnosis Models (continued)

chest pain
—S/P cardiac arrest
—Cardiac tamponade or constriction with hemodynamic instability
—Dissecting aortic aneurysms
—Complete heart block

- Pulmonary system
  —Acute respiratory failure requiring ventilatory support
  —Pulmonary emboli with hemodynamic instability
  —Patients in an intermediate care unit who are demonstrating respiratory deterioration
  —Need for nursing/respiratory care not available in lesser care areas such as floor or intermediate care unit
  —Massive hemoptysis
  —Respiratory failure with imminent intubation
- Neurologic disorders
  —Acute stroke with altered mental status
  —Coma: metabolic, toxic, or anoxic
  —Intracranial hemorrhage with potential for herniation
  —Acute subarachnoid hemorrhage
  —Meningitis with altered mental status or respiratory compromise
  —Central nervous system or neuromuscular disorders with deteriorating neurologic or pulmonary function
  —Status epilepticus
  —Brain-dead or potentially brain-dead patients who are being aggressively managed while determining organ donation status
  —Vasospasm
  —Severe head injury patients
- Drug ingestion and drug overdose
  —Hemodynamically unstable drug ingestion
  —Drug ingestion with significantly altered mental status with inadequate airway protection
  —Seizures following drug ingestion
- Gastrointestinal disorders
  —Life-threatening gastrointestinal bleeding including hypotension, angina, continued bleeding, or with comorbid conditions
  —Fulminant hepatic failure
  —Severe pancreatitis
  —Esophageal perforation with or without mediastinitis
- Endocrine
  —Diabetic ketoacidosis complicated by hemodynamic instability, altered mental status, respiratory insufficiency, or severe acidosis
  —Thyroid storm or myxedema coma with hemodynamic instability
  —Hyperosmolar state with coma and/or hemodynamic instability
  —Other endocrine problems such as adrenal crises with hemodynamic instability
  —Severe hypercalcemia with altered mental status, requiring hemodynamic monitoring
  —Hypo- or hypernatremia with seizures, altered mental status
  —Hypo- or hypermagnesemia with hemodynamic compromise or dysrhythmias
  —Hypo- or hyperkalemia with dysrhythmias or muscular weakness
  —Hypophosphatemia with muscular weakness
- Surgical
  —Postoperative patients requiring hemodynamic monitoring/ventilatory support or extensive nursing care
- Miscellaneous
  —Septic shock with hemodynamic instability
  —Hemodynamic monitoring
  —Clinical conditions requiring intensive care unit–level nursing care
  —Environmental injuries (lightning, near drowning, hypo/hyperthermia)
  —New/experimental therapies with potential for complications

Source: Society of Critical Care Medicine: *Guidelines for Intensive Care Unit Admission, Discharge, and Triage*. May 1998. https://sccmwww.sccm.org/professional_resources/guidelines/table_of_contents/Documents/ICU_ADT.pdf (accessed Nov. 15, 2009). Used with permission.

INTENSIVE CARE RESOURCES

Guidelines for Admission Criteria for Pediatric Intensive Care Units

Respiratory System

These are patients with severe or potentially life-threatening pulmonary or airway disease. Conditions include, but are not limited to, the following:

- Endotracheal intubation or potential need for emergency endotracheal intubation and mechanical ventilation, regardless of etiology
- Rapidly progressive pulmonary, lower or upper airway, disease of high severity with risk of progression to respiratory failure and/or total obstruction
- High supplemental oxygen requirement ($FIO_2 \geq 0.5$), regardless of etiology
- Newly placed tracheostomy with or without the need for mechanical ventilation
- Acute barotrauma compromising the upper or lower airway
- Requirement for more frequent or continuous inhaled or nebulized medications than can be administered safely on the general pediatric patient care unit (according to institution guidelines)

Cardiovascular System

These are patients with severe, life-threatening, or unstable cardiovascular disease. Conditions include, but are not limited to, the following:

- Shock
- Postcardiopulmonary resuscitation
- Life-threatening dysrhythmias
- Unstable congestive heart failure, with or without the need for mechanical ventilation
- Congenital heart disease with unstable cardiorespiratory status
- After high-risk cardiovascular and intrathoracic procedures
- Need for monitoring of arterial, central venous, or pulmonary artery pressures
- Need for temporary cardiac pacing

Neurologic

These are patients with actual or potential life-threatening or unstable neurologic disease. Conditions include, but are not limited to, the following:

- Seizures, unresponsive to therapy or requiring continuous infusion of anticonvulsive agents
- Acutely and severely altered sensorium in which neurologic deterioration or depression is likely or unpredictable, or coma with the potential for airway compromise
- After neurosurgical procedures requiring invasive monitoring or close observation
- Acute inflammation or infections of the spinal cord, meninges, or brain with neurologic depression, metabolic and hormonal abnormalities, and respiratory or hemodynamic compromise or the possibility of increased intracranial pressure
- Head trauma with increased intracranial pressure
- Preoperative neurosurgical conditions with neurologic deterioration
- Progressive neuromuscular dysfunction with or without altered sensorium requiring cardiovascular monitoring and/or respiratory support
- Spinal cord compression or impending compression
- Placement of external ventricular drainage device

Hematology/Oncology

These are patients with life-threatening or unstable hematologic or oncologic disease or active life-threatening bleeding. Conditions include, but are not limited to, the following:

- Exchange transfusions
- Plasmapheresis or leukopheresis with unstable clinical condition
- Severe coagulopathy
- Severe anemia resulting in hemodynamic and/or respiratory compromise
- Severe complications of sickle cell crisis, such as neurologic changes, acute chest syndrome, or

(continued on page 24)

INTENSIVE CARE RESOURCES

Guidelines for Admission Criteria for Pediatric Intensive Care Units (continued)

aplastic anemia with hemodynamic instability
- Initiation of chemotherapy with anticipated tumor lysis syndrome
- Tumors or masses compressing or threatening to compress vital vessels, organs, or airway

Endocrine/Metabolic

These are patients with life-threatening or unstable endocrine or metabolic disease. Conditions include, but are not limited to, the following:

- Severe diabetic ketoacidosis requiring therapy exceeding institutional patient care unit guidelines (if hemodynamic or neurologic compromise, *see* specific section)
- Other severe electrolyte abnormalities, such as the following:
  - —Hyperkalemia, requiring cardiac monitoring and acute therapeutic intervention
  - —Severe hypo- or hypernatremia
  - —Hypo- or hypercalcemia
  - —Hypo- or hyperglycemia requiring intensive monitoring
  - —Severe metabolic acidosis requiring bicarbonate infusion, intensive monitoring, or complex intervention
  - —Complex intervention required to maintain fluid balance
- Inborn errors of metabolism with acute deterioration requiring respiratory support, acute dialysis, hemoperfusion, management of intracranial hypertension, or inotropic support

Gastrointestinal

These are patients with life-threatening or unstable gastrointestinal disease. Conditions include, but are not limited to, the following:

- Severe acute gastrointestinal bleeding leading to hemodynamic or respiratory instability
- After emergency endoscopy for removal of foreign bodies
- Acute hepatic failure leading to coma, hemodynamic, or respiratory instability

Surgical

These are postoperative patients requiring frequent monitoring and potentially requiring intensive intervention. Conditions include, but are not limited to, the following:

- Cardiovascular surgery
- Thoracic surgery
- Neurosurgical procedures
- Otolaryngologic surgery
- Craniofacial surgery
- Orthopedic and spine surgery
- General surgery with hemodynamic or respiratory instability
- Organ transplantation
- Multiple trauma with or without cardiovascular instability
- Major blood loss, either during surgery or during the postoperative period

Renal System

These are patients with life-threatening or unstable renal disease. Conditions include, but are not limited to, the following:

- Renal failure
- Requirement for acute hemodialysis, peritoneal dialysis, or other continuous renal replacement therapies in the unstable patient
- Acute rhabdomyolysis with renal insufficiency

Multisystem and Other

These are patients with life-threatening or unstable multisystem disease. Conditions include, but are not limited to, the following:

- Toxic ingestions and drug overdose with potential acute decompensation of major organ systems
- Multiple organ dysfunction syndrome

INTENSIVE CARE RESOURCES

Guidelines for Admission Criteria for Pediatric Intensive Care Units (continued)

- Suspected or documented malignant hyperthermia
- Electrical or other household or environmental (for example, lightning) injuries
- Burns covering >10% of body surface (institutions with burn units only; institutions without such units will have transfer policy to cover such patients)

Special Intensive Care Technologic Needs

These are conditions that necessitate the application of special technologic needs, monitoring, complex intervention, or treatment, including medications associated with the disease that exceed individual patient care unit policy limitations.

Source: American Academy of Pediatrics and Society of Critical Care Medicine: *Guidelines for Developing Admission and Discharge Policies for the Pediatric Intensive Care Unit.* Apr. 1999. http://aappolicy.aappublications.org/cgi/reprint/pediatrics;103/4/840.pdf (accessed Oct. 15, 2009). Used with permission.

INTENSIVE CARE RESOURCES

Level I, II, and III Critical Care Centers

Level I Critical Care Centers

I. Medical Staff Organization

- A distinct critical care organizational entity (department, division, section, or service) exists.
  - —Privileges (both cognitive and procedural) for physicians practicing critical care medicine are approved by the medical staff credentials committee based on previous training and experience as defined by the medical staff.
  - —A section of the medical staff bylaws delineates the regulations governing the granting of critical care privileges and monitoring the critical care activities of privileged staff.
  - —Budgetary activities relating to unit function, quality assurance, and utilization review are conducted jointly by members of the medical, nursing, pharmacy, and administrative staff.
  - —A critical care representative serves on the medical staff executive committee.
- The critical care services for the center are led by a critical care physician who meets the definition of an intensivist and who has the appropriate time, expertise, and commitment to oversee the care of critically ill patients within the hospital.
- Intensive care unit patient management is directed by a staff-level physician who fulfills all of the following:
  - —Is privileged by the medical staff to have clinical management responsibility for critically ill patients
  - —Has board certification in critical care medicine
  - —Sees the patient as often as required by acuity but at least twice daily
  - —Is either the patient's attending physician or a consultant who provides direct management of critically ill patients
- Intensive care unit medical staff members should participate on the institution's bioethical committee.

II. Organization of Intensive Care Units

- A physician director who meets guidelines for the definition of an intensivist is required. Specific requirements for the unit director include the following:
  - —Training, interest, and time availability to give clinical, administrative, and educational direction to the intensive care unit
  - —Board certification in critical care medicine
  - —Time and commitment to maintain active and regular involvement in the care of patients in the unit
  - —Expertise necessary to oversee the administrative aspects of unit management, including formation of policies and procedures, enforcement of unit policies, and education of unit staff
  - —The ability to ensure the quality, safety, and appropriateness of care in the intensive care unit
  - —Availability (of either the director or a similarly qualified surrogate) to the unit around the clock for both clinical and administrative matters
  - —Active involvement in local and/or national critical care societies
  - —Participation in continuing education programs in the field of critical care medicine
  - —Hospital privileges to perform relevant invasive procedures
  - —Active involvement as an advisor and participant in organizing care of the critically ill patient in the community as a whole
  - —Active participation in the education of unit staff
  - —Active participation in the review of the appropriate use of intensive care unit resources in the hospital
- A nurse manager is appointed to provide precise lines of authority, responsibility, and accountability for the delivery of high-quality patient care. Specific requirements for the nurse manager include the following:
  - —A registered nurse with a bachelor of science degree in nursing or preferably a master of science degree in nursing
  - —Certification in critical care or equivalent graduate education
  - —At least two years' experience working in a critical care unit

INTENSIVE CARE RESOURCES

Level I, II, and III Critical Care Centers (continued)

—Experience with health information systems, quality improvement/risk management activities, and health care economics
—Ability to ensure that critical care nursing practice meets appropriate standards
—Preparation to participate in the on-site education of critical care unit nursing staff
—Ability to foster a cooperative atmosphere with regard to the training of nurses, physicians, pharmacists, respiratory therapists, and other personnel involved in the care of critical care unit patients
—Regular participation in ongoing continuing nursing education
—Knowledge about current advances in the field of critical care nursing
—Participation in strategic planning and redesign efforts

III. Physician Availability

- Several studies have suggested that a full-time hospital staff intensivist improves patient care and efficiency.
- Ideally, 24-hour in-house coverage should be provided by intensivists who are dedicated to the care of intensive care unit patients and who do not have conflicting responsibilities.
- If this ideal situation is not possible, 24-hour in-house coverage by experienced physicians (board-eligible/certified surgeons, internists, anesthesiologists, or emergency medicine physicians) who are not intensivists is acceptable when there is appropriate backup and supervision. This arrangement requires an intensivist to be on call and physically present in the hospital within 30 minutes for complex or unstable patients.
- The intensivist should be able to return > 95% of pages within five minutes and ensure that a fundamental critical care support (FCCS) course–trained physician or physician extender (*see* next bullet) reaches the intensive care unit patient within five minutes.
- Physicians (staff and/or fellows) or physician extenders covering the critical care units in-house should have advanced airway management skills and advanced cardiac life support qualifications. Training in the FCCS course sponsored by the Society of Critical Care Medicine is highly desirable.
- Ideal intensivist-to-patient ratios vary from intensive care unit to intensive care unit depending on the hospital's unique patient population. Hospitals should have guidelines for these ratios based on acuity, complexity, and safety considerations.
- The following physician subspecialists should be available and able to provide bedside patient care within 30 minutes:
  —General surgeon or trauma surgeon
  —Neurosurgeon
  —Cardiovascular surgeon
  —Obstetric-gynecologic surgeon
  —Urologist
  —Thoracic surgeon
  —Vascular surgeon
  —Anesthesiologist
  —Cardiologist with interventional capabilities
  —Pulmonologist
  —Gastroenterologist
  —Hematologist
  —Infectious disease specialist
  —Nephrologist
  —Neuroradiologist (with interventional capability)
  —Pathologist
  —Radiologist (with interventional capability)
  —Neurologist
  —Orthopedic surgeon

IV. Nursing Availability

- All patient care is carried out directly by or under supervision of a trained critical care nurse.
- All nurses working in critical care should complete a clinical/didactic critical care course before assuming full responsibility for patient care.
- Unit orientation is required before assuming

(continued on page 28)

INTENSIVE CARE RESOURCES

Level I, II, and III Critical Care Centers (continued)

responsibility for patient care.
- Nurse-to-patient ratios should be based on patient acuity according to written hospital policies.
- All critical care nurses must participate in continuing education.
- An appropriate number of nurses should be trained in highly specialized techniques such as renal replacement therapy, intra-aortic balloon pump monitoring, and intracranial pressure monitoring.
- All nurses should be familiar with the indications for and complications of renal replacement therapy.

V. Respiratory Care Personnel Requirements
- Respiratory care services should be available around the clock.
- An appropriate number of respiratory therapists with specialized training must be available to the unit at all times. Ideal levels of staffing should be based on acuity, using objective measures whenever possible.
- Respiratory care therapists should follow guidelines specified in Appendix 5 of the American College of Critical Care Medicine's (ACCM's) consensus report: *Critical Care Delivery in the Intensive Care Unit: Defining Clinical Roles and the Best Practice Model* (available at http://sccmwww.sccm.org/professional_resources/guidelines/table_of_contents/Documents/BestPracticeModel.pdf).
- Therapists must undergo orientation to the unit before providing care to intensive care unit patients.
- The therapist must have expertise in the use of mechanical ventilators, including the various ventilatory modes.
- Proficiency in the transport of critically ill patients is required.
- Respiratory therapists should participate in continuing education and quality improvement related to their unit activities.

VI. Pharmacy Services Requirements
- A "ready to administer" (unit dose) drug distribution system, intravenous admixture services, and, at a minimum, a medication information system or computerized prescriber order entry are essential.
- The ability to supply immediate medications and admixtures in a timely fashion is essential. A critical care pharmacy satellite is desirable for at least part-time coverage, but full-time coverage is optimal.
- A medication use system that creates and maintains patient medication profiles, interfaces with patient laboratory data, and alerts users to drug allergies, maximum dose limits, and drug-drug and drug-food/nutrient interactions is essential.
- Registered pharmacists, dedicated to the intensive care unit, should be available to evaluate all drug therapy orders, review and maintain medication profiles, monitor drug dosing and administration regimens, evaluate adverse reactions and drug-drug interactions, give drug and poison information, and provide recommendation on cost-containment issues.
- Availability of a clinical pharmacist dedicated to the intensive care unit with a specialized role in activities such as critical care therapeutics, nutritional support formulations, cardiorespiratory resuscitation therapeutics, and clinical research projects is desirable.
- Pharmacists should participate regularly on rounds with the intensivist and the critical care team, provide drug therapy–related education to critical care team members, and take part in multidisciplinary quality activity committees.
- Pharmacists should implement and maintain policies and procedures related to safe and effective use of medications in the intensive care unit.
- It is essential that the pharmacist have the qualifications and competence necessary to provide pharmaceutical care in the intensive care unit. This may be achieved by a variety of means, including advanced degrees, residencies, fellowships, or other specialized practice experience.

INTENSIVE CARE RESOURCES

Level I, II, and III Critical Care Centers (continued)

VII. Other Personnel

A variety of other personnel may contribute significantly to the efficient operation of the intensive care unit. These include unit clerks, physical therapists, occupational therapists, advanced practice nurses, physician assistants, dietary specialists, and biomedical engineers.

VIII. Laboratory Services

- A clinical laboratory should be available on a 24-hour basis to provide basic hematologic, chemistry, blood gas, and toxicology analysis.
- Laboratory tests must be obtained in a timely manner; immediately in some instances. "Stat" or "bedside" laboratories adjacent to the intensive care unit or rapid transport systems (for example, pneumatic tubes) provide an optimum and cost-effective setting for obtaining selected laboratory tests in a timely manner. Point-of-care technology may be used to obtain rapid laboratory results.

IX. Radiology and Imaging Services

Transport to distant non–intensive care unit sites for radiologic procedures has been shown to be associated with changes in physiologic status that required corrective therapeutic intervention in 68% of patients. Therefore, guidelines for intrafacility transfer should be followed for radiologic procedures performed distant from the intensive care unit bedside. The following diagnostic and therapeutic radiologic procedures should be immediately available to intensive care unit patients, 24 hours per day:

- Portable chest radiographs affect decision making in critically ill patients. They lead to therapeutic changes in 66% of intubated patients and 23% of nonintubated patients.
- Interventional radiologic capabilities should be available, including invasive arterial and venous diagnostic and therapeutic techniques, percutaneous access to the renal collecting system and biliary tract, percutaneous gastrostomy, and percutaneous drainage of fluid collections.
- Computed tomography and computed tomography angiography
- Duplex Doppler ultrasonography
- Magnetic resonance imaging and magnetic resonance angiography
- Echocardiography (transthoracic and transesophageal)
- Fluoroscopy

X. Services Provided in Unit

An intensive care unit has the capability of providing monitoring and support of the critically ill patient. To do, so the intensive care unit is prepared to provide the following:

- Continuous monitoring of the electrocardiogram (with high/low alarms) for all patients
- Continuous arterial pressure monitoring (invasive and noninvasive)
- Central venous pressure monitoring
- Transcutaneous oxygen monitoring or pulse oximetry for all patients receiving supplemental oxygen
- Equipment to maintain the airway, including laryngoscopes and endotracheal tubes
- Equipment to ventilate, including ambu bags, ventilators, oxygen, and compressed air
- Emergency resuscitative equipment
- Equipment to support hemodynamically unstable patients, including infusion pumps, blood warmer, pressure bags, and blood filters
- Beds with removable headboard and adjustable position, specialty beds
- Adequate lighting for bedside procedures
- Suction
- Hypo/hyperthermia blankets
- Scales
- Temporary pacemakers (transvenous and transcutaneous)
- Temperature monitoring devices
- Pulmonary artery pressure monitoring
- Cardiac output monitoring
- Continuous and intermittent dialysis and ultrafiltration

(continued on page 30)

INTENSIVE CARE RESOURCES

Level I, II, and III Critical Care Centers (continued)

- Peritoneal dialysis
- Capnography
- Fiberoptic bronchoscopy
- Intracranial pressure monitoring
- Continuous electroencephalogram monitoring capability
- Positive and negative pressure isolation rooms
- Immediate access to information: medical textbooks and journals, drug information, poison control centers, personnel phone and paging numbers, personnel schedules, patient laboratory and test data, and medical record information

XI. Intensive Care Unit Policies and Procedures

The following must be available to all intensive care unit personnel and must be updated yearly; many of these areas have been addressed by the Guidelines and Practice Parameters Committee of the ACCM:

- Admission and discharge criteria and procedures
- Policies for intra- and interfacility transport
- A total quality management/continuous quality improvement program is required that addresses safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity as outlined by the Institute of Medicine. Programs should specifically address appropriate Agency for Healthcare Research and Quality indicators.
- A list of hospital staff who are privileged for procedures/skills used in the intensive care unit
- End-of-life policies (for example, documentation of "do-not-resuscitate" orders)
- Guidelines for determining brain death
- Organ donation protocols
- Restraint and sedation protocols

XII. Telemedicine Capability

The ability to operate regional intensive care units through telemedicine capabilities (E-intensive care units, virtual intensive care units) is desirable.

Level II Critical Care Centers

Level II centers are unable to provide critical care for specific areas of expertise. For example, level II centers may lack neurosurgical expertise, a cardiac surgical program, or a trauma program. Nevertheless, these centers provide comprehensive critical care for their unique patient populations. Therefore, with the exception of services and personnel in the areas of expertise that they lack, these centers have the same organizational structures as outlined for Level I centers. These centers require policies and procedures that address transport to a Level I center when appropriate. Criteria for transfer should be specific and readily available to hospital personnel so that delays in definitive care are avoided.

Level III Critical Care Centers

Because Level III centers are limited in their ability to provide comprehensive critical care, their usually small intensive care units focus on the stabilization of patients before transfer to a comprehensive critical care center (Level I or II). As a result, the guidelines outlined previously for Level I and II centers, although desirable, are not always applicable. Level III centers require an on-site physician around the clock who can manage emergencies, can secure the airway, can establish rapid intravenous access, is qualified in advanced cardiac life support, and if not subspecialty trained in critical care medicine, has taken the FCCS course. It is desirable that Level III centers address the frequency with which these educational activities are updated. It is common and acceptable for emergency physicians, anesthesiologists, general internists, and general surgeons to fulfill this role. A critical care–trained nurse and respiratory therapist should be available on site, around the clock. Essential pharmacy services should be provided. With the exception of highly specialized services, basic services for stabilizing, monitoring, and treating critically ill patients should be available. Detailed transport policies and expertise in the transport of patients are essential for these centers. Although new and in need of additional validation, telemedicine-driven intensive care unit care should be considered as a surrogate for on-site intensivist-driven care.

INTENSIVE CARE RESOURCES

Level I, II, and III Critical Care Centers (continued)

Academic Versus Nonacademic Critical Care Centers

Level I and II centers may have an academic mission through affiliation with a medical school, nursing school, or other health services educational program. The critical care physician and nursing leadership, as well as pharmacists and respiratory therapists of these centers, require sufficient protected time to participate in scholarly activity (clinical and/or basic research, case reports) and to foster an environment of critical thinking. They should have the appropriate knowledge and teaching skills to participate in on-site education of critical care nursing staff, physicians-in-training, and staff physicians.

Nonacademic centers should maintain a commitment to remaining current with changes in the field of critical care. They should encourage and provide protected time for all critical care personnel to participate in continuing education activities and to maintain current certification in appropriate areas of expertise.

Open Versus Closed Intensive Care Units

Some critical care centers define their intensive care units as "open" or "closed" or a combination of both. In the open system, although nursing, pharmacy, and respiratory therapy staff are intensive care unit based, the physicians directing the care of the intensive care unit patient may have obligations at a site distant from the intensive care unit, such as outpatient and inpatient areas and the operating room. They may or may not choose to consult an intensivist to assist in management. In some of these intensive care units, critical care consultation is mandatory for all patients. In the closed system, care is provided by an intensive care unit–based team of critical care physicians, nurses, pharmacists, respiratory therapists, and other health professionals. A variety of studies reported in the literature have documented outcomes that are more favorable when intensive care unit patients are managed in a closed system compared with an open system. These studies should be interpreted cautiously. Regardless of the type of system used, the ACCM recommends that the intensivist and the intensive care unit patient's primary care physician and consultants proactively collaborate in the care of all patients. In both systems, an intensivist must be given the authority to intervene and directly care for the critically ill patient in urgent and emergent situations. Ideally, all orders regarding an intensive care unit patient's care should be channeled through a unit-based intensivist (and his or her physician or physician extender team, if applicable) to ensure optimal care and to minimize redundant or conflicting approaches to care. If these principles are followed, the distinctions between open and closed units and the divisive implications associated with the use of these terms wither away.

Intermediate (Step-Down, Transitional) Care Units

These types of units may be useful and are dependent on types of patients served by the hospital, types of staff available to manage patients in these units, and the geographic realities of the hospital's intensive care unit areas. They have advantages and disadvantages depending on whether they are freestanding in a hospital area distant from the intensive care unit, adjacent to the intensive care unit, or integrated within the intensive care unit. Intermediate care units may not be appropriate for all critical care centers. Guidelines have been published by the ACCM regarding criteria for admission to these units.

Source: Society of Critical Care Medicine: Guidelines on critical care services and personnel: Recommendations based on a system of categorization of three levels of care. *Crit Care Med* 31:2677–2683, Nov. 2003. Used with permission.

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Chapter 2
Challenging Patient Care Issues in the Intensive Care Unit

Although the benefits of having an intensive care unit are many, intensive care units also present a variety of challenges, in addition to the usual challenges of providing health care. Because the conditions of intensive care unit patients are far more critical, these patients are more susceptible to harm from medication reactions, infections, and other common health care problems. In addition, the necessity of a speedy response to changes in condition(s) can make errors more likely to occur—and the patients more likely to suffer.

Patients in the intensive care unit are more likely to experience adverse events than those in any other hospital unit, according to the report *To Err Is Human: Building a Safer Health System* from the Institute of Medicine.[1] Another study indicates that the intensive care unit has an average medical error incident rate of two per patient per day, and as much as 29% of those errors are considered potentially life threatening.[2] Extrapolating those figures to all intensive care units across the United States suggests that approximately 85,000 errors occur daily and that 24,650 of these errors have the potential to cause serious harm, including death.[3] The 2005 Multinational Sentinel Events Evaluation Study showed that 391 patients were affected in 584 events within a 24-hour period in 205 intensive care units worldwide.[4]

Meanwhile, issues such as communication with loved ones and other caregivers and making end-of-life decisions are much more frequent in an intensive care unit, creating additional challenges for the care team.

Leadership and Ethics Challenges

Providing health care presents a myriad of ethical questions and challenges, particularly in the critical care setting where life-or-death choices are made by caregivers every day. Among these challenges are end-of-life decisions and communication with the patient and family (to be discussed later in this chapter), as well as the issue of how far physicians should go in their efforts to save a patient who has little chance of recovery.

In 2006 the 38th *Respiratory Care* Journal Conference featured a discussion on the use of innovative approaches when standard practice is failing in the treatment of critically ill patients.[5] Presenters noted that although physicians have a moral obligation to provide the best and most appropriate care for patients, the definition of the best and most appropriate care can vary depending on the patient's prognosis, the available resources, and the values of the physician and patient.[5] This also brings into question the issue of resource allocation with regard to the treatment of the critically ill.

Hospital ethics committees must be prepared to discuss these issues and to develop guidelines to assist critical care clinicians in making these types of decisions. In addition, physicians must strive to stay aware of the latest research in their areas of expertise to ensure that they are making decisions based on the best available evidence-based data. Sidebar 2-1, page 34, and Sidebar 2-2, page 34, detail how organizations can ensure that they meet Joint Commission and Joint Commission International requirements with regard to leadership and ethics in the intensive care unit.

Sidebar 2-1: Tracking Compliance—Leadership

Joint Commission standards require hospital leadership to create and oversee systems and processes that provide a higher quality of safe care to patients in an ethical manner. To comply with these requirements, leaders must do the following:

- Create written policies to address any conflict of interest involving licensed independent practitioners and/or staff that may affect the safety or quality of care, treatment, and services, and implement those policies when necessary.
- Encourage ethical principles to guide the hospital's business practices, including marketing and billing.
- Include a process that allows staff, patients, and families to address ethical issues or issues prone to conflict.
- Make decisions regarding the ongoing provision of care, treatment, and services and discharge or transfer that are based on the needs of the patient (rather than, for example, third-party payers such as insurance companies).

United States

- Provide services that meet the needs of the organization's patient population, including services such as emergency, nursing care, and acute care services.
- Ensure that all patients with comparable needs receive the same standard of care, treatment, and services consistent with the hospital's mission, vision, and goals.
- Ensure that care, treatment, and services provided through contractual agreement are provided safely and effectively.
- Ensure that patient flow throughout the hospital is managed effectively using information, such as the available supply of patient beds, and develop plans for handling overflow in the emergency department and similar units.
- Have an organizationwide, integrated patient safety program that includes the full range of safety issues—from potential or no-harm errors (sometimes referred to as "near misses," "close calls," or "good catches") to hazardous conditions and sentinel events.

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

Sidebar 2-2: Tracking Compliance—Ethical Issues

A health care organization has an ethical and legal responsibility to its patients and community. When confronted by ethical dilemmas in patient care, the framework of the organization supports the professional staff and patients. Joint Commission International standards require leaders to do the following:

- Establish ethical and legal norms that protect patients and their rights.
- Establish a framework for the organization's ethical management.
- Disclose the organization's ownership.

International

- Honestly portray the organization's services to patients.
- Provide clear admission, transfer, and discharge policies.
- Accurately bill for services.
- Disclose and resolve conflicts when financial incentives and payment arrangements compromise patient care.
- Support those confronted by ethical dilemmas in patient care and ensure that such support is readily available.

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

Table 2-1: Sources of Intensive Care Unit Medication Errors

Intensive Care Unit Medication Errors by Phase

Phase	Actual Errors (Categories B–I)		Harmful Errors (Categories E–I)		Sentinel Events (Categories G–I)	
	n	%	*n*	%	*n*	%
Prescribing	8,665	24.4	168	13.2	20	29.4
Transcribing/Documenting	8,550	24.0	186	14.6	3	4.4
Dispensing	2,661	7.5	79	6.2	3	4.4
Administering	15,106	42.5	776	61.1	39	57.4
Monitoring	570	1.6	61	4.8	3	4.4
Total	35,552	100.0	1,270	100.0	68	100.0

Types of Intensive Care Unit Medication Errors

Type of Error	Nonharmful		Harmful	
	n	%	*n*	%
Wrong administration technique	845	89.3	101	10.6
Improper dose/quantity	8,586	95.1	438	4.9
Unauthorized/wrong drug	3,527	95.8	156	4.2
Extra dose	1,922	96.2	76	3.8
Drug prepared incorrectly	1,181	96.5	43	3.5
Omission error	9,427	96.8	309	3.2
Wrong route	686	97.6	17	2.4
Wrong patient	1,538	98.0	31	2.0
Wrong time	2,422	98.4	39	1.6
Prescribing error	7,621	98.6	108	1.4

Source: U.S. Pharmacopeia: Medication errors in intensive care units. *USP Patient Safety CAPSLink.* Feb. 2006. http://www.usp.org/pdf/EN/patientSafety/CapsLink2006-02-01.pdf (accessed Nov. 16, 2009). Used with permission.

Challenges with Medication-Related Incidents

Intensive care patients are often placed on complex medication regimens and are prone to drug-drug and drug-nutrient interactions, and their bodies react to and absorb medications in an altered fashion,[6] all of which contribute to increased rates of adverse drug events (ADEs) for these patients.[7] One study found that there are approximately 1.5 serious medical errors per 10 critical care beds per day.[8]

Medication Errors

Medication errors in the intensive care unit can occur at any time during the process of providing medication to a patient, but according to an analysis of more than 35,000 medication errors reported to MEDMARX®, the U.S.–based medication error database maintained by the United States Pharmacopeia, most errors occur during the administration phase. The prescribing phase and the transcribing/documenting phase had the next highest numbers of errors.[9]

Table 2-1, above, provides information on intensive care unit medication errors. Sidebar 2-3, page 36, provides additional information developed by the U.S.–based Agency for Healthcare Research and Quality (AHRQ) on patient safety in the intensive care unit. (*See* Sidebar 2-4, page 36, for more information on MEDMARX.)

Sedation

Many critical care patients require sedation to

Sidebar 2-3: Tips for Intensive Care Units

Using its research findings, the Agency for Healthcare Research and Quality has developed the following tips to help hospitals improve patient safety in the intensive care unit:

- *Build teamwork:* Train hospital staff to communicate effectively as a team. *See* "Challenges with Communication" on pages 54–56 for more information.
- *Insert chest tubes safely:* Universal precautions (achieved by using sterile cap, mask, gown, and gloves), wider skin prep, extensive draping, and tray positioning (UWET, an easy-to-remember mnemonic) should be used when inserting chest tubes, as per The Joint Commission's Universal Protocol on Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery™.
- *Prevent central line–associated bloodstream infections:* Be vigilant and use five evidence-based procedures—hand washing, using full-barrier precautions during the insertion of central venous catheters, cleaning the skin with chlorhexidine, avoiding the femoral site, and removing unnecessary catheters to reduce the risk of infection.
- *Limit urinary catheter use to three days:* Assess catheter use early and use computer-based reminders to alert clinicians to remove catheters as soon as possible to reduce the risk of urinary tract infections.
- *Make good use of senior intensive care unit nurses:* Use registered nurses and maintain appropriate round-the-clock staffing levels in the intensive care unit to prevent airway tube complications.
- *Minimize unnecessary interruptions:* Reduce distractions faced by the nursing staff during critical times, such as shift changes. Encourage staff to speak up when necessary, but create a "zone of silence" near medication preparation carts and other areas where concentration is essential.

Source: Agency for Healthcare Research and Quality: *10 Patient Safety Tips for Hospitals*. Oct. 2007. http://www.ahrq.gov/qual/10tips.htm (accessed Nov. 16, 2009).

Sidebar 2-4: Anonymous Reporting: The MEDMARX® Program

MEDMARX® is a U.S.–based, Internet-accessible database administered by U.S. Pharmacopeia and Quantros, Inc., that hospitals and health care systems use to track and trend adverse drug reactions and medication errors. Hospitals and health care systems participate in MEDMARX voluntarily and subscribe to it on an annual basis.

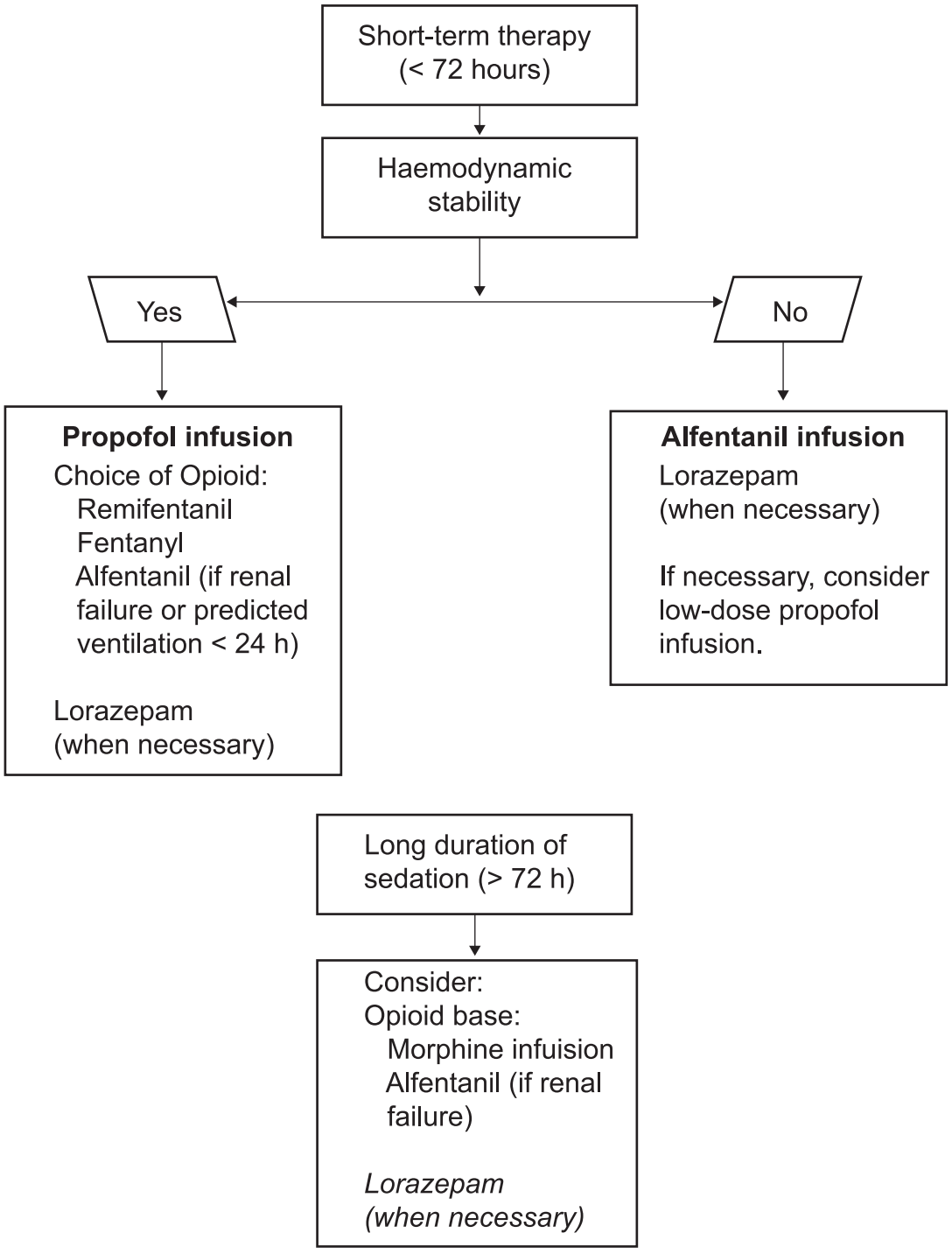
Subscribing organizations are able to anonymously report medication errors to learn valuable lessons from their experiences as well as those of other users. The database allows users to compare and contrast with other organizations, identify patterns, and work to improve quality and prevent further errors. Organizations outside of the United States might also find the MEDMARX data on types of medication errors, causes, contributing factors, products involved, and actions taken instructive for their own quality improvement initiatives. For more information, visit the MEDMARX Web site at http://www.medmarx.com.

reduce stress, to relieve pain, to assist in tolerance of a ventilator, and for a variety of other reasons. However, undersedation and oversedation can result in complications or slower recovery for patients. Undersedation can cause hypercatabolism (breakdown of tissues), immunosupression, hypercoagulability (increased chance of thrombosis), and increased activity of the nervous system. Oversedation can increase time on ventilator support and prolong intensive care unit length of stay.[10]

Therefore, protocols regarding the administration of sedation should be developed and followed carefully. A sample protocol is provided in Figure 2-1 on page 37.

Because each anesthesia agent has its own advantages and disadvantages, critical care providers should be aware of the potential problems for each agent and make care decisions accordingly. In addition, patients on long-term sedation should be given "sedation vacations," ideally once each day. This strategy has been shown to decrease the amount of time the patient must spend on mechanical ventilation and decrease the intensive care unit length of stay.[11]

Figure 2-1: Sample Sedation Protocol



Source: Rowe K., Fletcher S.: Sedation in the intensive care unit. *Contin Educ Anaesth Crit Care Pain* 8:50–55, Apr. 2008. Used with permission.

Adverse Drug Reactions

Adverse drug reactions can also include ADEs that were not related to errors, but rather, were unforeseeable problems or system failures. These events result in unintended harm from an act of omission or commission rather than being caused by the underlying condition of the patient. For example, difficulties with technology or equipment can result in an adverse drug reaction for a patient. Although some adverse drug reactions are unpreventable (as in the case of an allergic reaction when the patient was previously unaware of the allergy), steps can be taken to minimize non–error-related adverse drug reactions.

Steps to minimize adverse drug reactions might include increasing the frequency and use of technology and equipment testing, upgrading and/or replacing equipment, reporting "near misses" (*see* the "Voluntary Reporting" section on page 42), and improving communication and medication reconciliation (*see* the "Improved Medication Reconciliation" section on pages 38–39). Remember that, globally, adverse drug reactions or ADEs occur most frequently in the intensive care unit—these events might be tracked by your organization. Each hospital might also have its own definition of an ADE, which may be summarized as follows:

- An incident with possible injury to the patient that is linked to a drug
- Injuries that result from medical interventions related to a drug
- Injuries that result from medical interventions related to a drug that were later pronounced by a clinician as avoidable or preventable and that resulted from an error
- Events related to drugs or medical devices in which the patient outcome is death, life-threatening, hospitalization, disability, or congenital anomaly, or in which the outcome requires an intervention to prevent permanent harm or injury

After medications have been administered, the patient must be monitored to ensure that the intended response occurs. One method to use is computerized monitoring so that identification of adverse drug reactions or the potential risk can be detected close to the time that it occurs. An analysis of events leading up to the reaction can be conducted and may lead to identification of process problems.

Implementing an intensive care unit–specific adverse drug event or reaction program and system might help to identify areas of avoidable drug-related risk for the critically ill patient. The intensive care unit could prove to be a favorable location in the hospital for developing voluntary reporting based on the frequency of these events.

An intensive care unit–specific ADE program can also detect errors in the prescribing, dispensing, administering, and monitoring steps of the medication system. Because it is limited to detecting only events that are flagged by antidote use, age, and diagnosis rules or drug-drug pairs, the system can be programmed to detect events in which there is an increased risk of an adverse drug reaction. A robust, integrated system is ideal because data can be retrieved from a pharmacy or laboratory computer, computerized prescriber order entry (CPOE) system, smart infusion pump, or bar code medication administration system.

Preventing Medication-Related Incidents

Studies show that medical errors are rarely the result of insufficient training; rather, the hospital's processes are set up in such a way that it is easy for errors to occur and difficult for them to be caught before they cause harm.[12,13] Therefore, with the potential for medication errors to harm the patients they are trying to help, particularly in the intensive care unit, hospitals must redesign processes to minimize the opportunities for errors to occur. The following sections discuss some strategies that have demonstrated success.

Improved Medication Reconciliation

Medication reconciliation is the process of comparing the medications that the patient has been given before and during each step of the health care process to the medications that the patient is meant to receive at the next step.

Patients are at a high risk for harm from ADEs when communication about medications is not clear. The

chance for communication errors increases whenever individuals involved in a patient's care change. Communicating about the medication list, ensuring that it is accurate, and reconciling any discrepancies whenever new medications are ordered or current medications are adjusted are essential to reducing the risk of transition-related ADEs. Communication enables the next provider of service to receive thorough knowledge of the patient's medications, and to safely order or prescribe other medications that may be needed.

This process helps to avoid errors of transcription and omission, duplication of therapy, bad drug interactions, administration of medications that are not appropriate for the patient's condition, and other errors.

Medication errors continue to be one of the most frequently cited causes of preventable harm in health care. The Joint Commission is committed to helping hospitals and other health care organizations prevent medication errors, as illustrated by the National Patient Safety Goal on medication reconciliation. Joint Commission International does not currently have an International Patient Safety Goal for medication reconciliation, but it does have requirements for who can order and dispense medication, proper dosages at the proper times, and the recording of all patient medications dispensed and administered in the organization, as well as medications brought into the organization for patient self-administration or as samples.

Since the National Patient Safety Goal on medication reconciliation was established in 2005, many organizations have struggled to develop and implement effective and efficient processes to meet the intent of the goal. Recognizing that medication reconciliation problems continue to put patients at risk, The Joint Commission expects accredited health care organizations to continue to address medication reconciliation. During the on-site survey, Joint Commission surveyors will evaluate the organization's medication reconciliation processes, discuss opportunities for improvement, and collect information on the progress organizations are making in meeting these requirements. For updated information on this evaluation, please visit The Joint Commission's Web site at http://www.jointcommission.org/PatientSafety/ NationalPatientSafetyGoals/.

Figure 2-2 on page 40 illustrates one possible process that an organization can implement regarding medication reconciliation. Please note that it is up to individual organizations to identify a process that works best for them.

Computerized Prescriber Order Entry (CPOE)

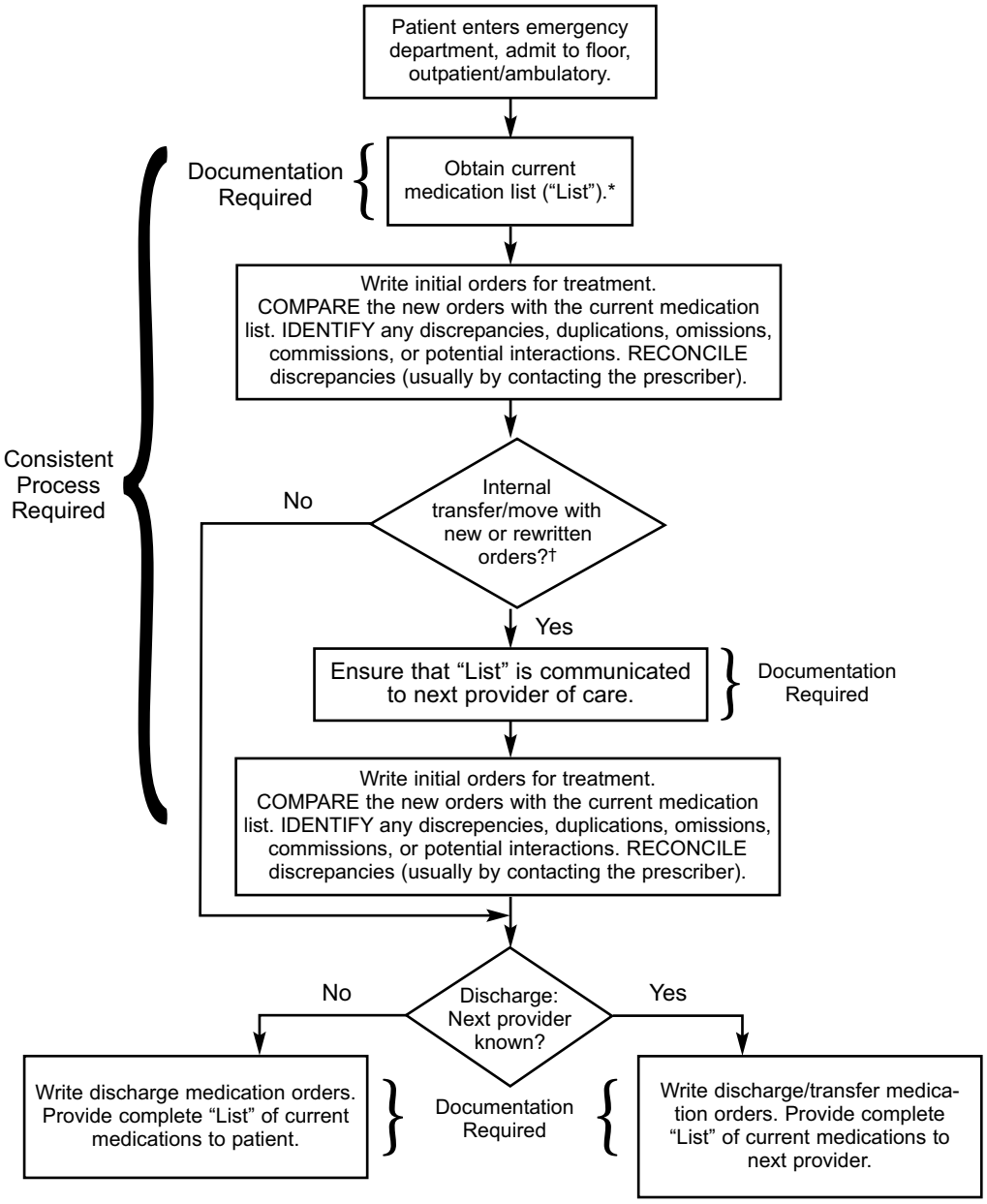
CPOE is an increasingly popular technology that allows caregivers to enter medication prescriptions, test orders, and other care instructions directly into the computer, to be automatically entered into the patient's record and be accessed by nurses and others who carry out those orders. Not only does CPOE solve the issue of handwriting illegibility, many CPOE systems can be set up to require that the name of the medication, dosage, route, frequency of administration, and other important details be entered. CPOE can prevent errors that occur due to omitted information, flag unusual orders, work in concert with patients' electronic medical records to check for allergies and potential drug interactions, and provide data about the medications and their use.

Fewer than 10% of U.S. hospitals use CPOE, although it has been shown to significantly reduce serious medication errors: A study of medication errors in a pediatric intensive care unit found that CPOE reduced potential ADEs from 2.2 to 1.3 per 100 orders, medication prescribing errors from 30.1 to 0.2 per 100 orders, and rule violations from 6.8 to 0.1 per 100 orders.[14] Another study that compared handwritten prescriptions to computerized prescriptions found that nearly 4% of the handwritten orders required further clarification and that 2.3% contained an error. In comparison, less than 1% of the computerized orders required clarification or contained an error.[15]

The Institute of Medicine's Committee on Identifying and Preventing Medication Errors recommended that by 2008 all health care providers have plans in place to write prescriptions electronically. The committee also recommended that by 2010 all providers should be using e-prescribing systems and that all phar-

Figure 2-2: Sample Medication Reconciliation Process

The following flowchart is an example of a process for reconciling medications.



* For inpatients, two lists are required: (1) a home medication list (this list remains the same throughout hospitalization) and (2) a current medication list, which will change throughout the patient's hospital stay. The home medication list will be used in conjunction with the current medication list at the time of discharge to determine a patient's discharge medication list.

† For inpatients, providers must review both the home medication list and the current medication list on transfer.

Source: The Joint Commission, *Medication Reconciliation Handbook*, Second Edition, Oakbrook Terrace, IL: Joint Commission Resources, 2009.

macies should be able to receive prescriptions electronically.[16] To achieve cost-effective high-quality care in European countries, the health care industry is increasingly turning to CPOE; the total European CPOE market is expected to grow at an annual average rate of 28.6% by 2010.[17]

Smart Infusion Pumps

Critically ill patients often receive their medications via an infusion pump that can be programmed to deliver designated volumes of medications at a specific rate. These pumps leave room for error, however, as the provider must enter the dosage for the medication. To help prevent entry errors, newly developed "smart infusion pumps" are available and are programmed with drug libraries and decision-support software that raises flags when unusual dosages or other potentially incorrect information is entered.

When combined with other medication safety practices, these smart pumps can have a significant effect in reducing intravenous medication errors. One study found that smart pumps, standard drug concentrations, and human-engineered medication labels used in concert were responsible for a 73% reduction in intravenous medication errors.[18]

Hospitals that implement smart infusion pumps must make certain that they are programmed to address the types of errors most likely to occur in the settings in which they are being used or the impact will be minimal: One group of researchers found that a popular brand of smart pump was able to intercept only 4% of the preventable ADEs common to the intensive care units of the organizations in the study.[19] In addition, staff must be trained well on how to use them. One study found that the pumps had no measurable impact on the medication error rate, likely due in part to poor compliance by the provider.[20]

Reducing the Risk of Errors in Tubing and the Smart Pump

Tubing errors, including using the wrong tubing for patient lines, incorrect tubing connections, and inserting medications into the wrong tube, are an increasing source of patient harm. Because of the high number of lines that intensive care unit patients tend to have inserted, these patients are particularly at risk for these types of errors. As of 2006, the United States Pharmacopeia had received more than 300 reports of tubing errors.[21] Tubing errors are such a concern worldwide that the World Health Organization (WHO) Collaborating Centre for Patient Safety Solutions—a joint venture of the WHO, The Joint Commission, and Joint Commission International—made avoiding catheter and tubing misconnections one of its nine initial Patient Safety Solutions in 2005. (For more information on the WHO Collaborating Centre for Patient Safety Solutions, visit http://www.ccforpatientsafety.org/.)

Because of the potential for tubing errors (including those associated with the use of a smart pump), a hospital should conduct a failure mode and effects analysis (FMEA). By conducting an FMEA, hospitals can determine the potential for error with this high-risk process and help reduce the likelihood of error—and the risk of patient harm—when connecting a smart pump and other tubing to connectors.

Bar Coding and Radio Frequency Identification Technology

Confusion caused by similar-sounding drug names may account for up to 25% of all medication errors, and labeling and packaging similarities may be responsible for up to 33% of errors, including 30% of fatalities.[22] Bar coding and radio frequency identification technology help prevent these types of errors by providing computerized checks to ensure that the medication ordered is the medication administered.

Bar coding and radio frequency identification serve similar functions. Each technology allows medication (and other medical supplies and equipment) to be tagged so that they can be easily scanned, identified, and tracked. Whereas a bar code is a set of black bars similar to a universal product code in the food industry, a radio frequency identification tag works via radio waves; therefore, when using radio frequency identification, the scanner does not need to be held directly over the tag in order to work.

Both technologies can be integrated with a hospital's computer systems and electronic medical records to provide a series of checks and to help prevent errors due to look-alike and sound-alike medications. For example, a physician enters an order for a medication, and the computer system accesses that medication's code, which is based on name, strength, volume, and dosage. When the nurse receives the order to administer the medication, he or she can then scan the actual package of medication so that the computer can confirm that it is the correct one. Then, before administering the drug to the patient, the nurse can scan a bar code or radio frequency identification tag on the patient's wristband to confirm that the drug is being given to the right person.

Bar coding and radio frequency identification present some challenges—the pharmaceutical industry does not yet have a standardized bar coding system like those used in the retail and manufacturing industries, and radio frequency identification is a newer and, therefore, somewhat expensive technology. However, both provide a means to accurately track pharmaceutical supplies and therefore prevent many ADEs due to misidentification of medications.

Voluntary Reporting

Most experts agree that voluntary reporting alone is not sufficient for medication error prevention, as these programs identify only 5% to 20% of all errors. Some clinicians do not wish to report errors for fear of being penalized; others forget to report minor errors during the course of a busy day or are not aware of mistakes.

However, that does not mean voluntary reporting programs do not have value, as they create a culture of safety by putting the emphasis on improving patient safety rather than placing blame. Some systems also collect information on near misses, using them as opportunities to prevent future adverse events.[23] One system captured five times more near misses than reports of events that actually caused patient harm.[24]

To work, the reporting system must be easy to use so that filing a report does not cause a significant interruption in the busy schedules of critical care providers. In addition, it must have leadership support, and the organization must make it clear to caregivers that the information is being analyzed and used to change systems for the improvement of patient care. Some organizations have found benefits in prompted reporting—periodic e-mail, phone, or face-to-face contact with physicians and other caregivers asking if they observed any medication errors recently.

Finally, a system for reporting safety concerns in the intensive care unit should be available to patients and their families. Joint Commission and Joint Commission International requirements state that patients and family members are to be educated on available reporting methods for concerns related to care, treatment, services, and patient safety issues and that they should be encouraged to use them.

Direct Observation

Sending in a team to observe caregivers at work to identify potential errors and ADEs can produce a great deal of valuable data; direct observation conducted in one study found that there was one actual or potential preventable ADE for every five doses of medication administered.[25] Most hospitals find the cost and manpower required for this method too prohibitive to use as a primary means of surveillance. In addition, some caregivers can be distrustful of the method, feeling as though they are being micromanaged.

Direct observation can still be a good way to kick off an overall medication safety and surveillance program because it can help identify those areas with the greatest need for improvement. It can also be useful for occasional reviews and in areas that are having some particular difficulties.

Manual Chart Review

Like direct observation, manual chart reviews are quite time- and labor-intensive, and therefore are rarely used as a primary method of medication-incident surveillance. In addition, manual chart reviews may not catch many common medication errors. For example, if a patient was in pain for hours and ended up needing a

much stronger pain medication because of the long delay, the chart would not likely reflect that; rather, it would just indicate that the patient had been given the medication. The Institute for Healthcare Improvement has developed trigger tools to help with this concern.

However, chart reviews are important when researching a specific ADE. In addition, reviewing a sample of charts can be valuable as a periodic check, particularly in areas believed to have some problems with medication errors and patient safety.

Automated Surveillance

Today there are computer systems available that can alert clinical staff to potential ADEs before they occur by tracking specific types of information that suggest that an ADE has occurred or is at risk of occurring. Automated surveillance systems can help prevent ADEs by flagging prescriptions with unusual dosages, strengths, frequencies, durations, or administration instructions, as well as potential interactions with other drugs already prescribed to a patient.

Automated surveillance systems can also detect ADEs that have occurred and were not reported by scanning medical records for indications of new or worsening symptoms, changes in a patient's lab results or toxicity levels, prescriptions for drugs commonly used as an antidote, and other red flags. Computerized systems also make it easier to analyze ADE data so that prevention steps can be taken.

One study, funded by the AHRQ, found that an automated surveillance system detected 3.6 times more ADEs than voluntary reporting at one hospital, and 12.3 times more at another facility.[26] Another study found that a computerized system reduced the number of potential ADEs by 40.9%, medication prescription errors by 99.4%, and rule violations by 97.9%.[27]

These systems can vary widely in cost and complexity, although some researchers have found ways to adapt existing CPOE systems and other technologies to handle some of these tasks.[28]

Educating Staff

Staff must be educated not only about any new systems to prevent medication incidents, but also about how and where they are likely to happen and about the importance of clear communication in preventing errors. In addition, it can be valuable to alert staff to the types of medication that are often involved in medication incidents—such as heparin, insulin, and warfarin—and that certain types of medication can cause severe injury to patients if administered incorrectly.

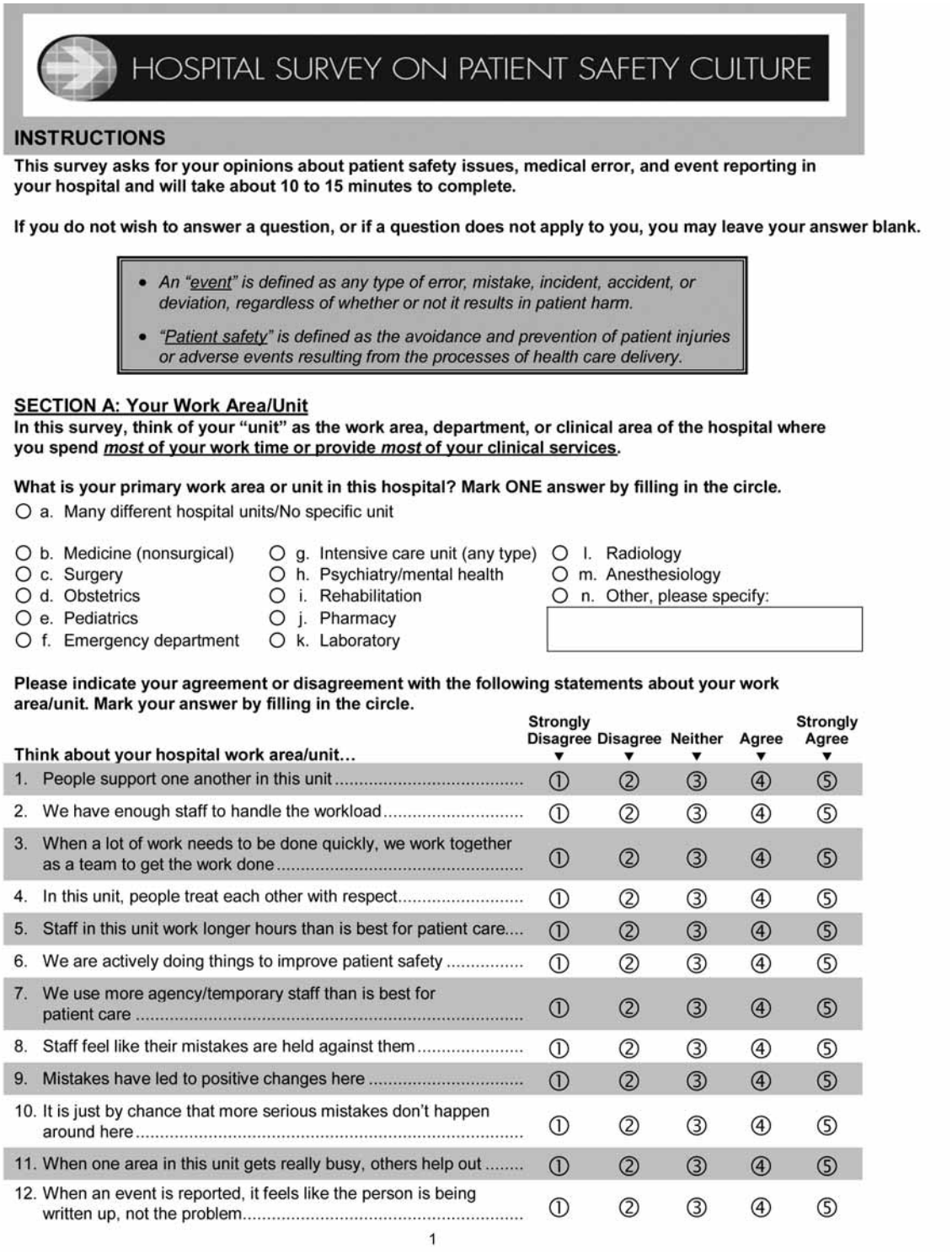
The AHRQ and Pascal Metrics, Inc. (an organization dedicated to measuring the culture of hospitals globally), have developed a safety culture toolkit along with surveys to help hospitals determine the degree to which the current culture promotes patient safety (*see* Figure 2-3, pages 44–47, and Figure 2-4, page 48). These tools are adaptable for organizations anywhere in the world.

Utilization of Critical Care Pharmacists

The Joint Commission requires that a pharmacist review all medication orders given in hospitals unless a licensed independent practitioner controls the ordering, preparation, and administration of the medication (*see* Sidebar 2-5, page 49).[29] Joint Commission International calls for the licensed pharmacist, technician, or trained professional to review each prescription or order, newly prescribed or ordered, for appropriateness or when the dosage or other factors change (*see* Sidebar 2-6, page 50). Pharmacists have extensive training specifically about medications, understand drug interactions and common dosages, and know what each drug is commonly used to treat. A critical care pharmacist can provide a crucial check during the medication process that can prevent many medication errors. One study found that whereas a full-time unit-based pharmacist decreased the rate of serious medication errors in a pediatric intensive care unit by 79%, a part-time pharmacist did not have a significant effect.[30]

For more on critical care pharmacists, *see* "The Role of the Intensive Care Unit Pharmacist" in Chapter 4.

Figure 2-3: Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture



HOSPITAL SURVEY ON PATIENT SAFETY CULTURE

INSTRUCTIONS

This survey asks for your opinions about patient safety issues, medical error, and event reporting in your hospital and will take about 10 to 15 minutes to complete.

If you do not wish to answer a question, or if a question does not apply to you, you may leave your answer blank.

- *An "event" is defined as any type of error, mistake, incident, accident, or deviation, regardless of whether or not it results in patient harm.*
- *"Patient safety" is defined as the avoidance and prevention of patient injuries or adverse events resulting from the processes of health care delivery.*

SECTION A: Your Work Area/Unit

In this survey, think of your "unit" as the work area, department, or clinical area of the hospital where you spend *most* of your work time or provide *most* of your clinical services.

What is your primary work area or unit in this hospital? Mark ONE answer by filling in the circle.

○ a. Many different hospital units/No specific unit

○ b. Medicine (nonsurgical)
○ c. Surgery
○ d. Obstetrics
○ e. Pediatrics
○ f. Emergency department
○ g. Intensive care unit (any type)
○ h. Psychiatry/mental health
○ i. Rehabilitation
○ j. Pharmacy
○ k. Laboratory
○ l. Radiology
○ m. Anesthesiology
○ n. Other, please specify:

Please indicate your agreement or disagreement with the following statements about your work area/unit. Mark your answer by filling in the circle.

Think about your hospital work area/unit…	Strongly Disagree ▼	Disagree ▼	Neither ▼	Agree ▼	Strongly Agree ▼
1. People support one another in this unit	①	②	③	④	⑤
2. We have enough staff to handle the workload	①	②	③	④	⑤
3. When a lot of work needs to be done quickly, we work together as a team to get the work done	①	②	③	④	⑤
4. In this unit, people treat each other with respect	①	②	③	④	⑤
5. Staff in this unit work longer hours than is best for patient care	①	②	③	④	⑤
6. We are actively doing things to improve patient safety	①	②	③	④	⑤
7. We use more agency/temporary staff than is best for patient care	①	②	③	④	⑤
8. Staff feel like their mistakes are held against them	①	②	③	④	⑤
9. Mistakes have led to positive changes here	①	②	③	④	⑤
10. It is just by chance that more serious mistakes don't happen around here	①	②	③	④	⑤
11. When one area in this unit gets really busy, others help out	①	②	③	④	⑤
12. When an event is reported, it feels like the person is being written up, not the problem	①	②	③	④	⑤

1

Figure 2-3: Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture (continued)

SECTION A: Your Work Area/Unit (continued)

Think about your hospital work area/unit…	Strongly Disagree ▼	Disagree ▼	Neither ▼	Agree ▼	Strongly Agree ▼
13. After we make changes to improve patient safety, we evaluate their effectiveness	①	②	③	④	⑤
14. We work in "crisis mode" trying to do too much, too quickly	①	②	③	④	⑤
15. Patient safety is never sacrificed to get more work done	①	②	③	④	⑤
16. Staff worry that mistakes they make are kept in their personnel file	①	②	③	④	⑤
17. We have patient safety problems in this unit	①	②	③	④	⑤
18. Our procedures and systems are good at preventing errors from happening	①	②	③	④	⑤

SECTION B: Your Supervisor/Manager

Please indicate your agreement or disagreement with the following statements about your immediate supervisor/manager or person to whom you directly report. Mark your answer by filling in the circle.

	Strongly Disagree ▼	Disagree ▼	Neither ▼	Agree ▼	Strongly Agree ▼
1. My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures	①	②	③	④	⑤
2. My supervisor/manager seriously considers staff suggestions for improving patient safety	①	②	③	④	⑤
3. Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts	①	②	③	④	⑤
4. My supervisor/manager overlooks patient safety problems that happen over and over	①	②	③	④	⑤

SECTION C: Communications

How often do the following things happen in your work area/unit? Mark your answer by filling in the circle.

Think about your hospital work area/unit…	Never ▼	Rarely ▼	Some-times ▼	Most of the time ▼	Always ▼
1. We are given feedback about changes put into place based on event reports	①	②	③	④	⑤
2. Staff will freely speak up if they see something that may negatively affect patient care	①	②	③	④	⑤
3. We are informed about errors that happen in this unit	①	②	③	④	⑤
4. Staff feel free to question the decisions or actions of those with more authority	①	②	③	④	⑤
5. In this unit, we discuss ways to prevent errors from happening again	①	②	③	④	⑤
6. Staff are afraid to ask questions when something does not seem right	①	②	③	④	⑤

2

(continued on page 46)

Figure 2-3: Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture (continued)

SECTION D: Frequency of Events Reported

In your hospital work area/unit, when the following mistakes happen, *how often are they reported?*
Mark your answer by filling in the circle.

	Never	Rarely	Some-times	Most of the time	Always
1. When a mistake is made, but is *caught and corrected before affecting the patient*, how often is this reported?	①	②	③	④	⑤
2. When a mistake is made, but has *no potential to harm the patient*, how often is this reported?	①	②	③	④	⑤
3. When a mistake is made that *could harm the patient*, but does not, how often is this reported?	①	②	③	④	⑤

SECTION E: Patient Safety Grade

Please give your work area/unit in this hospital an overall grade on patient safety. Mark ONE answer.

○ A Excellent	○ B Very Good	○ C Acceptable	○ D Poor	○ E Failing

SECTION F: Your Hospital

Please indicate your agreement or disagreement with the following statements about your hospital.
Mark your answer by filling in the circle.

Think about your hospital…	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. Hospital management provides a work climate that promotes patient safety	①	②	③	④	⑤
2. Hospital units do not coordinate well with each other	①	②	③	④	⑤
3. Things "fall between the cracks" when transferring patients from one unit to another	①	②	③	④	⑤
4. There is good cooperation among hospital units that need to work together	①	②	③	④	⑤
5. Important patient care information is often lost during shift changes	①	②	③	④	⑤
6. It is often unpleasant to work with staff from other hospital units	①	②	③	④	⑤
7. Problems often occur in the exchange of information across hospital units	①	②	③	④	⑤
8. The actions of hospital management show that patient safety is a top priority	①	②	③	④	⑤
9. Hospital management seems interested in patient safety only after an adverse event happens	①	②	③	④	⑤
10. Hospital units work well together to provide the best care for patients	①	②	③	④	⑤
11. Shift changes are problematic for patients in this hospital	①	②	③	④	⑤

SECTION G: Number of Events Reported

In the past 12 months, how many event reports have you filled out and submitted? Mark ONE answer.

- ○ a. No event reports
- ○ b. 1 to 2 event reports
- ○ c. 3 to 5 event reports
- ○ d. 6 to 10 event reports
- ○ e. 11 to 20 event reports
- ○ f. 21 event reports or more

3

Figure 2-3: Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture (continued)

SECTION H: Background Information

This information will help in the analysis of the survey results. Mark ONE answer by filling in the circle.

1. How long have you worked in this hospital?
   - O a. Less than 1 year
   - O b. 1 to 5 years
   - O c. 6 to 10 years
   - O d. 11 to 15 years
   - O e. 16 to 20 years
   - O f. 21 years or more

2. How long have you worked in your current hospital work area/unit?
   - O a. Less than 1 year
   - O b. 1 to 5 years
   - O c. 6 to 10 years
   - O d. 11 to 15 years
   - O e. 16 to 20 years
   - O f. 21 years or more

3. Typically, how many hours per week do you work in this hospital?
   - O a. Less than 20 hours per week
   - O b. 20 to 39 hours per week
   - O c. 40 to 59 hours per week
   - O d. 60 to 79 hours per week
   - O e. 80 to 99 hours per week
   - O f. 100 hours per week or more

4. What is your staff position in this hospital? Mark ONE answer that best describes your staff position.
   - O a. Registered Nurse
   - O b. Physician Assistant/Nurse Practitioner
   - O c. LVN/LPN
   - O d. Patient Care Assistant/Hospital Aide/Care Partner
   - O e. Attending/Staff Physician
   - O f. Resident Physician/Physician in Training
   - O g. Pharmacist
   - O h. Dietician
   - O i. Unit Assistant/Clerk/Secretary
   - O j. Respiratory Therapist
   - O k. Physical, Occupational, or Speech Therapist
   - O l. Technician (e.g., EKG, Lab, Radiology)
   - O m. Administration/Management
   - O n. Other, please specify:

5. In your staff position, do you typically have direct interaction or contact with patients?
   - O a. YES, I typically have direct interaction or contact with patients.
   - O b. NO, I typically do NOT have direct interaction or contact with patients.

6. How long have you worked in your current specialty or profession?
   - O a. Less than 1 year
   - O b. 1 to 5 years
   - O c. 6 to 10 years
   - O d. 11 to 15 years
   - O e. 16 to 20 years
   - O f. 21 years or more

SECTION I: Your Comments

Please feel free to write any comments about patient safety, error, or event reporting in your hospital.

THANK YOU FOR COMPLETING THIS SURVEY.

4

Source: Agency for Healthcare Research and Quality: *Hospital Survey on Patient Safety Culture*. http://www.ahrq.gov/qual/patientsafetyculture/hospsurvindex.htm (accessed Nov. 18, 2009).

Figure 2-4: Safety Attitudes Questionnaire for the Intensive Care Unit

SAQ!
Safety Attitudes Questionnaire

Unless otherwise indicated, respond to items thinking of the **specific area where you spend most of your time working**.

Name the area where you spend most of your time working:

	Circle the response that best reflects your agreement with each item	Disagree Strongly	Disagree Slightly	Neutral	Agree Slightly	Agree Strongly	N / A
1.	Nurse input is well received in this clinical area.	1	2	3	4	5	X
2.	In this clinical area, it is difficult to speak up if I perceive a problem with patient care.	1	2	3	4	5	X
3.	Disagreements in this clinical area are resolved appropriately (i.e., not who is right, but what is best for the patient).	1	2	3	4	5	X
4.	I have the support I need from other personnel to care for patients.	1	2	3	4	5	X
5.	It is easy for personnel here to ask questions when there is something that they do not understand.	1	2	3	4	5	X
6.	The physicians and nurses here work together as a well-coordinated team.	1	2	3	4	5	X
7.	I would feel safe being treated here as a patient.	1	2	3	4	5	X
8.	Medical errors are handled appropriately in this clinical area.	1	2	3	4	5	X
9.	I know the proper channels to direct questions regarding patient safety in this clinical area.	1	2	3	4	5	X
10.	I receive appropriate feedback about my performance.	1	2	3	4	5	X
11.	In this clinical area, it is difficult to discuss errors.	1	2	3	4	5	X
12.	I am encouraged by my colleagues to report any patient safety concerns I may have.	1	2	3	4	5	X
13.	The culture in this clinical area makes it easy to learn from the errors of others.	1	2	3	4	5	X
14.	I like my job.	1	2	3	4	5	X
15.	Working here is like being part of a large family.	1	2	3	4	5	X
16.	This clinical area is a good place to work.	1	2	3	4	5	X
17.	I am proud to work in this clinical area.	1	2	3	4	5	X
18.	Morale in this clinical area is high.	1	2	3	4	5	X
19.	When my workload becomes excessive, my performance is impaired.	1	2	3	4	5	X
20.	I am less effective at work when fatigued.	1	2	3	4	5	X
21.	I am more likely to make errors in tense or hostile situations.	1	2	3	4	5	X
22.	Fatigue impairs my performance during emergency situations (for example, emergency resuscitation, seizure).	1	2	3	4	5	X
23.	Hospital management does not knowingly compromise the safety of patients.	1	2	3	4	5	X
24.	Hospital management supports my daily efforts.	1	2	3	4	5	X
25.	I get adequate, timely information about events that might affect my work from hospital management.	1	2	3	4	5	X
26.	The levels of staffing in this clinical area are sufficient to handle the number of patients.	1	2	3	4	5	X
27.	Unit management does not knowingly compromise the safety of patients.	1	2	3	4	5	X
28.	Unit management supports my daily efforts.	1	2	3	4	5	X
29.	I get adequate, timely information about events that might affect my work from unit management.	1	2	3	4	5	X
30.	All the necessary information for diagnostic and therapeutic decisions is routinely available to me.	1	2	3	4	5	X
31.	Problem personnel are dealt with constructively by our hospital management.	1	2	3	4	5	X
32.	Trainees in my discipline are adequately supervised.	1	2	3	4	5	X
33.	This hospital does a good job of training new personnel.	1	2	3	4	5	X
34.	My suggestions about safety would be acted upon if I expressed them to management.	1	2	3	4	5	X
35.	Have you ever completed this survey (or a similar one) before?	No		Yes		Not Sure	
36.	Do you work in the same area as a year ago?	No		Yes		Not Sure	
37.	What is your gender?	Male		Female			
38.	What patient population do you primarily work with?	Adults		Peds		Both	

What is your role in this area?

[1] Administration/Management	[5] Patient Care Assistant/Aide/Care Partner	[10] Registered Nurse
[2] Assistant/Clerk/Secretary	[6] Pharmacist	[11] Respiratory Therapist
[3] Dietician	[7] Physician – Attending	[12] Technician – EKG, Lab, Radiology
[4] LVN/LPN	[8] Physician – Fellow/Resident	[13] Therapist – Physical, Occupational, Speech
	[9] Physician Assistant / Nurse Practitioner	[14] Other :

How long have you worked in this hospital/clinic/office? _____ Years

How long have you worked in your current specialty? _____ Years

Thank you for taking the time to provide your views on patient safety. Please write additional comments on the reverse side.

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Source: J. Bryan Sexton, Ph.D. Used with permission.

Sidebar 2-5: Tracking Compliance—Medication Management and Patient Safety

The Joint Commission's standards on medication management address the selection and procurement, safety, management, dispensing, and labeling of medications. These processes should include the following conditions:

- Members of the medical staff, licensed independent practitioners, pharmacists, and staff should be involved in ordering, dispensing, administering, and/or monitoring the effects of medications and should work together to develop written criteria for determining which medications are available for dispensing or administering to patients.

United States

- Medications should be stored according to manufacturers' recommendations, in a secure location that cannot be accessed by unauthorized personnel. Emergency medications, as designated by medical staff, should be stored in a safe location where they can be easily accessed when patients need them and in the appropriate strengths and dosages that are likely to be needed.
- Medications are clearly labeled in a standardized manner, and the label should include all the necessary information.
- A pharmacist or other designated, qualified health care professional must review all physician orders regarding medications to ensure their appropriateness and to check for potential allergies, interactions with other drugs, or other adverse reactions.
- The medications should be dispensed to patients in the appropriate quantities and dosages.

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

Challenges with Infection Prevention and Control

Intensive care patients are more susceptible to infections, partly because of their more serious medical conditions and partly because they are more likely to have invasive treatment and monitoring, such as central lines and ventilators. As a result, infection rates in adult and pediatric intensive care units are approximately three times higher than elsewhere in hospitals.[31] Among the most common types of infections contracted in the intensive care unit are central-line catheter infections and ventilator-associated pneumonia.

Central-Line Catheter Infections

Central-line catheters, also known as central venous catheters, have become invaluable to the way medicine is practiced, particularly when it comes to caring for the most critically ill patients. However, because central lines remain inserted into a patient's vein for an extended period of time, they can also be a source of infection.

More than five million central lines are inserted each year in the United States, resulting in approximately 200,000 central line–associated bloodstream infections (CLABSIs).[32] In intensive care units, where 32% to 80% of patients have central lines, the CLABSI rate ranges from 2.9 to 8.8 per 1,000 catheter days.[33] Other common intensive care unit infections include local site infections, septic thrombophlebitis, endocarditis, and other metastatic infections (for example, lung abscess, brain abscess, osteomyelitis, endophthalmitis).[34]

The incidence of infections varies based on type of catheter, frequency of catheter manipulation, and patient-related factors, including the underlying disease and acuity of illness. Other known risk factors include the following[35]:

- Inexperience of the caregiver placing the catheter
- Nurse-to-patient ratio in the intensive care unit
- Catheter insertion with less than maximal sterile barriers
- Placement of the catheter and the technique by which it was placed
- Contamination around the insertion site
- Placement for more than seven days

Research has found that strict adherence to infection prevention and control strategies can significantly reduce

Sidebar 2-6: Tracking Compliance—Medication Management as a Collaborative Process

Medication selection, procurement, storage, ordering, dispensing, administration and monitoring are collaborative processes that consider patient needs and safety as well as economics. The following conditions should be implemented:

- Health care practitioners involved in ordering, dispensing, administering, and monitoring processes should be involved in monitoring and maintaining the hospital's medication list. Decisions to add or remove medications from the list are to be guided by criteria. There should be a process or mechanism to monitor patient response to medications newly added to the list. This list is reviewed at least annually based on safety and efficacy information.
- Medications should be stored under conditions suitable for product stability. Controlled substances should be accurately accounted for according to applicable law and regulation. Medications and chemicals used to prepare medications should be accurately labeled with contents, expiration dates, and warnings. All medication storage areas are to be periodically inspected according to hospital policy to ensure that medications are stored properly.
- Policies and procedures guide the safe prescribing, ordering, and transcribing of medications in the organization, and a collaborative process should be in place to develop the policies and procedures. Relevant staff are trained in correct prescribing, ordering, and transcribing practices.
- Medication orders or prescriptions should be complete per hospital organization policy. Only those permitted by the organization and by relevant licensure, laws, and regulations prescribe or order medications. Individuals permitted to prescribe and order medications are known to the pharmaceutical service or others who dispense medications. Medication orders or prescriptions are reviewed for appropriateness prior to dispensing.
- Medication preparation and dispensing is to adhere to law, regulation, and professional standards of practice. There should be a uniform medication dispensing and distribution system in the hospital. Medications are to be appropriately labeled after preparation. Medications are dispensed in the most ready-to-administer form. The system supports accurate and timely dispensing.

International

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

the incidence of CLABSIs. For example, in one study, a group of Michigan hospitals was able to reduce CLABSIs in their intensive care units by 66%[36]; in another study, a group of Pennsylvania hospitals reduced CLABSIs in their intensive care units by 68%.[37] These strategies include the following:

- Developing checklists that include not only the steps for central-line insertion, but also the necessary infection prevention and control procedures to standardize the procedures and ensure that vital components of the process are not overlooked. Checklists should include hand washing, use of sterile barriers, and use of chlorhexidine antisepsis. Sidebar 2-7 on page 51 includes more information on hand hygiene.
- Reviewing central lines daily, because the longer a central line stays in place, the greater the risk of the line eventually becoming infected. Therefore, lines that are no longer necessary should be removed right away. To ensure that unnecessary central lines are removed as soon as possible, all central lines should be reviewed every day during rounds to determine whether they are still needed for the patient's care.

For more on central-line infection prevention, *see* Sidebar 2-8, page 52.

Ventilator–Associated Pneumonia

Ventilator-associated pneumonia (VAP) is the second most common hospital-acquired infection, after urinary tract infections. VAP accounts for approximately 15% of all hospital-associated infections, 27% of all

Sidebar 2-7: Tracking Compliance—Hand Hygiene

The Joint Commission's National Patient Safety Goals require organizations to comply with the guidelines for hand hygiene set out by the Centers for Disease Control and Prevention (CDC) or the World Health Organization (WHO). Joint Commission International's International Patient Safety Goals require organizations to adopt or adapt currently published and generally accepted hand hygiene guidelines, such as the CDC and WHO recommendations. Among the CDC and WHO guidelines are the following:

- When hands are visibly dirty or have blood or body fluids on them, hands should be washed with antimicrobial or non-antimicrobial soap and water; in a clinical situation, use alcohol-based hand rub or, alternatively, antimicrobial soap and water.
- Before and after direct patient contact, hands should be cleaned with antimicrobial soap and water.
- Hands should be washed with antimicrobial soap and water before and after the use of sterile gloves.

In addition, The Joint Commission Center for Transforming Healthcare, a new joint project venture, has introduced to health care organizations an approach to the challenges associated with hand hygiene by creating solutions to improve these challenges. The Center's current organization participants consist of leading hospitals and health systems in the United States who use a proven systematic approach to analyze this specific problem and develop targeted solutions. To learn more about the Center and the hand hygiene project, visit its Web site at http://www.centerfortransforminghealthcare.org/.

Also, the WHO has launched a global initiative to address hand hygiene titled "Five Moments for Hand Hygiene." More information is available at http://www.who.int/gpsc/5may/background/5moments/en/. For more information on the CDC recommendations, see the CDC's *Guideline for Hand Hygiene in Health-Care Settings* at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5116a1.htm, or the *WHO Guidelines on Hand Hygiene in Health Care* at http://www.who.int/patientsafety/information_centre/guidelines_hhad/en/.

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals *or the* Joint Commission International Accreditation Standards for Hospitals.**

infections acquired in the medical intensive care unit, and 24% of those acquired in the coronary care unit.[38] Hospital mortality of ventilated patients who develop VAP is 46%, compared with 32% for ventilated patients who do not develop VAP.[39]

Because individuals who contract VAP are already critically ill and require mechanical ventilation, they are at high risk for death or serious complications.[40] Other risk factors for VAP are long duration of mechanical ventilation, advanced age, depressed level of conscious- ness, preexisting lung disease, immune suppression from disease or medication, and malnutrition.[40]

To keep ventilated patients from developing VAP, caregivers should attempt to avoid mechanical ventilation if possible and use tracheotomy instead of intubation if long-term ventilation is required.[40]

For more on infection prevention and control, *see* Sidebars 2-9 and 2-10, page 53.

Preventing Antibiotic-Resistant Infections

One of the greatest concerns in the field of infection prevention and control is the rise in bacteria that are resistant to antibiotics, making them extremely difficult to treat and sometimes resulting in fatalities. Among these bacteria are methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE).

Of course, the earlier these infections are discovered, the better the chances of effective treatment. To identify these and other dangerous bacteria as early as possible, some health care providers are using active surveillance cultures (ASCs). This means that all admitted patients, or a high-risk subset, are screened for MRSA, VRE, and other bacteria and are kept in isolation until that culture

Sidebar 2-8: Institute for Healthcare Improvement Care Bundles

As part of its 5 Million Lives Campaign, the Institute for Healthcare Improvement has developed care bundles to help hospitals implement strategies to improve patient safety. Care bundles, in general, are small groupings of evidence-based practices that, when performed collectively and reliably, have been proven to improve patient outcomes. The science supporting the bundle components is sufficiently established to be considered a standard of care.

Among those care bundles are practices to prevent central line–associated bloodstream infections.

Central Line Bundle
The Central Line Bundle is a group of evidence-based interventions for patients with intravascular central catheters that, when implemented together, result in better outcomes than when implemented individually.

The following are key components of the Central Line Bundle:
- Hand hygiene
- Maximal barrier precautions
- Chlorhexidine skin antisepsis
- Optimal catheter site selection, with avoidance of the femoral vein for central venous access in adult patients
- Daily review of line necessity with prompt removal of unnecessary lines

Source: Institute for Healthcare Improvement: *Implement the Central Line Bundle*. http://www.ihi.org/IHI/Topics/CriticalCare/IntensiveCare/Changes/ImplementtheCentralLineBundle.htm (accessed Nov. 16, 2009). Used with permission.

comes back negative. This allows hospitals to respond quickly with the appropriate measures when infected patients have been identified to prevent the infection from spreading.

Although ASCs can be costly, they end up helping an organization save money by preventing infections that would be even more costly to treat. According to a report by the Society for Healthcare Epidemiology of America, several other countries, including Denmark, Norway, and the Netherlands, have had tremendous success in reducing their rates of MRSA by using ASCs and strictly applying barrier precautions with patients found to be infected with MRSA.[41]

Clostridium difficile Infections

Clostridium difficile, or *C. difficile,* is a bacterium that causes diarrhea and other more serious intestinal conditions, such as colitis. People who have other illnesses or conditions requiring prolonged use of antibiotics and the elderly are at greater risk of acquiring this disease. The number of cases of *C. difficile* in hospitals seems to be on the increase, and some researchers believe that this infection costs the U.S. health care system more than $1.1 billion a year.[42] Because *C. difficile* can be brought on by prolonged antibiotic use, discontinuation of the antibiotics can sometimes cure the disease; however, in some cases, *C. difficile* must be treated with medication or surgical resection of the colon.

The bacteria are found in feces. People can become infected if they touch items or surfaces that are contaminated with feces and then touch their mouths or mucous membranes. Health care workers can spread the bacteria to other patients or can contaminate surfaces through hand contact. Therefore, hand hygiene and other infection prevention and control procedures can help prevent the spread of this dangerous infection.

Incidents and severity of *C. difficile* infection are increasing in incidence and it is becoming more difficult to treat.[43] Recent reports of a more virulent and possibly more resistant strain of *C. difficile* is causing numerous outbreaks of the disease in North America and Europe (*see* Sidebar 2-11, page 54) and produces 16 times more toxin A and 23 times more toxin B than other strains (toxins A and B cause antibiotic-associated colitis).[43]

Because *C. difficile* is almost always associated with antimicrobial use, an individual should avoid unnecessary and inappropriate antimicrobial therapy.

Sidebar 2-9: Tracking Compliance—Infection Prevention and Control

Joint Commission standards require hospitals to take actions to prevent or reduce the risk of infections in patients, employees, and visitors. To that end, the organization's management systems must support the infection prevention and control process, which is designed to lower risks and to improve the rates or trends of epidemiologically significant infections.

Hospitals must do the following:

- Identify an individual(s) to be responsible for the infection prevention and control program. When the individual(s) with clinical authority over the infection prevention and control program does not have expertise in infection prevention and control, he or she should consult someone who has expertise in order to make knowledgeable decisions.
- Assign responsibilities for daily management of infection prevention and control activities. Identify risks for acquiring and transmitting infections based on factors such as geographic location, community, population served, types and levels of treatment provided, and infection surveillance data and other infection data.
- Based on the identified risks, set goals designed to minimize the possibility of transmitting infections.
- Develop formal infection prevention and control plans using evidence-based guidelines, national guidelines, or in the absence of such guidelines, expert input.
- Implement infection prevention and control plans using standard precautions, including thoroughly investigating any infectious outbreaks; reducing the risk of infections associated with medical equipment, devices, and supplies by cleaning and sterilizing them appropriately; and preventing the transmission of infectious disease among patients and caregivers.

United States

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

Sidebar 2-10: Tracking Compliance—Prevention and Control of Infection Program

The goal of a hospital's prevention and control of infection (PCI) program is to identify and reduce the risks of acquiring and transmitting infections among patients, staff, health care professionals, contract workers, volunteers, students, and visitors. Joint Commission International requires hospitals to do the following:

- Assign one or more individuals to oversee the PCI program. The individual(s) is to be qualified for the organization's size, level of risks, and program scope and complexity and must fulfill program oversight responsibilities as assigned or described in a job description.
- Create a designated mechanism for the coordination of the PCI program. Coordination of activities must involve physicians, nurses, infection control professionals, and others, as appropriate to the organization.
- Base the infection control program on current scientific knowledge, accepted practice guidelines, and applicable law and regulation.
- Create a comprehensive program and plan to reduce the risk of health care–associated infections in patients and health care workers. The program includes systematic and proactive surveillance activities to determine usual (endemic) rates of infection.
- Reduce the risk of infections by ensuring adequate equipment cleaning and sterilization and the proper management of laundry and linen.

International

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

Sidebar 2-11: *Clostridium difficile* in a Kuwaiti Intensive Care Unit

Three Kuwait hospitals reported the following important factors associated with *Clostridium difficile* (*C. difficile*)–infected patients in their intensive care unit and burn unit study:

- Of the 276 patients participating in the study, 25 were culture-positive for *C. difficile* after admission to the hospital. Of the 187 patients in Mubarak Al-Kabeer Hospital's intensive care unit, 13 (7%) tested positive; 3 (6%) of the 51 patients in the Ibn Sina Hospital burn unit tested positive; and 9 (36%) of the 25 patients in the Kuwait Cancer Control Centre tested positive.
- Based on time of *C. difficile* acquisition and patients' characteristics, two groups of patients were identified: patients who acquired the organism within two weeks of hospital admission (early acquisition) and patients who acquired it after two weeks of hospitalization (late acquisition).
- Compared with the patients in the early acquisition group, patients in the late *C. difficile* acquisition group who had more severe underlying disease and a higher number of deaths had been exposed to more antibiotics and the use of a nasogastric tube.
- The hands of the health care providers (nurses, physicians, and respiratory therapists) in intensive care units and burn units were examined for the possibility of carrying the infection by hand as a method of transmission. Samples from the hands of 72 health care providers were cultured for *C. difficile* before and after exposure to patients whose cultures were positive. None were positive.
- In this study, the rate of acquisition of the organism in the units indicated that *C. difficile* was present in these hospital settings and, given a trigger factor—for example, insertion of nasogastric tubes—nosocomial diarrhea can develop in patients admitted into the intensive care unit or burn unit.

Source: Rotimi V.O., et al.: Hospital-acquired *Clostridium difficile* infection amongst ICU and burn patients in Kuwait. *Med Princ Pract* 11, 2002. http://content.karger.com/ProdukteDB/produkte.asp?Aktion=ShowPDF&ArtikelNr=48656&Ausgabe=227589&ProduktNr=224259&filename=48656.pdf (accessed Nov. 11, 2009).

If a patient has *C. difficile,* the clinician must attentively monitor the patient for disease advancement and must follow infection prevention and control guidelines to prevent the spread of the disease to other patients.

Challenges with Communication

Safe, high-quality health care in the intensive care unit requires effective communication between members of the multidisciplinary team, as well as between the care team and the patients (if possible) and their families. Solid communication allows for sound decisions about treatment options, including surgery, tests, the use of machines and monitors, and drugs. It also helps to reduce the stress and anxiety suffered by patients and loved ones during times of critical illness.

Communication Within the Care Team

Communication strategies within a team providing critical care should be designed to provide double checks and verbal confirmations before treatments are provided to patients, as well as to help team members maintain their situational awareness. *Situational awareness* refers to a team member's knowledge of the current circumstances, as well as of surrounding issues that might cause the circumstances to change.

In the intensive care unit, this means that each team member would need to be aware of the patient's condition, any medical issues that might affect the condition or treatment, the treatment plan, and where the patient currently stands in that plan. Therefore, team communication must include methods for providing this information to each member. Members of the multidisciplinary intensive care unit team are not usually present at the same time (except perhaps at rounds). It may be necessary to develop a way to display the information in a place where all team members have access, such as on a board or computer screen in the patient treatment area or a special notification form in the patient chart.

In addition, communication strategies must include a method that allows team members to request information from each other in a safe, nonconfrontational way. For example, The Joint Commission and Joint

Commission International have requirements designed to help improve team communication to ensure that the correct patient receives treatment: Caregivers must use two patient identifiers before administering medications, blood, or blood components or before providing other treatment. In addition, when caregivers provide orders or critical test results to each other verbally or over the phone, the person receiving the information must repeat it to the giver to verify that it is correct.

The following sections discuss some additional commonly used team communication strategies.

Situation–Background–Assessment–Recommendation

The Situation–Background–Assessment–Recommendation (SBAR) communication method provides a framework for communication between members of the health care team about a patient's condition. It leaves no basic questions unanswered and prevents assumptions from being made by either party. It also allows team members to provide necessary information without being interrupted by questions that could distract them and cause them to forget a crucial piece of data.

The acronym "SBAR" stands for the information that the communicator should provide, as follows[44]:

- *Situation:* What the team member found when he or she first observed the patient. "Mrs. Smith is suffering from shortness of breath."
- *Background:* Other patient information that is relevant to the situation. "She's 80 years old and has chronic lung disease that has been getting worse in the last two weeks."
- *Assessment:* What the patient's vital signs are and/or what the communicator's examination found. "I'm not hearing any breath sounds on the right so I believe she may have a pneumothorax."
- *Recommendation:* What the team member thinks should be done. "Mrs. Smith likely needs a chest tube."

Standardized Transition of Care

The Joint Commission requirements state that hospitals should have a standard method for transitions in care—also known as handoffs or handovers—when responsibility for a patient is passed from one caregiver to another. Joint Commission International requires that information about the patient's care and response to care be communicated among medical, nursing, and other care providers during each staffing shift and between shifts. Handoffs in the intensive care unit may occur between nurses on different shifts, between intensivists and primary care physicians, or between nurses and transport staff, radiologists, psychologists, and any other individual who may need to take responsibility for the patient for a time. When the patient is handed off, caregivers must pass on information needed to continue providing care for that patient, such as the patient's current condition and treatment and possible changes or complications.

Standardization of handoffs throughout the organization will not only assist with handoffs occurring within the intensive care unit but also with handoffs that occur when a patient leaves the intensive care unit for an inpatient bed on another unit. A standardized approach should identify the following items:

- Which handoff situation it applies to
- Who is, or should be, involved in the communication
- What information should be communicated; for example:
  - —Diagnoses and current condition of the patient
  - —Recent changes in condition or treatment
  - —Anticipated changes in condition or treatment
  - —What to watch for in the next interval of care
- Opportunities to ask and respond to questions
- When to use certain communication techniques, such as repeat-back or the SBAR technique
- What print or electronic information should be available

Daily Goals

Some organizations have found the use of daily goals for patient care to be an effective way of ensuring that all team members are working toward the same objectives. In general, the goals are developed during multidisciplinary rounds each morning and posted in a location that all caregivers can easily access.

One organization found that before implementing daily goals, less than 10% of residents and nurses understood the goals of care for the day. After implementing the daily goals form, more than 95% of nurses and residents understood the goals of care for the day.[45] In addition, the new system decreased intensive care unit length of stay from a mean of 2.2 days to 1.1 days.[45] In another study, daily goal worksheets reduced the average intensive care unit length of stay from 6.4 days to 4.3 days. In this study, the worksheet was a very simple form with the patient's name and bed number and spaces to fill in any tests, procedures, medications, consults, and so on that the patient would need that day.[46]

Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS™)

TeamSTEPPS™ (Team Strategies and Tools to Enhance Performance and Patient Safety) is an initiative developed by the AHRQ and the U.S. Department of Defense Health Care Team Coordination program. It stresses teamwork and communication among physicians, nurses, and other health care personnel to optimize the use of information, people, and resources to achieve the best clinical outcomes for patients, with the ultimate goal of improving patient safety.

The core of the TeamSTEPPS framework is four key principles/skills/core competencies that are integrated to foster delivery of safe, high-quality care as a cohesive patient care team, which includes the patient, direct caregivers, and those who play a supportive role within the health care delivery system. The four key skill areas are as follows[47,48]:

1. *Leadership:* Involves the ability to coordinate the activities of team members by ensuring that team actions are understood, changes in information are shared, and team members have the necessary resources.
2. *Situation monitoring:* The individual's active scanning of the behaviors and actions of those around him or her to assess the situation or environment. Situation monitoring fosters mutual respect and team accountability and provides a safety net for the team and the patient.
3. *Mutual support:* The ability to anticipate and support other team members' needs through accurate knowledge about their responsibilities and work load. Mutual support protects team members from work-overload situations that may reduce effectiveness and increase the risk of error.
4. *Communication:* Communication is a process by which information is clearly and accurately exchanged among team members. Because major changes in communication processes also require culture change, the TeamSTEPPS initiative aims to revise organizations' cultures by doing the following:
   - Establishing names for behaviors and a common language for talking about communication failures
   - Bridging the professional divide and leveling the hierarchies often seen in health care
   - Providing teachable and learnable skills and actions to practice
   - Increasing mindfulness
   - Enlisting the patient as a valued team member

Challenges in Patient/Family Communication

Members of the intensive care unit care team should be sure to discuss the plan of care, along with the patient's response to treatment and the goals that have been set regarding care, with the patient and his or her family. This information should be provided in easy-to-understand language and in a timely manner. When the patient cannot be the primary contact regarding his or her care, it is usually helpful for the family to designate a single point of contact who can relay information from the caregivers to the family.

When significant issues, such as dramatic changes in the patient's condition or the patient's need for a living will or do-not-resuscitate order, need to be discussed, intensive care unit staff should hold a formal family conference, in which several members of the multidisciplinary team meet with the patient and family to provide information and answer questions (*see* Sidebars 2-12 and 2-13, page 57, for additional information on patient rights). More is found on this topic in Chapter 4, "Patient Safety and the Multidisciplinary Approach to Care."

Sidebar 2-12: Tracking Compliance—Rights and Responsibilities of the Individual

The Joint Commission's standards chapter "Rights and Responsibilities of the Individual" requires hospitals to demonstrate that they respect patients' rights. To do so, hospitals must develop a written policy on patients' rights and communicate it to patients. This policy should include the patients' rights to privacy, pain management, religious and spiritual services, and accommodations for disabilities.

United States

The organization should also demonstrate respect for the patient's right to make decisions about care, treatment, and services, as well as the right to refuse such care. The written policy should also include information about advance directives in accordance with local or regional regulations.

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

Sidebar 2-13: Tracking Compliance—Patient and Family Rights

Joint Commission International's standards in the "Patient and Family Rights" chapter require hospitals to establish trust and open communication with patients and to understand and protect each patient's cultural, psychosocial, and spiritual values.

International

Organizations should define the rights of patients and then educate patients and staff about those rights. Patients are to be informed of their rights and how to act on those rights. Staff are taught to understand and respect patients' beliefs and values and to provide considerate and respectful care that protects patients' dignity.

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

Challenges in the Pediatric and Neonatal Intensive Care Units

Pediatric patients present numerous challenges to care providers because they are different from adult patients in many more ways than just physical size and proportions. First, normal heart rate, respiratory rate, and blood pressure ranges for children are not only different from those for adults, but they vary depending on the age of the child—normal vital signs for a 3-year-old are not the same as those for a 14-year-old.

In addition, the signs of deterioration are not necessarily the same, so symptoms that might be of minor concern in an adult patient should be treated very seriously in a child. For example, children are far more vulnerable to dehydration or slight medication overdoses and could rapidly deteriorate if those conditions are not quickly and appropriately treated.

These issues also apply to neonatal patients, who also have the added problem of premature birth, making their condition even more delicate. One study found that adverse events occurred at a higher rate for neonatal patients who were at less than 28 weeks' gestation.[49]

In addition, experts agree that medication errors have the potential to cause harm within the pediatric population at a higher rate than in the adult population. For example, medication-dosing errors are more common in pediatrics than in adults because of weight-

based dosing calculations, fractional dosing, and the need for decimal points.

Children are more prone to medication errors and the resulting harm because of the following:

- Most medications used in the care of children are formulated and packaged primarily for adults. Therefore, medications often must be prepared in different volumes or concentrations within the health care setting before being administered to children. The need to alter the original medication dosage requires a series of pediatric-specific calculations and tasks, each significantly increasing the possibility of error.
- Most health care settings are primarily built around the needs of adults. Many settings lack trained staff oriented to pediatric care, pediatric care protocols and safeguards, and/or up-to-date and easily accessible pediatric reference materials, particularly with regard to medications.
- Children—particularly young, small, and sick children—are usually less able to physiologically tolerate a medication error due to still-developing renal, immune, and hepatic functions.
- Many children, particularly very young children, cannot communicate effectively to providers regarding any adverse effects that medications may be causing.

Pediatric-specific strategies for reducing medication errors include the following:

- Standardize and identify medications effectively, as well as the processes for drug administration.
- Ensure full pharmacy oversight—as well as the involvement of other appropriate staff—in the verifying, dispensing, and administering of both neonatal and pediatric medications.
- Use technology judiciously.

For more on risk reduction strategies, *see* The Joint Commission's *Sentinel Event Alert* "Preventing Pediatric Medication Errors" at http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_39.htm.

Also at issue is whether parents should be present for resuscitation efforts or other invasive procedures. In many hospitals, intensive care unit staff ask parents to leave the room, thinking that witnessing that treatment would be too upsetting or that their presence would interfere with care. However, studies have found that family presence (FP) during these interventions is usually positive, allowing parents to feel involved and active in the care of their children without interrupting treatment.

In one study, parents who were at their child's bedside reported that they felt that they were able to soothe and support their child, as well as assist caregivers by providing information about their child's health—100% said that being with their child was something they would do again. The reasons for this most frequently mentioned were that the parents' presence helped the child, allowed them to learn about the child's conditions, and let them see that caregivers were doing everything possible to treat them. In 100% of cases, the FP did not interfere with care.[50]

In 2003, representatives from 18 U.S. organizations, including the American College of Emergency Physicians,[51] the American Academy of Pediatrics, the Emergency Nurses Association,[52] and the Society for Academic Emergency Medicine, convened for the National Consensus Conference on Family Presence During Pediatric Cardiopulmonary Resuscitation and Procedures to develop recommendations. The recommendations are as follows:

- Consider FP as an option for all families during pediatric procedures and cardiopulmonary resuscitation.
- Offer FP as an option when the care to the child will not be interrupted and after an assessment for the following:
  —Combative and threatening behavior
  —Extreme emotional volatility
  —Behaviors consistent with intoxication or altered mental status
  —Disagreement among family members
  —Threat to the safety of the health care team
  If the family is not provided with the option for FP, document the reasons why FP was not offered.

- Consider the safety of the health care team at all times.
- In-hospital transport and transfer settings should have written policies and procedures for FP; these should include, but not be limited to, the following:
  - —Definition of a facilitator
  - —Definition of family member, legal guardian
  - —Definition of procedure
  - —Preparation of the family, including explanations, descriptions, and role of the family
  - —Process of escorting the family in and out of the treatment room
  - —Handling disagreements
  - —Providing support for the staff
- Health care policies regarding FP should undergo legal review.
- Educate all health care providers with the following:
  - —Include education in FP in all core curricula for health care providers at all levels.
  - —Include this education also in health care settings as part of hospital orientation.
- Promote research to include, but not be limited to, investigation of the following:
  - —Best methods for education of providers
  - —Long-term outcomes of FP on the patient, family, and staff
  - —Best means of approaching and instructing families
  - —Best practices for FP
  - —Reasons why families may decline the opportunity to be present
  - —Cost-effectiveness of FP
  - —Potential legal ramifications of implementing or not implementing FP
  - —Relation of FP to consent issues regarding tissue donation or autopsy
  - —Relation of FP to pain management

Formal written protocols regarding FP can make the hospital's position clear and ensure that caregivers understand what their role is when family members ask to be with a patient.

Evidence-Based Guidelines for the Intensive Care Unit

Health care practice tends to place a high value on autonomy of the caregiver, but this can lead to too much variability in the treatment of patients. This is why many organizations are implementing evidence-based guidelines.

Evidence-based medicine is sometimes derisively called "cookbook medicine," but it doesn't mean doing the same thing for all patients. It refers to a decision-making strategy that takes into account the evidence from the best research along with the clinical expertise of the caregivers. Evidence-based practice allows for necessary variations, depending on the individual patient's condition and background and the clinician's skill.

Despite this, some physicians can sometimes be resistant to the idea of evidence-based protocols. One way to improve patient safety in the intensive care unit is to empower critical care team members to promote and enforce the evidence-based guidelines through rewards and other positive feedback and the support of leadership. By empowering critical care nurses in this manner, one organization saw compliance with evidence-based guidelines increase from a range of 62%–77% up to nearly 90%.[54] At another organization, pharmacists evaluated all sedated, ventilated patients each day and made recommendations based on established protocols, resulting in a significant decrease in the duration of mechanical ventilation for those patients.[55] Sidebar 2-14, page 60, discusses performance improvement and quality requirements for Joint Commission and Joint Commission International accreditation.

Staff Training and Skills

In the midst of the patient safety improvement initiatives in the intensive care unit, hospitals should be sure not to lose sight of one of the most important factors in high-quality patient care—the skills of the caregivers. Training to enhance staff's technical skills, which are specialized for this medically fragile patient group, as well as their nontechnical skills—such as task management, teamwork, situational awareness, and decision making[56]—is still crucial to the care and safety of critically ill patients

Sidebar 2-14: Tracking Compliance—Performance Improvement

Both The Joint Commission and Joint Commission International standards require that hospitals collect data to monitor their performance. Organization leadership set the improvement priorities, and the data collected include the following for Joint Commission– and/or Joint Commission International–accredited organizations:

- Performance improvement priorities
- Operative or other procedures that place patients at risk of disability or death
- All significant discrepancies between preoperative and postoperative diagnoses, including pathologic diagnoses
- Adverse events related to using moderate or deep sedation or anesthesia
- The use of blood and blood components and transfusion reactions
- The results of resuscitation
- Behavior management and treatment
- Adverse drug reactions and medication errors
- Patient perception of the safety and quality of care, treatment, and services
- Leading and planning the quality improvement and patient safety program
- Designing new clinical and managerial processes well
- Monitoring how well processes work through indicator data collection
- Analyzing the data
- Implementing and sustaining changes that result in improvement
- Driven leadership
- Seeking to change the culture of an organization
- Proactively identifying and reducing risk and variation
- Using data to focus on priority issues
- Seeking to demonstrate sustainable improvements

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals *and* Joint Commission International Accreditation Standards for Hospitals.**

Sidebar 2-15: Training and Simulation

One method of training that is gaining in popularity is simulation. Although a great deal of clinical training happens on the job or in the classroom, simulation training can ensure patient safety in two ways: First, it allows clinicians to gain experience with a wide range of specific scenarios, without necessitating that they "practice" on patients. (Because the training does not occur in the patient setting, some researchers have argued that there is an ethical imperative to use simulation training.) Second, effective simulation training will help staff improve their skills and thereby provide their real-life patients with safer, higher-quality care. Simulation is not intended to be the primary form of clinical training; however, used in conjunction with on-the-job training and other types of education, it can provide a fuller, introspective training experience.

Simulation training can range from computer-based learning, which may sometimes be more appropriate for introducing a new skill, to the use of trained actors playing patients, to full-blown enactments of specific clinical scenarios, such as a particularly difficult procedure, complete with electronic mannequins that are programmed to act and react like actual human patients.

In the latter two types of simulations, the training session is usually recorded on video. After the scenario has been completed, trainees can then watch the recording with a facilitator to review and discuss their performances. This can be particularly useful if the goal of the training is to improve teamwork, communication, or other "soft" skills.

Most simulation centers have the capability to create a wide variety of scenarios, depending on a hospital's training needs. The scenario can be designed to go smoothly or terribly wrong: The "patient" can be programmed to react to treatment in numerous ways, based on the age, gender, and medical condition(s) it is meant to represent. In addition, trainers may participate in the scenario, acting as difficult or as helpful as real-life coworkers can be.

Sidebar 2-15: Training and Simulation (continued)

Although there can be many expenses associated with simulation, the training can pay for itself by improving patient care and safety. In addition, it may help save on malpractice costs and reduce performance inefficiencies, as well as decrease the number of adverse events that may not lead to lawsuits but that are a patient safety concern nonetheless.

Sources: The Joint Commission: *Medical Team Training: Strategies for Improving Patient Care and Communication.* Oakbrook Terrace, IL: Joint Commission Resources, 2008; Ziv A., et al.: Simulation-based medical education: An ethical imperative. *Acad Med* 78:783–788, Aug. 2003; Gaba D.M: The future vision of simulation in health care. *Qual Saf Health Care* 13(Suppl. 1):i2–i10, 2004.

(*see* Sidebar 2-15, beginning on page 60, and the "Intensive Care Resources" section, pages 62–69, for more detail). Periodic educational seminars can also serve as reminders about various evidence-based protocols that staff should be following. For example, one organization increased hand hygiene compliance from 89% to 100% after instituting an educational program about the practice.[57] Another organization significantly reduced the incidence of pressure ulcers in the intensive care unit through one-on-one clinical instruction for bedside nurses.[58]

Chapter 3 explores the role and responsibilities of the physician who specializes in the care of the critically ill patient—the intensivist.

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care

I. Program Director Qualifications

The director of an advanced training program for physicians in critical care

A. Demonstrates a commitment to critical care

The director demonstrates a commitment to advanced training and practice in critical care medicine by the development of an educational curriculum recognized by the Accreditation Council for Graduate Medical Education as an accredited program in critical care. A commitment to the interest and well-being of the patients, as well as the trainees, should also be demonstrated.

B. Has the interest, authority, and time required to fulfill teaching responsibilities in order to develop, implement, and achieve the educational goals of the training program

The director has the time available to teach trainees in the program, as well as to interact with other advanced training directors for physicians in critical care, in order to maintain the quality of all institutional programs. A prior and continuing commitment to the principles and practices of educational theory and methodologies should be demonstrated.

C. Has the proper training and experience in the management of critically ill patients and administration of critical care units

The director achieves certification in his/her primary specialty and in the subspecialty of critical care and has had active experience in unit administration.

D. Maintains active clinical involvement in the practice of critical care

The director should be an intensivist with a substantial time commitment to the clinical practice of critical care, not only to maintain his/her knowledge base, but also to serve as a role model for trainees.

E. Maintains continuing education in critical care

The director maintains his/her own continuing education by reading appropriate literature and participating in conferences on national and regional levels relating to critical care.

F. Exhibits active interest in medical research related to critical care

The director should actively participate in and provide an environment conducive to basic science and clinical research and should encourage his/her trainees to participate in and publish results of research and to engage in scientific presentations.

II. Program Content

A. Specific Credentials

Each trainee should achieve provider and/or instructor status in one or more of the following:

1. Advanced Cardiac Life Support (ACLS)
2. Advanced Trauma Life Support (ATLS) optional
3. Pediatric Advanced Life Support (PALS) or Advanced Pediatric Life Support (APLS)
4. Fundamental Critical Care Support (FCCS) optional

B. Cognitive

Acquisition of the following cognitive skills by trainees could be assured by the training director through the use of any of a number of techniques, including didactic sessions, journal clubs, or illustrative case reports.

1. Cardiovascular Physiology, Pathology, Pathophysiology, and Therapy
   a. Shock and its complications
   b. Myocardial infarction and its complications

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

c. Cardiac rhythm and conduction disturbances; indications for and types of pacemakers
d. Pulmonary embolism-thrombus; air, fat, amniotic
e. Pulmonary edema; cardiogenic, noncardiogenic
f. Cardiac tamponade and other acture pericardial diseases
g. Acute and chronic life-threatening valvular disorders
h. Acute aortic and peripheral vascular disorders, including A-V fistulas
i. Acute complications of cardiomyopathies and myocarditis
j. Vasoactive and inotropic therapy
k. Pulmonary hypertension and cor pulmonale
l. Complications of angioplasty
m. Principles of oxygen transport and utilization
n. Hemodynamic effects caused by ventilatory assist devices
o. Thrombolytic and anticoagulant therapy
p. Perioperative management of patient undergoing cardiovascular surgery
q. Recognition, evaluation, and management of hypertensive emergencies and urgencies

C. Respiratory Physiology, Pathology, Pathophysiology, and Therapy
1. Acute respiratory failure
a. Hypoxemic respiratory failure including acute respiratory distress syndrome
b. Hypercapnic respiratory failure
c. Acute or chronic respiratory failure
2. Status asthmaticus
3. Smoke inhalation, airway burns
4. Aspiration
5. Flail chest, chest trauma, pulmonary contusion
6. Bronchopulmonary infections
7. Upper airway obstruction
8. Near drowning
9. Pulmonary mechanics and gas exchange
10. Oxygen therapy
11. Hyperbaric oxygenation
12. Mechanical ventilation
a. Pressure and volume ventilators
b. Positive end-expiratory pressure, intermittent mandatory ventilation, continuous positive airway pressure, high-frequency ventilation, inverse ratio ventilation, pressure-support ventilation, negative pressure ventilation, differential lung ventilation, pressure control, and noninvasive ventilation
c. Indications for and hazards of mechanical ventilation
d. Barotrauma and volutrauma
e. Criteria for weaning and weaning techniques
f. Extracorporeal membrane oxygenation
g. Permissive hypercapnia
h. Liquid ventilation
13. Airway maintenance
a. Emergency airway management
b. Endotracheal intubation
c. Tracheostomy—open and percutaneous
d. Long-term intubation vs. tracheostomy
14. Ventilatory muscle physiology, pathophysiology, and therapy, including polyneuropathy of the critically ill, and prolonger effect of neuromuscular blockers
15. Pleural diseases
a. Empyema
b. Massive effusion
c. Pnuemothorax
d. Hemothorax
16. Pulmonary hemorrhage and massive hemoptysis
17. Nitric oxide

(continued on page 64)

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

D. Renal Physiology, Pathology, Pathophysiology, and Therapy
   1. Renal regulation of fluid balance and electrolytes
   2. Renal failure: prerenal, renal, and postrenal
   3. Derangements secondary to alterations in osmolality and electrolytes
   4. Acid-base disorders and their management
   5. Principles of hemodialysis, peritoneal dialysis, ultrafiltration, continuous arteriovenous hemofiltration (CAVH), and continuous veno-venous hemofiltration (CVVH)
   6. Interpretation of urine electrolytes
   7. Evaluation of oliguria
   8. Drug dosing in renal failure
   9. Rhabdomyolysis

E. Central Nervous System (CNS) Physiology, Pathology, Pathophysiology, and Therapy
   1. Coma
      a. Metabolic
      b. Traumatic
      c. Infectious
      d. Mass lesions
      e. Vascular—anoxic or ischemic
      f. Drug induced
   2. Hydrocephalus
   3. Psychiatric emergencies
   4. Perioperative management of patient undergoing neurologic surgery
   5. Brain death evaluation and certification
   6. Diagnosis and management of persistent vegetative states
   7. Management of increased intracranial pressure (ICP), including ICP monitors
   8. Status epilepticus
   9. Neuromuscular disease causing respiratory failure
      a. Guillain-Barré
      b. Amyotropic Lateral Sclerosis
      c. Myasthenia Gravis
   10. Nontraumatic intracranial bleed
      a. Subarachnoid
      b. Intracerebral
      c. Others

F. Metabolic and Endocrine Effects of Critical Illness
   1. Colloid osmotic pressure
   2. Alimentation
      a. Enteral and parenteral
      b. Evaluation of nutritional needs including indirect calorimetry
   3. Endocrine
      a. Disorders of thyroid function (thyroid storm, myxedema coma, sick euthyroid syndrome)
      b. Adrenal crisis
      c. Disorders of antidiuretic hormone metabolism
      d. Diabetes mellitus
         (1) Ketotic and nonketotic hypersmolar coma
         (2) Hypoglycemia
      e. Pheochromocytoma
      f. Insulinoma
      g. Disorders of calcium and magnesium balance

G. Infectious Disease Physiology, Pathology, Pathophysiology, and Therapy
   1. Antibiotics
      a. Antibacterial agents including aminoglycosides, penicillins, cephalosporins, and quinolones
      b. Antifungal agents
      c. Antituberculosis agents
      d. Antiviral agents
      e. Agents for parasitic infections
   2. Infection control for special care units
      a. Development of antibiotic resistance
      b. Universal precautions
      c. Isolation and reverse isolation
   3. Anaerobic infections
   4. Systemic Inflammatory Response Syndrome (SIRS)

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

5. Tetanus
6. Hospital-acquired and opportunistic infections in the critically ill
7. Adverse reactions to antimicrobial agents
8. Intensive care unit support of the immunosuppressed patient
   a. Acquired Immunodeficiency Syndrome (AIDS)
   b. Transplant
   c. Oncologic
9. Infectious risks to health care workers
10. Evaluation of fever in the intensive care unit patient

H. Physiology, Pathology, Pathophysiology, and Therapy of Acute Hematologic and Oncologic Disorders
1. Acute defects in hemostasis
   a. Thrombocytopenia/thrombocytopathy
   b. Disseminated intravascular coagulation
2. Anticoagulation; fibrinolytic therapy
3. Principles of blood component therapy
   a. Platelet transfusion
   b. Packed red blood cells
   c. Fresh frozen plasma
   d. Specific coagulation factor concentrates
   e. Albumin, plasma protein fraction
   f. Stroma-free hemoglobin
   g. White blood cell transfusion
   h. Cryoprecipitate
4. Acute hemolytic disorders including thrombotic microangiopathies
5. Acute syndromes associated with neoplastic disease and antineoplastic therapy
6. Sickle cell crisis
7. Plasmapheresis
8. Prophylaxis against thromboembolic disease

I. Physiology, Pathology, Pathophysiology, and Therapy of Acute Gastrointestinal (GI), Genitourinary (GU), and Obstetric-Gynecological (Ob-Gyn) Disorders
1. Acute pancreatitis with shock
2. Upper gastrointestinal bleeding including variceal bleeding
3. Lower gastrointestinal bleeding
4. Acute and fulminant hepatic failure
5. Toxic megacolon
6. Acute perforations of the gastrointestinal tract
7. Ruptured esophagus
8. Acute inflammatory diseases of the intestine
9. Acute vascular disorders of the intestine, including mesenteric infarction
10. Obstructive uropathy, acute urinary retention
11. Urinary tract bleeding
12. Toxemia of pregnancy; amniotic fluid embolism, HELLP (hemolysis, elevated liver function tests, and low platelet count) syndrome, ovarian hyperstimulation
13. Hydatidiform mole
14. Perioperative management of surgical patients
15. Stress ulcer prophylaxis
16. Drug dosing in hepatic failure
17. Acalculous cholecystitis
18. Postoperative complications including fistulas, wound infection, and evisceration

J. Environmental Hazards
1. Drug overdose and withdrawal
   a. Barbiturates
   b. Narcotics
   c. Salicylates
   d. Alcohols
   e. Cocaine
   f. Trcyclic antidepressants
   g. Acetaminophen
   h. Others
2. Temperature-Related Injuries

(continued on page 66)

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

a. Hyperthermia
b. Hypothermia
c. Envenomation

K. Immunology and Transplantation
1. Principles of transplantation (organ donation, procurement, maintenance of organ donors, preservation, transportation, allocation, implantation, national organization of transplantation activities)
2. Immunosuppression
3. Organ transplantation: indicators and postoperative care

L. Trauma, Burns
1. Initial approach to the management of multiple system trauma
2. CNS trauma (brain and spinal cord)
3. Skeletal trauma including the spine and pelvis
4. Chest trauma, blunt and penetrating
5. Abdominal trauma, blunt and penetrating
6. Crush injury
7. Burns
8. Electrical injury

M. Monitoring, Bioengineering, Biostatistics
1. Prognostic indices, severity, and therapeutic intervention scores
2. Principles of electrocardiographic monitoring, measurement of skin temperature and resistances, transcutaneous measurements
3. Invasive hemodynamic monitoring
   a. Principles of strain gauge transducers
   b. Signal conditioners, calibration, gain, adjustment
   c. Display techniques
   d. Principles of arterial, central venous, and pulmonary artery pressure catheterization and monitoring
   e. Assessment of cardiac function and derived hemodynamic parameters
4. Noninvasive hemodynamic monitoring
5. Electrical safety
6. Thermoregulation
7. CNS brain monitoring (intracranial pressure, cerebral blood flow, cerebral metabolic rate, electroencephalogram, jugular venous bulb oxygenation, transcranial Doppler)
8. Respiratory monitoring (airway pressure, introthoracic pressure, tidal volume, pulse oximetry, dead space to tidal volume ratio, compliance, resistance, capnography, pnuemotechography)
9. Metabolic monitoring (oxygen consumption, carbon dioxide production, respiratory quotient)
10. Use of computers in critical care units

N. Administrative and Management Principles and Techniques
1. For training subsequent trainees in critical care medicine
2. Organization and staffing of critical care units
3. Standards for special care units, The Joint Commission
4. Medical record keeping in special care units
   a. Problem-oriented record approach
   b. System-structures record approach
   c. Manual vs. mechanical (computer) record generation
   d. Organization of physician, nursing, technical, and laboratory records within special care units
5. Priorities in the care of the critically ill or injured
6. Collaborative practice principles
7. Participation in relevant hospital committees
8. Design of special care units
9. Emergency medical systems in prehospital care
10. Performance improvement, principles and practices
11. Principles of triage and resource allocation
12. Utilization management
    a. Case management

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

b. Clinical practice guidelines
13. Critical pathway development
14. Electronic database
15. Medical economics: essential principles of health care reimbursement
    a. Health care legislation
    b. Managed care
16. Budget development and management

O. Pharmacokinetics and Dynamics: Drug Metabolism and Excretion in Critical Illness
1. Uptake metabolism and excretion of common drugs
   a. Antibiotics
   b. Antiarrhythmics
   c. Chemotherapeutic agents
   d. Neuromuscular blockers
   e. Sedatives
   f. Analgesics
   g. Others

P. Ethical and Legal Aspects of Critical Care Medicine
1. Death and dying
2. The ethical decision-making process
3. Forgoing life-sustaining treatment and orders not to resuscitate
4. Principles of pain management
5. Use of surrogate decision makers, especially in the vulnerable population
6. Major ethical principles
7. Futile care
8. Treatment of the handicapped and mentally retarded
9. Rights of patients, the right to refuse treatment
10. Living wills, advance directives; durable power of attorney

Q. Principles of Research in Critical Illness
1. Study design
2. Biostatistics
3. Grant funding and protocol writing
4. Manuscript preparation

R. Psychosocial Aspects: Awareness of the Physiologic and Social Effects of Life-Threatening Illness on Patients and Families

III. Procedural Skills

The definition of competency to perform the listed procedures must include knowledge of the indications, contraindications, and complications of these interventions.

A. Airway Management
1. Maintenance of open airway in nonintubated, unconscious, paralyzed patients
2. Intubation (oral, nasotracheal)
3. Cricothyrotomy, transtracheal catheterization, tracheostomy

B. Breathing, Ventilation
1. Ventilation by bag and mask
2. Suction techniques
3. Chest physiotherapy, incentive spirometry
4. Fiberoptic laryngotracheo-bronchoscopy
5. Management of pneumothorax (needle, chest tube insertion, drainage systems)
6. Monitoring airway pressures
7. Operation of mechanical ventilators
8. Measurement of endotracheal tube cuff pressures
9. Interpretation of sputum Gram stain
10. Performance of bedside pulmonary function tests
11. Application of appropriate oxygen therapy
12. Application of end tidal CO_2 detectors, pulse oximetry, oximetric pulmonary artery catheters
13. Radiograph interpretation

C. Circulation
1. Arterial puncture and blood sampling
2. Insertion of monitoring catheters

(continued on page 68)

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

a. Central venous
b. Arterial
c. Pulmonary artery catheters

3. Pericardiocentesis
4. Management of arterial and venous air embolism
5. Transvenous pacemaker insertion
6. Cardiac output determinations by the thermodilution technique
7. Obtain 7-lead electrocardiogram
8. Use of infusion pumps for vasoactive drugs
9. Cardioversion
10. Application and regulation of intra-aortic assist devices
11. Application of noninvasive cardiovascular monitoring
12. Transcutaneous pacing defibrillation

D. Central Nervous System
1. Lumbar puncture
2. Monitoring of modified electroencephalogram
3. Application of hypothermia

E. Renal
1. Manage peritoneal dialysis
2. Manage CAVH, CVVH
3. Insertion of hemodialysis catheters

F. Gastrointestinal Tract
1. Insertion of transesophageal devices
2. Prevention and management of upper gastrointestinal bleeding
3. Gastric tonometry

G. Hematology
1. Utilization of blood component therapy
2. Management of massive transfusions, including rapid infusers
3. Autotranfusion
4. Proper ordering and interpretation of coagulation studies

H. Infection
1. Intensive care unit sterility techniques and precautions
2. Sampling, staining, interpretation of blood, sputum, urine, body fluids, and drainage

I. Metabolism, Nutrition
1. Enteral feeding access
2. Parenteral nutrition

J. Monitoring, Bioengineering
1. Utilization, zeroing, calibration of transducers
2. Use of amplifiers and recorders
3. Troubleshooting equipment
4. Correcting basic electrical safety hazards

K. Trauma
1. Temporary immobilization of fractures
2. Pneumatic anti-shock garment
3. Use of special beds, e.g., circle electric bed, roto bed, flexicare
4. Peritoneal lavage

L. Intensive Care Unit Laboratory
1. Blood gas analysis

IV. Patient Care Experience

Trainees must have at least 12 months of primary service experience in which the trainee has significant responsibility for patient management. Consultative experience alone does not provide the exposure necessary to train an intensivist.

Trainees must, at a minimum, be exposed to patients with the following:

A. Hemodynamic Instability
1. Use of computer and calculators to determine derived parameters, including systemic and pulmonary vascular resistance, oxygen content, intrapulmonary shunt, alveolar-arterial gradients, oxygen transport, and oxygen consumption

INTENSIVE CARE RESOURCES

Guidelines for Advanced Training of Physicians in Critical Care (continued)

2. Dynamic electrocardiogram interpretation
3. Infusion of epinephrine, dopamine, norepinephrine, nitroglycerin, dobutamine, isoproterenol, nitroprusside, and other vasoactive drugs
4. Thrombolytic therapy
5. Fluid resuscitation

B. Respiratory Insufficiency and Failure
1. Indications, applications, techniques, criteria, and physiological effects of positive end-expiratory pressure; intermittent positive pressure breathing; intermittent mandatory ventilation; continuous positive airway pressure; pressure-support ventilation; airway pressure release ventilation; pressure control; noninvasive ventilation
2. Use of intermittent positive pressure breathing therapy, bronchodilators, humidifiers
3. Weaning techniques
4. Sedation, analgesia, neuromuscular blockade

C. Acute Neurologic Insult Including Those with Increased Intracranial Pressure
1. Management of intracranial pressure monitors and intracranial hypertension

D. Acute Renal Insufficiency and Failure

E. Acute Life-Threatening Endocrine and/or Metabolic Derangements

F. Drug Overdose and Poisonings

G. Coagulation Disorders

H. Serious Infections Including Sepsis
1. Interpretation of antibiotic levels, sensitivities

I. Nutritional Inadequacy and Failure
1. Monitoring and assessment of metabolism and nutrition

J. Acute Trauma

In order to properly prepare the intensivist to function in the multidisciplinary environment, it is necessary for all trainees to have patient care experience with both critically ill medical and surgical patients.

Interinstitutional cooperation among medical centers may be necessary to provide the trainee with adequate patient experience. Additional experiences may include the following:

1. Neonatal intensive care patients
2. Neurosurgical intensive care patients
3. Invasive and noninvasive cardiology
4. Pulmonary function tests
5. Respiratory therapy
6. Burn patients
7. Dialysis
8. Shock/trauma
9. Operating room anesthesia
10. Coronary care patients
11. Pediatric intensive care patients
12. Infectious disease
13. Pulmonary medicine
14. Nutritional support
15. Cardiovascular surgery patients
16. Transplant intensive care patients
17. Obstetric intensive care patients

Source: Society of Critical Care Medicine: Guidelines for advanced training for physicians in critical care. *Crit Care Med* 25:1601–1607, Sep. 1997. Used with permission.

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Chapter 3
The Intensivist-Directed Critical Care Unit and Organizational Models for Patient Safety

Although current literature does not identify a "best practice" model for the delivery of critical care, it does identify factors that can result in improved outcomes, such as reduced mortality, decreased length of stay, improved efficiency, and decreased cost of care. Recent studies reveal a correlation between the following outcomes and the employment of the intensivist in the delivery of critical care[1]:

- The timely and personal intervention by an intensivist reduced mortality, length of stay, and cost of care.
- At academic medical centers, the addition of an intensivist to the critical care team reduced mortality in the intensive care unit.
- Intensivists who fulfill an administrative role in the intensive care unit through benchmarking, performing clinical research, and standardizing care reduce length of stay, cost of care, and treatment complications.

Definition and Role of the Intensivist

Intensive care is a specialty area for physicians. In the United States, physicians who are board certified in a primary medical specialty—typically surgery, internal medicine, pediatrics, or anesthesiology—can also receive one to three years of special education, training, and subspecialty certification in the practice of critical care after completing their residency.[2] This generally consists of a fellowship approved by the Accreditation Council for Graduate Medical Education (ACGME) in critical care medicine, after which the physician must pass one of four critical care certifying exams offered by the respective specialty boards. International medical graduates are also eligible for ACGME training and certification; more information is available on the organization's Web site at http://www.acgme.org.

Responsible for promoting quality care in the intensive care unit and for the efficient use of critical care resources, intensivists devote more than 50% of their professional time to the practice of intensive care medicine. They are responsible for participating in a unit-based, hospital-approved system that provides 24-hour coverage by physicians who possess similar credentials in intensive care medicine.

In addition to performing common critical care procedures, including respiratory and cardiovascular support, intensivists must do the following[3]:

- Participate in unit management activities, including the following:
  - —Triage and bed allocation
  - —Discharge planning
  - —Supervision of the application of unit policies
  - —Participation in quality improvement efforts
  - —Interaction with other departments (as necessary) to facilitate smooth operation of the intensive care unit
- Maintain continuing education in critical care medicine by keeping current with the medical literature, participating in continuing medical education (CME) programs, and, if possible, participating in relevant research and presentation

The Leapfrog Group, an association of large companies and other significant private and public health care

Table 3-1: Organizational Characteristics of Intensivist Staffing

Survey Item	Met Leapfrog IPS Standard	Did Not Meet Leapfrog IPS Standard
Mean number of intensivists staffing intensive care units	**5.08 ± 2.97**	**5.06 ± 4.20**
Average number of intensivists certified in critical care	4.50 ± 3.11	4.20 ± 2.93
Intensive care units where intensivists directed multidisciplinary team rounds on all patients	9/11 (82%)	13/17 (76%)
Intensive care units in which intensivists make rounds on all surgical patients	5/11 (45%)	4/16 (25%)
Intensive care units in which intensivists make rounds on all nonsurgical patients	5/11 (45%)	5/16 (31%)
Percentage of patients the intensivist's team makes rounds on (range)	80.0 ± 14.58 (60–100)	57.5 ± 23.20 (20–100)
Intensive care units in which the intensivist team has authority to write orders on all patients	3/12 (25%)	11/17 (65%)
Intensive care units in which intensivist has full admission and discharge authority	5/12 (42%)	4/16 (25%)
Intensivist present 8 hours per day, 7 days per week	**10/12 (83%)**	**3/17 (18%)**
Intensivist providers care exclusively in intensive care unit	6/12 (50%)	7/17 (41%)

Organizational characteristics of intensive care unit physician staffing reported by intensive care unit directors are described. Mean number of intensivists per intensive care unit that met and did not meet the standard was 5.08 ± 2.97 and 5.06 ± 4.20, respectively. In 83% of the intensive care units meeting the standard, intensivists were present at least 8 hours per day versus 18% in intensive care units that did not meet the standard. Numerator/denominator displayed because some respondents did not answer question. IPS: intensive care unit physician staffing.

Source: Pronovost P.J., et al.: The organization of intensive care unit physician services. *Crit Care Med* 35:2256–2261, Oct. 2007. Used with permission.

purchasers, states in its fact sheet on intensive care unit physician staffing (IPS) that to meet its IPS standard, intensivists must do the following[4]:

- Be present during daytime hours and provide clinical care exclusively in the intensive care unit
- When not present on site or via telemedicine, return pages at least 95% of the time within five minutes and arrange for a fundamental critical care support (FCCS)–certified physician or physician extender to reach intensive care patients within five minutes

Recent studies note that the above description may need to be more specific because there is a great deal of variation between hospitals that say they meet the Leapfrog IPS standard. (*See* Table 3-1, above, for more detail.)

Although intensivists currently provide one third to two thirds of all care rendered in the intensive care unit, the use of these specialists is gaining momentum.[5] In an article that addresses emerging trends in intensive care unit management and staffing, the authors noted that the twenty-first century is likely to see increased use of highly qualified intensivists playing a central role in critical care management and working to coordinate multiple other services and specialists who contribute to the care of the patient.[6]

Intensivists are not just being promoted for use in adult intensive care units. They are also recommended in pediatric intensive care units (PICUs) and other specialty intensive care units. The Society of Critical Care Medicine (SCCM) and the American Academy of Pediatrics have developed guidelines for pediatric critical care medicine that include staffing by an in-house physician 24 hours a day, and a pediatric intensivist available in 30 minutes or less for Level I PICUs. The guidelines also recommend that the following caregivers be available to the PICU[7]:

- Pediatric subspecialists, including a cardiologist, nephrologist, hematologist/oncologist, pulmonologist, endocrinologist, gastroenterologist, allergist, neonatologist, neurologist, and geneticist
- Pediatric surgeons and surgical subspecialists
- Pediatric anesthesiologist and radiologist
- Psychologist or psychiatrist
- Child life specialist
- Social worker
- Pediatric clinical pharmacist

Intensivist Use and Patient Outcomes

Maintaining that the intensivist can provide the most effective care for patients when given the authority to screen admissions, consult on all patients, and authorize patient discharge, the SCCM is a strong advocate for the use of the intensivist-directed model for intensive care units.[8]

The literature seems to support that view, with numerous studies showing that use of intensivists in the intensive care unit leads to significant reductions in intensive care unit and hospital mortality, as well as in length of stay.[9–11] These findings were consistent across a variety of populations and hospital settings. The following studies have found similarly positive effects on patient outcomes:

- One literature review found that intensivist-model intensive care units were associated with a patient mortality reduction of 15% to 60%.[12]
- A study that included 68 trauma centers found that care in an intensivist-model intensive care unit is associated with a large reduction in in-hospital mortality following trauma, particularly in elderly patients who might have limited physiologic reserve and extensive comorbidity.[10]
- At a large urban PICU in the United States the management and leadership performances of intensivists, as assessed by residents and fellows using the Physician Management Index, have been directly correlated to the accomplishment of daily patient goals.[13]

The implementation of intensivist-staffed intensive care units is also associated with decreased hospital costs. In fact, a study of hospitals using the Leapfrog Group's IPS model found that those hospitals experienced an average cost savings of $510,000 to $3.3 million; only under worst-case-scenario assumptions did intensivist staffing result in additional cost to hospitals.[14]

The Role of the Attending Physician

Every hospitalized patient must have an attending physician of record who bears the ultimate legal and ethical responsibility for all of the medical care provided. In open units, any attending physician can be the patient's physician of record. Even if the attending physician requests an intensivist to assume the coordination or provision of care, the former still maintains ultimate responsibility for the care rendered. The intensivist can also serve as the attending physician in an open unit. In a closed unit, however, the intensivist has the authority to provide patient care. This authority is either through mandatory consultation with the admitting physician or by automatically becoming the attending physician of record for all admitted patients. The mandatory consultant approach enables the patient to benefit from receiving full-time intensivist care while the admitting physician retains control, which can lessen physician opposition to employing full-time intensivists. For more information on open and closed units, *see* pages 78–79 later in this chapter.

The Multidisciplinary Team Approach

The multidisciplinary team approach supports an attending physician in providing the best possible care. Regardless of the delivery model used, members of the multidisciplinary intensive care team should be consistent across organizations. Members of the team include nurses, advanced practice nurses, pharmacists, dieticians,

physical therapists, respiratory therapists, social workers, bioethicists, religious or spiritual care workers, and others.

When specialty consultation is necessary, the intensivist is responsible for coordinating this care. This coordination requires intensivists to foster communication among professional disciplines. They can do so in the following ways[6]:

- Actively involve the primary caregiver in major decisions.
- Demonstrate commitment.
- Set the care standard.
- Educate other caregivers.
- Inspire confidence among the nurses and housestaff.
- Develop appropriate care protocols.
- Conduct coordinated "work rounds."
- Actively communicate with the family and specialty consultants.
- Exercise effective bed control.
- Ease the transition to and from general care areas.
- Be familiar with and sensitive to the complications of multisystem organ disease, facilitating appropriate and timely care delivery and withdrawal from patient care, when necessary.

More information on multidisciplinary team care in the intensive care unit is provided in Chapter 4, "Patient Safety and the Multidisciplinary Approach to Care."

Conducting Team Rounds

One method of encouraging communication in the intensive care unit is for the intensivist to conduct daily team rounds, enabling team members to develop collaborative care plans for the patients (*see* Sidebar 3-1, page 77). On these rounds, for example, the following information could be provided:

- The primary physician can provide background on the patient's history.
- The critical care nurse can offer current information on the patient's progress.
- The respiratory therapist can discuss ventilator management.
- The pharmacist can advise on medications.
- The dietitian can recommend nutritional options.
- The social worker can assist in discharge planning and placement decisions.
- The pastoral care worker can offer counsel for end-of-life decisions, as necessary.

Having an intensive care unit physician perform daily rounds has been shown to reduce mortality and complications in patients undergoing abdominal aortic surgery, according to one study.[15] In one report, each year physicians diagnose approximately 200,000 people in the United States with abdominal aortic aneurysm who will undergo corrective surgery and receive care in the intensive care unit.[16] Another report indicates that the frequency rate for this procedure is 8.2% in the United Kingdom, 8.8% in Italy, 4.2% in Denmark, and 8.5% in Sweden for males.[17]

Leadership WalkRounds™

Leaders can also foster open communication in the intensive care unit environment through Leadership WalkRounds™. WalkRounds is a stimulated information-gathering tool where management and critical care providers engage in a structured, two-way conversation about safety; data from that conversation are captured, analyzed, prioritized, and addressed. The WalkRounds process is designed to do the following[18]:

- Show that senior leaders are engaged in and support patient safety efforts
- Hear the concerns of critical care providers. Through WalkRounds, leaders can directly interact with staff, gather staff opinions and perceptions of issues and risks, and influence the tone of the culture.
- Increase mutual understanding between senior leaders and critical care staff about patient safety issues
- Foster a culture of teamwork and continuous learning
- Allocate resources to areas of greatest risk

WalkRounds can be held in an open area of the intensive care unit or a separate room. During WalkRounds, leaders ask detailed questions of staff to prompt discussion. Questions may include the following[19]:

- What works well in the area?

Sidebar 3-1: Implementing a Daily Goals Form

At Johns Hopkins Hospital (JHH), patients in the intensive care unit are cared for by an intensivist-led team that includes the intensive care unit attending and fellows, anesthesia and surgery residents, nurse practitioners, nurses, respiratory therapists, and a pharmacist. During daily rounds, the intensive care unit team visits each patient for about 20 to 25 minutes and develops a plan of care for the day.

Several years ago, JHH began an initiative to improve communication during these rounds and to shift them from a provider-centered discussion to a more patient-centered one. The intensive care unit developed a daily goals form that asks staff to list the tasks to be completed, the care plan, and the communication plan for discussions with patients and their families. All providers on the team—physicians, nurses, respiratory therapists, and pharmacists—review the goals and initial the form three times a day. The daily goals form is updated whenever the goals of care change.

This daily goals form resulted in a significant improvement in the percentage of residents and nurses who understood the daily goals of patients. Prior to the initiative, fewer than 10% of residents and nurses understood the goals of care for the day. Three weeks after implementation, more than 95% of nurses and residents understood the goals of care. This initiative also decreased the length of stay for patients. JHH includes long-term goals of care (including any palliative care goals) in its daily goals form and is rolling the initiative out to other areas in the hospital. (*See* Chapter 6, "Patient Safety Success Stories in the Intensive Care Unit.")

Another hospital that embraced the daily goals concept is Beth Israel Medical Center in New York. The hospital implemented a worksheet, which was completed daily during multidisciplinary rounds and posted at each bedside in the medical intensive care unit. Information recorded on the sheet included the following:

- Data on tests or procedures
- Medications
- Sedation or analgesia
- Catheters
- Consultations
- Nutrition
- Mobilization
- Family discussions
- Consents
- Disposition

After implementing the worksheet, the organization measured nurses' and physicians' understanding of the goals of care and communication. Measurement showed that perceptions of understanding improved and unit stays were shortened.

Sources: Pronovost P., et al.: Improving communication in the ICU using daily goals. *J Crit Care* 18:71–75, Jun. 2003; Narasimhan M., et al.: Improving nurse-physician communication and satisfaction in the intensive care unit with a daily goals worksheet. *Am J Crit Care* 15:217–222, Mar. 2006.

- What doesn't work well?
- Are you worried about anything that could cause harm?
- Do we disclose all that we reasonably should to the patient, family, or friend, including mistakes and potential mistakes?
- How well does teamwork work in this area?

These, and questions like these, will elicit different responses, and all participants should be encouraged to give feedback. After WalkRounds conclude, the leaders participating in the WalkRounds should immediately discuss what went well, what went poorly, what was learned and could possibly begin prioritizing important issues and potential improvements.

To be successful at WalkRounds, organization leaders should set up a robust system for tracking and ranking collected data, such as an interactive database that allows for sorting and prioritizing. Information from the WalkRounds process should be integrated with other data, including a reporting system, root cause analyses, surveillance, and audit data. After information has been entered and analyzed, organizations should share data with a multidisciplinary committee so that action items may be assigned to management.

A critical element of the WalkRounds process is a clearly delineated and formal structure for feedback to critical care providers who participate in WalkRounds and to executive boards about findings and actions taken to address issues brought up in WalkRounds. By using formal methods of feedback, a hospital's intensive care unit can ensure the appropriate buy-in, foster commitment to the WalkRounds process, and facilitate planning, prioritization, and assignment of action items (*see* Figure 3-1, pages 80–81).

WalkRounds are more than just an opportunity for intensive care leaders to take the floor and expound on their beliefs and pet projects, or to listen and shake hands. The substance of WalkRounds comes from an effective dialogue among all participants. Tracking data carefully and ensuring that follow-up actions are taken will determine how interesting and effective the WalkRounds become.

Collaboration

Intensivists should collaborate with other team members, such as nursing, religious or spiritual care, and social services, to serve the patient's family needs during the time that the patient is in intensive care unit care. Intensivists should possess the skills and sensitivity to answer family members' questions about care and to provide guidance for difficult treatment choices, including end-of-life decisions.

In addition to directing patient care, the intensivist should participate in the management of daily activities necessary for the safe, efficient, consistent, and timely delivery of intensive care unit services.[1] These responsibilities include the following:

- Performing triage based on admission and discharge criteria, bed allocation, and discharge planning
- Developing and enforcing, in collaboration with other intensive care unit team disciplines, clinical and administrative protocols intended to improve clinical care and to meet regulatory requirements
- Coordinating and assisting in the implementation of quality improvement activities within the intensive care unit, including the supervision of data collection
- Supervising the application of unit policies
- Interacting with other departments, as necessary, to facilitate the smooth operation of the intensive care unit

These management responsibilities require the intensivist to be physically present in the unit and exempt from competing obligations, such as operating room, office practice, or clinic responsibilities.

Open Units, Closed Units, and Hybrids

Some critical care centers define their intensive care units as "open" or "closed," or a combination of the two. These descriptions refer to the system by which physicians and other caregivers oversee the care of intensive care unit patients.

The Open Unit

In an open unit, any attending physician with the appropriate admitting privileges can be the physician of record and can direct intensive care unit care whether a dedicated intensivist is available or not. Advantages to this model include continuity of care, as well as ensuring a comfort level for physicians who might have concerns about turning over care decisions to another physician. However, under this model, there are risks for duplication of services, a lack of a cohesive plan, and inconsistent coverage during nights and other off hours.[1] In addition, although nursing, pharmacy, and respiratory staff are intensive care unit based, the physicians directing the care of the intensive care unit patients may have obligations at a site distant from the intensive care unit, such as outpatient and inpatient areas or the operating room. They may or may not choose to consult with an intensivist to assist in care management. Therefore, they may not have the skills or time to provide ideal critical care.

The Closed Unit

In a closed unit, care is provided by an intensive care unit–based team of critical care physicians, nurses, pharmacists, respiratory therapists, and other health professionals. The intensivist is the physician of record for all of the intensive care unit patients, and all orders and procedures are carried out by dedicated intensive

care unit caregivers. This model offers the advantages of improved efficiency and standardized protocols for care, but it has the potential to cause conflict with other physicians.[1]

The Hybrid or Transitional Unit

In this model, an intensivist team is present in the intensive care unit and care is comanaged with the patient's physician. This model can cause conflict with regard to who has final authority and responsibility for patient care decisions, but with solid communication, it can reduce conflict between intensivists and other physicians.

Some studies show that closed models tend to provide the best patient outcomes because of the focus on intensivists and the specialized expertise of critical care staff. For example, a literature review of 26 studies regarding "high-intensity" intensive care unit staffing (in which intensivist consultation is mandatory or all care is directed by an intensivist) versus "low-intensity" staffing (in which there is no intensivist or consultation is elective) found the following[9]:

- High-intensity staffing was associated with lower hospital mortality in 16 of 17 studies and lower intensive care unit mortality in 14 of 15 studies.
- High-intensity staffing reduced hospital length of stay in 10 of 13 studies and reduced intensive care unit length of stay in 14 of 18 studies.

That being said, closed intensive care units are still controversial because of the potential conflict with attending physicians and other nonintensivist caregivers. Hospitals should determine the model that will best suit the needs of their patient populations and their medical staff resources.

Obstacles to Using Intensivists

Despite the significant benefits of using intensivists in the intensive care unit, many hospitals find obstacles that prevent them from being able to establish this model effectively. The Leapfrog Group acknowledges that its IPS model might not be feasible for some organizations because of resource and workforce limitations.[4]

Cost

Although studies have shown that the use of intensivists can significantly reduce costs, some hospitals with smaller intensive care units may lack the financial resources to support full-time intensive care unit physicians. It is estimated that providing around-the-clock coverage for a single intensive care unit requires the employment of five full-time intensivists; the net cost to the hospital for such staffing ranges from $500,000 to $1 million each year.[6] One study found that in a worst-case scenario, rather than realizing savings, a hospital employing the Leapfrog IPS model could see costs of $890,000 to $1.3 million.[14]

Shortage of Critical Care Professionals

More than a decade ago, several workforce reports forecast that there would be an oversupply of specialists. Many of these studies cited the growth of managed care as potentially lowering the demand for these physicians. Consequently, subsequent U.S. government initiatives discouraged the training of medical specialists, and many teaching hospitals reduced the size of their fellowship programs in critical care to combat what was predicted to be an impending glut of physicians.

This prediction has not proven to be true, however. Managed care may have actually increased the demand for intensivists as a result of patients being discharged earlier or denied admission, forcing hospitals to service even more critically ill patients than they had in the past. In addition, the managed care industry's focus on cost-effectiveness may stimulate increased demand for critical care specialists, as evidenced by a workforce study that shows that the implementation of the full-time intensivist model is more common in hospitals where managed care penetration is high.[20] Sidebar 3-2, page 82, describes a recent report to the U.S. Congress regarding this shortage, its potential effects, and what policymakers are doing to combat it.

The ideal intensivist/patient ratio depends on the acuity and size of a hospital's intensive care unit patient population. One study found that there were no differences in mortality between intensivist/intensive care unit

Figure 3-1: Worksheet for Intensive Care Rounds

Times and Duration of Rounds

	Dates	Frequency	Duration	Notes
Option 1				
Option 2				
Option 3				
Option 4				
Option 5				

Intensive Care Rounds Checklist		
Planning Step	**Elements to Consider**	**Completed?**
Intensive care leadership engagement and support	• Stated support of leaders • Involvement of the board, if applicable • Commitment of senior leaders to ongoing involvement	
Intensive care leadership training	• Information shared with intensive care leaders	
Staff training and engagement	• Education and sharing of plan with the intensive care unit staff	
Inventory of what is already known about patient safety in the intensive care unit	• Review of incident report system and data collected • Review of patient safety initiatives and data collected and analyzed to date for the intensive care unit • Review of any failure mode and effects analyses, root cause analyses, and any other data points in relation to patient safety issues or concerns in intensive care	
Involve the right people in planning	• Approach and invite involvement of key staff in the intensive care unit or performance/quality improvement department. • Conduct a planning meeting with staff about patient safety rounds in the intensive care unit. • Invite multiple staff to help design and implement the patient safety rounds.	

Figure 3-1: Worksheet for Intensive Care Rounds (continued)

Other questions to consider for the intensive care unit during WalkRounds include the following:

1. Were you able to care for your patients this week as safely as possible? If not, why not?	
2. Can you describe how communication between caregivers either enhances or inhibits safe care on your unit?	
3. Can you describe the unit's ability to work as a team?	
4. Have there been any "near misses" that almost caused patient harm but did not?	
5. Is there anything we could do to prevent the next adverse event?	
6. What do you think this unit could do on a regular basis to improve safety? For example, would it be feasible to discuss safety concerns—for example, patients with same name, near misses that happened—during report?	
7. When you make an error, do you always report it?	
8. If you prevent/intercept an error, do you always report it?	
9. If you make or report an error, are you concerned about personal consequences?	
10. Do you know what happens to the information that you report?	
11. Have you developed any personal practices that you specifically do to prevent making errors (memory aids, double-checking, forcing functions)?	
12. Have you discussed patient safety issues with your patients or their families?	
13. Do patients and families voice any safety concerns?	
14. What specific intervention from leadership would make the work you do safer for patients?	
15. What would make these executive WalkRounds more effective?	

Source: Frankel A., et al.: Patient Safety Leadership WalkRounds. *Jt Comm J Qual Saf* 29:16–26, Jan. 2003.

Sidebar 3-2: The Intensivist Shortage

A 2006 report to the United States Congress by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health & Human Services (HHS) stated that as many as two thirds of patients needing critical care services may be receiving suboptimal care due to a shortage of intensivists. The report, titled *The Critical Care Workforce: A Study of the Supply and Demand for Critical Care Physicians,* projects that this problem will continue to grow because of the aging population and the increased utilization of intensivists.

The report predicts a 35% shortage of intensivists by 2020. Because research shows that the involvement of intensivists improves outcomes for critically ill patients, the report recommends that steps be taken to increase the intensivist supply. With an estimated 360,000 deaths occurring each year in intensive care units not managed by intensivists, increasing the intensivist supply may help save up to 54,000 lives annually.

Some of the recommended solutions include the following:

- Expand opportunities for U.S.–trained international medical graduates to practice in the United States.
- Increase medical and nursing school capacity to train critical care providers.
- Address the problem of patient demand by increasing support for critical care research in the elderly population.
- Explore alternative care pathways for elderly patients with high-mortality conditions.

Sources: Health Resources and Services Administration (HRSA): *The Critical Care Workforce: A Study of the Supply and Demand for Critical Care Physicians*. Washington, DC: HRSA, 2006; American College of Chest Physicians, American Thoracic Society, SCCM, and the American Association of Critical-Care Nurses: Article: HHS report indicates two thirds of ICU patients receive suboptimal care (press release). http://www.highbeam.com/doc/1G1-146069136.html (accessed Nov. 16, 2009).

bed ratios ranging from 1:7.5 to 1:15, but a ratio of 1:15 was associated with longer length of stay.[11]

Intensivists are not the only critical care providers experiencing a reduction in numbers. Patients who require a prolonged stay in the intensive care unit also place a great burden on the workforce, particularly the nursing staff.[21] According to a report from the U.S. Health Services and Resources Administration, there was already a 6% shortage of registered nurses in 2000. By 2010, that shortage is expected to be 12%, and by 2020, that shortage will grow to 29%.[21] Given the established association between patient care and safety and patient/nurse ratios, this shortage represents a serious patient safety issue. Acute care nurses can provide safe, cost-effective care as part of a collaborative medical management team (*see* Chapter 4, page 95, for additional information on the acute care nurse practitioner).

Other Obstacles

Other obstacles to implementing intensivist-directed intensive care units include burdensome managed care documentation requirements and complex reimbursement rules unique to critical care that have discouraged many physicians from entering the field. Others are leaving the field because of economically motivated downsizing and restructuring that reduces flexibility and amplifies work stress.

Yet another obstacle to the widespread use of intensivists is the cost of malpractice insurance for critical care practitioners. Although large academic medical centers are able to self-insure, smaller community hospitals must seek out liability insurance. In addition, intensivists are not always welcomed by other physicians and specialists who may have reservations about using them in the intensive care unit. At issue are continuity of care, professional concerns, and economic concerns. With the introduction of an intensivist-staffed intensive care unit, physicians and other specialists fear the loss of control over their patients' care and the loss of practice revenue. Their concerns are not totally unfounded. As an example, changing the management in the intensive care unit may substantially reduce the need for specialty consults because intensivists can perform functions traditionally considered to fall within the specialists'

domain, such as inserting catheters and managing patients on ventilators.

Alternative Staffing

If employing a full-time intensivist to oversee the intensive care unit is prohibitive, other possibilities include the use of hospitalists, contracted physicians, or mid-level providers or transferring patients to other facilities.

Hospitalists

Hospitalists, with a dedicated hospital-based practice and experience in inpatient medicine, represent a viable physician staffing option. Like intensivists, these professionals are present throughout the day to coordinate inpatient care and can react to clinical data in real time. They may be generalists or specialists who can assume some of the care of critically ill patients and can extend the reach of the intensivist-directed model of care by working in concert with an intensivist, thus allowing full-time intensivists in areas where there is a shortage.

In fact, hospitalists who provide after-hours pediatric intensive care when an intensivist is unavailable have been shown to improve patient outcomes and reduce length of stay in the pediatric intensive care unit.[22] In addition, hospitalists tend to require fewer laboratory and radiology tests to assess patients' conditions, particularly in the area of intensive care patients.[23] Hospitals that use these nonspecialists to supplement coverage in the intensive care unit should adopt protocols for them to follow based on the principles of critical care medicine.

Contracted Physicians

Another alternative is to contract with physicians based in the community for the desired amount of coverage. This alternative can be accomplished by evaluating when intensivist coverage is most needed in the intensive care unit based on, for example, peak times in the emergency department or times during which the most adverse drug events are known to occur. Forming a consortium with one or more community hospitals to contract together for intensivist coverage is another option for achieving the optimal level of coverage in the intensive care unit.

Mid-Level Providers and Alternative Staffing Patterns

The use of mid-level providers, such as nurse practitioners or advanced practice nurses with specialized critical care training, might enable an intensivist to direct care from off site via telephone, during nights, or over weekends. This may include a telemedicine arrangement (*see* Chapter 5, "Patient Safety and Telemedicine in the Intensive Care Unit," for more on this option).

An alternative physician-staffing pattern is another option that can be considered in providing optimal care in the intensive care unit. It can involve the use of specialists who have not completed a formal training program in critical care but who have considerable intensive care unit experience to provide critical care in lieu of intensivists. Among those who may be qualified are anesthesiologists, internists, surgeons, and pulmonologists. However, while working in the intensive care unit, these specialists must have no conflicting responsibilities that would interfere with their employment in the intensive care unit. They must, of course, demonstrate that they have the appropriate training and level of intensive care unit experience (*see* Sidebar 3-3, pages 84–85), agree to the time commitment required, and possess continuing education credits in critical care based on the credentialing requirements established by the hospital.

Transferring Patients to Other Facilities

Some small or rural hospitals may have to send critically ill patients to larger urban and/or academic institutions, which generally have more resources, including better subspecialty care and equipment as well as physicians who have expertise in the care of critically ill patients.

This practice, termed the *regionalization of critical care services,* allows communities to expand access to high-quality critical care to areas in which patients might not otherwise receive such specialized treatment. It also allows hospitals to consolidate resources, such as the costly technologies required to provide intensive care.

Sidebar 3-3: Tracking Compliance—Physician Privileging in the Intensive Care Unit

Both The Joint Commission and Joint Commission International standards that pertain to physician privileging are concerned with ensuring that the individuals who provide clinical care provide only those services within the scope of their ability and the privileges granted. (Dentists are also cited as staff who must have the appropriate privileges to provide care to comply with Joint Commission International hospital standards.)

Organizations sometimes fail to keep accurate privileging lists for physicians who treat patients in the intensive care unit. In some instances, the privileges listed in the intensive care unit contain only core privileges and not provider-specific privileges. Consequently, a general surgeon who performs vascular surgery or a family practitioner who performs cesarean sections could have those privileges noted in their respective lists. In other instances associated with physicians who work in the intensive care unit, some physicians can provide services for which they do not have privileges. For example, some intensive care units that extend to physicians the privilege of administering moderate sedation also require that the physician to whom the privilege is extended be capable of rescuing patients in distress (or resuscitation), even though this procedure may not be included as a privilege on the list. A physician who administers moderate sedation as a specific privilege but who is unable to rescue a patient clearly does not meet Joint Commission– or Joint Commission International–accredited hospital requirements. Such a situation highlights the need for the hospital to spell out its privileging requirements clearly to ensure the competence of the practitioners to whom it extends privileges.

United States

International

In some instances, organizations do not maintain accurate privilege lists for the intensive care unit. The information on the privilege list may be old, the list may not include dates, or the list could be so outdated that it includes staff members who no longer work in the intensive care unit. Outdated privileging lists can result in privileging a practitioner for procedures that the hospital is unable to support.

A great deal of information is needed for licensed independent practitioners to be appropriately evaluated and privileged to perform services in the intensive care unit. Because the scope and type of service for which a licensed independent practitioner may be privileged varies both by specialty and by applicant, it is essential that separate records be maintained for each individual who applies for privileges in the intensive care unit. These records should be housed in a central location and must be made accessible at a moment's notice should the need arise to verify an applicant's credentials for performing a specific procedure. Some facilities have these records computerized; in others, for example, nursing supervisors have access to the records during off hours.

Regular Review of Files

Each individual's file should be reviewed on a regular basis to ensure that the practitioner actually performs the services for which privileges have been granted. To verify that the file has been reviewed, the file can be dated and signed by the department chairperson or president of the medical staff, or by whomever such a responsibility is delegated to. Files should indicate that the practitioner's skills were examined for the full scope of the privileges—particularly those for performing high-risk procedures and for treating high-risk conditions, such as those encountered in the intensive care unit. Moreover, privileges must be hospital specific. If the hospital does not provide the service, the privilege should not be granted.

Privileging Lists

Delineation of privileges is probably best achieved by the development of a list specific to the intensive care

Sidebar 3-3: Tracking Compliance—Physician Privileging in the Intensive Care Unit (continued)

unit that specifies the scope of services for which a practitioner is granted privileges. These services can be shown in checklist format. Applicants can check the privileges requested, and the department chairperson can affirm whether or not the privilege is recommended. The use of this method addresses issues of inaccurate privileging lists, the provision of services where privileges are lacking, and the failure to include a complete list of procedures for privileges granted to specific practitioners. Such a list is often included as a supplement to an application for appointment to the medical staff. (*See* the "Intensive Care Resources" section on pages 86–91 for examples of privilege request forms.)

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals *or the* Joint Commission International Accreditation Standards for Hospitals.**

Among the disadvantages of this practice are the risks associated with transporting critically ill patients, the displacement of patients from their local support environments, family opposition to the transfer, the potential to overwhelm capacity at larger hospitals, and the possible interruption in the continuity of care.[24]

However, in some cases, such as pediatric or neonatal critical care cases, the benefits of receiving highly specialized care far outweigh the risks of transport.[25] To ensure patient safety during transport, hospitals should have a plan that includes details on the equipment and personnel that must accompany a critically ill patient being transferred.[26]

The potential benefits of intensivist staffing of the intensive care unit are great enough that hospitals that provide critical care should at least explore the concept, making certain to include in the analysis the possible cost savings resulting from improved patient safety. Chapter 4 discusses how the intensivist can work with other members of a multidisciplinary team to provide a comprehensive approach to the treatment of critically ill patients.

INTENSIVE CARE RESOURCES

Privilege Request Form and Criteria for Privileges: Internal Medicine

Saint Francis Hospital
Department of Internal Medicine
Privilege Request Form

Physician Name:_____

Please check the privileges for which you are eligible and for which you wish to apply, and sign the statement at the bottom of this document.

Core privileges:

	Requested	Granted
General Internal Medicine *Core Privileges for General Internal Medicine include* ***Diagnostic Lumbar Puncture****, Paracentesis, Arthrocentesis, Ventilator Management for less than 24 hours (>24 hours requires a Pulmonary/Critical Care Consult)*, Skin Biopsy and Thoracentesis*	_____	_____

Special request privileges:

	Requested	Granted
Endotracheal Intubation	_____	_____
Central Venous Catheterization	_____	_____
Moderate Sedation	_____	_____

As an applicant for initial appointment or reappointment to the Department of **Internal Medicine** at Saint Francis Hospital, you are eligible to request privileges only in those areas where you satisfy the threshold and maintenance criteria established by the Board of the Hospital. Enclosed are descriptions of the core and special request privileges typical for your department. Should you desire privileges not covered by these documents, please contact the Medical Staff Office at 494-1400 and eligibility criteria for the additional privileges will be forwarded to you.

The burden of documentation of eligibility for privileges is on the applicant. The Chairperson of your department and/or the Credentials Committee may request additional documentation in cases where hospital data cannot corroborate your eligibility. Such documentation of eligibility may include activity at other hospitals or health care facilities. Your application will be processed only after such documentation, as appropriate, is complete.

***All patients covered by the teaching service are to have Pulmonary/Critical Care consultation at the time ventilatory support is anticipated or required.**

INTENSIVE CARE RESOURCES

Privilege Request Form and Criteria for Privileges: Internal Medicine (continued)

Department of Internal Medicine
Privilege Request Form
Page 2

Statement of Understanding:

I have read the documents defining eligibility criteria for all of the core and special request privileges which I have requested. To the best of my knowledge, I am qualified to request the above noted privileges based upon the criteria established by the Board of Saint Francis Hospital. I understand that I may be requested to provide documentation of my eligibility, including volume and quality data, from other health care institutions.

Name: _____

Signature: _____

Date: _____

(continued on page 88)

INTENSIVE CARE RESOURCES

Privilege Request Form and Criteria for Privileges: Internal Medicine (continued)

CRITERIA FOR PRIVILEGES
INTERNAL MEDICINE

I. Threshold Criteria:

Basic Education: M.D. or D.O. degree

Formal Training: Successful completion of an approved Internal Medicine residency program.

Required Previous Experience: Provision of inpatient services to at least 40 patients in the last 24 months.

II. Core Privilege Definition:

Admission, diagnosis, and provision of non-surgical care, including consultation, to patients for the treatment of general medical problems. Core privileges for Internal Medicine include Lumbar Puncture, Arthrocentesis, Paracentesis, Ventilator Management for less than 24 hour time periods, Skin Biopsy and Thoracentesis. These privileges do not include any of the special services listed in Section III below.

III. Special Request Privileges:

For each of the clinical privileges, the applicant must document threshold and maintenance competence as outlined on the appropriate special request form:

A. Endotracheal Intubation
B. Central Venous Catheterization
C. Moderate Sedation

IV. Maintenance Requirements

A. Applicant must provide inpatient services with a satisfactory quality record to at least 24 patients over the past 2 year period to maintain non-provisional privileges, as well as participation in Internal Medicine QA activities as requested.

Recommended for Approval:	Medicine Department Credentials Committee	06-07-95
	Credentials Committee	02-06-96
	Medical Executive Committee	02-13-96
	Professional Affairs Committee	02-28-96
Approved:	Executive Committee of the Board of Directors	02-28-96
Revised:	Credentials Committee	07-02-96
Recommended for Approval:	Medicine Department Credentials Committee	07-08-96
	Credentials Committee	08-13-96
	Medical Executive Committee	08-13-96
	Professional Affairs Committee	08-21-96
Approved:	Executive Committee of the Board of Directors	08-21-96
Revised & Approved:	Executive Committee of the Board of Directors	02-27-02

INTENSIVE CARE RESOURCES

Privilege Request Form and Criteria for Privileges: Internal Medicine (continued)

CRITERIA FOR PRIVILEGES

ENDOTRACHEAL INTUBATION

I. Threshold Criteria

A. Basic education: M.D. or D.O. degree
B. Completion of accredited Internal Medicine residency program

II. Required Previous Experience

A. During residency or fellowship training, applicant must have performed 20 Endotracheal Intubation procedures, or be currently certified to provide Advanced Cardiac Life Support or Advanced Trauma Life Support. Applicant must provide written verification of previous experience.

III. Oversight

A. Provisional appointees shall have their first year/or first twenty-five (25) cases reviewed, whichever is first, by QI.

IV. Maintenance Requirements

A. Applicant must perform 5 Endotracheal Intubation procedures with satisfactory quality record over the past 2 year period or maintain current certification to provide Advance Cardiac Life Support or Advanced Trauma Life Support to maintain non-provisional privileges.

Recommended for Approval:	Credentials Committee	02-06-96
	Medical Executive Committee	02-13-96
	Professional Affairs Committee	02-28-96
Approved:	Executive Committee of the Board of Directors	02-28-96
Revised & Approved:	Executive Committee of the Board of Directors	02-28-02

(continued on page 90)

INTENSIVE CARE RESOURCES

Privilege Request Form and Criteria for Privileges: Internal Medicine (continued)

CRITERIA FOR PRIVILEGES

CENTRAL VENOUS CATHETERIZATION

I. Threshold Criteria for Requesting Privileges

A. Basic education: M.D. or D.O. degree; and
B. Completion of accredited Internal Medicine residency

II. Required Previous Experience:

A. During residency training, or subsequent clinical practice, must have performed a minimum of 25 supervised central venous catheterization procedures, all of which as the principal operator.

III. Oversight

A. Provisional appointees shall have their first year/or first twenty-five (25) cases reviewed, whichever is first, by QI.

IV. Maintenance Requirements

A. Applicant must perform 20 central venous catheterization procedures with a satisfactory quality record over the past 2 year period to maintain non-provisional privileges.

Recommended for Approval:	Ad Hoc Cardiology Committee	04-03-95
	Medicine Department Credentials Committee	04-05-95
	Credentials Committee	11-21-95
	Medical Executive Committee	11-21-95
	Professional Affairs Committee	11-22-95
Approved:	Executive Committee of the Board of Directors	11-22-95
Revised & Approved:	Executive Committee of the Board of Directors	02-27-02

INTENSIVE CARE RESOURCES

Privilege Request Form and Criteria for Privileges: Internal Medicine (continued)

MODERATE SEDATION BY NON-ANESTHESIOLOGISTS

I. **Threshold Criteria:**

A. M.D., D.O., D.M.D., or D.D.S. degree

B. Successful completion of the airway module class or an Advanced Life Support Class.

C. View the Moderate Sedation Video, and make a passing grade of 80% or better on the exam.

II. **Maintenance Criteria:**

A. Must have current proof of successful completion of airway module Class or Advanced Cardiac Life Support Class*.

*ACLS, PALS, ATLS, or NRP are to be renewed every two years as of July 1996.

Recommended for Approval:	Credentials Committee	04/11/95
	Medical Executive Committee	04/11/95
	Professional Affairs Committee	04/11/95
Approved:	Executive Committee of Board of Directors	04/11/95
Reviewed and Approved:	Executive Committee of Board of Directors	02-27-02

Source: Saint Francis Health System. Used with permission.

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Chapter 4
Patient Safety and the Multidisciplinary Approach to Care

The multidisciplinary team approach—with a full-time critical care director and, in some instances, 24-hour intensivist coverage—is touted as the model to follow in the delivery of intensive care medicine, according to adherents of the approach.[1] The presence of a collaborative team of multidisciplinary intensive care caregivers from various disciplines has not only been shown to improve outcomes, including length of stay, mortality, and rate of complications, but also to improve the efficiency and cost-effectiveness of care for patients hospitalized in the intensive care unit.[2,3]

Unit-based intensive care unit teams have several attributes in common. They do the following[4]:

- Facilitate admission and discharge decision making
- Allow for the efficient collection of accurate data (for example, appropriate diagnoses) to support quality improvement and cost-effectiveness analysis
- Promote efficient patient transfer in and out of the intensive care unit
- Help to reduce conflicting orders
- Reduce the number of physicians involved in a patient's management
- Allow for smooth application of therapeutic protocols
- Incorporate zero defects into its care protocols (*also see* the "Intensive Care Resources," pages 104–105)

The Composition of the Intensive Care Unit Team

The composition of the multidisciplinary team is more important than the special skills of the individual clinicians on the team. Membership should be based on the clinicians' availability and interest. Those willing to serve on the team should not be turned away simply because they are not certified in critical care medicine; that training can be obtained later, if necessary. Successful team dynamics include cooperativeness, continuity, and collegiality. Sidebar 4-1, below, provides more detail on the attributes of an effective multidisciplinary intensive care unit team.

Sidebar 4-1: An Effective Multidisciplinary Intensive Care Unit Team

An effective multidisciplinary intensive care unit team has the following characteristics:

- Medical and nursing directors with significant authority, coresponsibility, and cooperative management
- Nursing sophistication and a highly collaborative relationship with medical staff in a team approach
- Extensive use of standards, protocols, and guidelines to ensure consistent approach to medical, nursing, and technical issues
- Dedication to coordination, communication, and continuity for all aspects of intensive care unit management
- Emphasis on certification, research, education, and peer review, as well as evidence-based care, ethical issues, and patient advocacy

Source: Ng K.S., Tai D.Y.H.: Intensive care medicine in Singapore: Challenges in a new era. *Ann Acad Med Singapore* 30:216–221, May 2001.

The Role of the Unit Director/Patient Care Leader

The unit director of the intensive care team, sometimes known as the patient care leader, should be available to the unit or hospital at all times and should be free from competing obligations, such as operating room, office practice, or clinic responsibilities. He or she may be a medical or nursing director. This professional also should manage daily activities in close collaboration with the nurse manager. These activities vary based on whether the director is a medical director or a nursing director, and include the following:

- Coordination of triage, bed allocation, and discharge planning
- Participation in ongoing quality improvement activities, including supervision of data collection
- Supervision of the application of unit policies
- Development and administration of the unit budget
- Interaction with other departments, as necessary, to facilitate the smooth operation of the intensive care unit

In addition, effective intensive care unit directors are characterized by the following attributes[5]:

- Board certification in critical care medicine
- Expertise necessary to oversee the administrative aspects of unit management, including formation of policies and procedures, enforcement of unit policies, and education of unit staff
- The ability to ensure the quality, safety, and appropriateness of care in the intensive care unit
- Active involvement in local and/or national critical care societies
- Participation in continuing education programs in the field of critical care medicine
- Privileged to perform relevant invasive procedures
- Advisor and participant in organizing care of the critically ill patient in the community as a whole
- Active participation in the education of unit staff
- Active participation in the review of the appropriate use of intensive care unit resources in the hospital

In many instances, the appointment of the director of an intensive care unit is based on politics rather than patient care issues. Often, the surgeon who brings the most cases to the hospital gets the position, the rationale being that, because the physician's patients are in the unit, he or she would be the logical choice to oversee it. However, when the decision is made thusly, it prevents the hospital from realizing the full benefit of the multidisciplinary team. The appointment of an intensive care unit director should be based on the attributes described earlier, and hospital leadership should be prepared to defend the choice against political opposition.

The Role of the Intensive Care Unit Nursing Director

Like the medical director, the nursing director or nurse manager has formal authority over the intensive care unit and shares jointly in its overall management. The nursing director is typically a registered nurse who possesses certification in either critical care nursing or critical care. He or she is responsible for the daily operations of the intensive care unit—from clinical duties, such as establishing practices, to administrative duties, such as unit budgeting. Current trends indicate that the nursing director's primary responsibility, however, is managing the nursing staff, a job that entails ensuring that the nursing competencies are closely matched with the acuities of the patients. The nursing director typically participates in the education and training of the nursing staff, as well as in strategic planning efforts.[6]

The Role of the Critical Care Nurse

Many critical care nurses have specialized training and experience, including advanced certification by the American Association of Critical-Care Nurses (AACN), that allows them to use the critical care registered nurse (C.C.R.N.) credential. At this time, the AACN reports that it has more than 240 chapters in the United States, as well as chapters in China, Japan, and Germany.[7] These skills and training enable critical care nurses to conduct complex assessments, high-intensity therapies and interventions, and continuous nursing vigilance. They provide the majority of the patient assessment, evaluation, and care in the intensive care unit.

Intensive care nursing practice includes understanding and supporting medical care, including diagnosis, treatment, care planning, and priority setting.[1] Partner-

ing with the intensive care unit attending physician to provide care and oversee the plan of care, the critical care nurse ensures that consultants and ancillary care practitioners render care consistent with the plan. The nurse is responsible for making the attending physician aware of any changes in the patient's condition; his or her expertise is crucial to recognition and response to changes that could signify deterioration of the patient's condition.[8] Critical care nurses also help ensure that interventions are consistent with accepted standards of practice.

The critical care nurse is also involved in hospital systems efforts, such as the implementation of unit-based protocols, quality improvement projects, data analysis from outcomes pathways, staff and patient satisfaction, safe practices, and sentinel events. They may serve as educators and mentors to other nursing staff and often take on other roles, such as researcher, consultant, and leader.

In addition, critical care nurses counsel families about short- and long-term management of the patient's illness and serve as the patient's advocate. Very often, they play an integral role in the decision-making process of the patient, family, and critical care team.

The Role of the Advanced Practice Nurse

Other nurses who help provide and coordinate the care of critically ill and injured patients include advanced practice nurses who have received advanced education at the master's or doctorate level. In the intensive care unit, advanced practice nurses are either clinical nurse specialists or acute care nurse practitioners (A.C.N.P.s). These nurses typically assume an expanded role of providing physician-supervised direct medical care and advanced nursing care, including assessment, diagnosis, planning, intervention, and evaluation.[9] Their skills and competencies include advanced physical assessment, clinical reasoning, and clinical management. Based on guidelines established by local law, they may write orders; interpret laboratory results, diagnostic tests, and x-rays; prescribe pharmacologic and nonpharmacologic treatments; perform bedside procedures, such as vascular catheterization; and troubleshoot medical equipment problems.

Advanced practice nurses also serve as staff educators and researchers. Finally, they are involved in patient and family education. One six-year study showed that patients cared for by advanced practice nurses in the intensive care unit experienced improved outcomes, including reduced hospital length of stay, fewer ventilation days, and improved mortality.[10]

The Role of the Intensive Care Unit Pharmacist

Intensive care unit pharmacists are specialists in the use of medications in the intensive care setting. Since the 1980s, when pharmacy services were expanded to include critical care settings, several professional pharmacy organizations have established specialty groups of critical care pharmacists. Among them are the American College of Clinical Pharmacy (ACCP), the American Society of Health-System Pharmacists, and the Clinical Pharmacy and Pharmacology Section of the Society of Critical Care Medicine (SCCM). The World Health Professions Alliance, gathering the International Pharmaceutical Federation, International Council of Nurses, World Medical Association, and World Dental Federation, has been established to facilitate working together in support of governments, policymakers, and the World Health Organization to help deliver cost-effective, quality health care worldwide.

Although pharmacists can receive specialty board certification, the educational backgrounds (including advanced degrees, residencies, fellowships, or other specialized practice experience) of critical care pharmacists vary. In addition, clinical pharmacologists—physicians or doctors of pharmacy who use their extensive knowledge to carefully monitor patients' medications—can also become involved in critical care medicine. The ACCP and the SCCM have also developed joint recommendations for fundamental, desirable, and optimal pharmacy services, as well as personnel requirements for the provision of pharmaceutical care to critically ill patients.[11]

As part of the intensive care unit team, intensive care pharmacists provide basic dispensing functions and drug information services, solve medication-related

problems, and make decisions regarding drug prescribing, monitoring, and regimen adjustments.[1,11–13] Depending on the organization and the individual in training, the pharmacist may provide patient and staff education, as well as participate in clinical research activities. Some pharmacists also perform multidisciplinary rounds.

One study showed that involving intensive care pharmacists on intensive care unit rounds with the multidisciplinary team reduced adverse drug events caused by prescribing errors.[14] The pharmacist could reduce adverse drug events by intercepting medication errors and preventing the adverse event from ever occurring. The presence of a full-time intensive care unit pharmacist on the unit team also provides continuity with respect to individualized pharmacotherapeutic care.[12]

The Role of the Intensive Care Unit Respiratory Care Practitioner

Respiratory therapists focus primarily on management of the ventilator system, airway care, delivery of bronchodilators, monitoring of hemodynamics and blood gases, and delivery of protocol-regulated respiratory care for the patient. They monitor and adjust ventilators and provide other respiratory support as needed. Respiratory therapists can manage the airway and may perform endotracheal intubation. In addition, they often obtain and analyze arterial blood to measure blood gases and to test a patient's breathing strength.

Respiratory therapists can receive one of two levels of training: They can become either certified respiratory therapists or registered respiratory therapists, the latter requiring additional training. Many of those who work in intensive care also receive certification in advanced cardiac life support and/or pediatric advanced life support.

As members of the multidisciplinary team, respiratory therapists have proven to be very effective at weaning patients from mechanical ventilation and improving the allocation of respiratory care services. Respiratory therapist–directed protocols have been proven to result in shortened ventilator days, reduced intensive care unit length of stay, fewer complications, and reduced re-intubation rates, according to several studies.[1,2]

Other Members of the Multidisciplinary Team

Medical personnel are not the only crucial part of the multidisciplinary intensive care unit team. Other professionals such as social workers, dietitians, and religious or spiritual care workers are also important to the overall care of intensive care unit patients.[8]

Social Workers

Social workers may have a variety of credentials, licenses, degrees, and specialty certifications. Typically, the social workers who serve in the intensive care unit have a bachelor's and/or master's degree in social work, and some are certified as social worker case managers. Through this training, they have specialized knowledge of government-assisted services and policies, social systems, and community resources. They are therefore prepared to effectively manage social issues that may result from a patient's hospitalization. For example, they are able to provide counseling for patients and families, help families develop coping mechanisms to handle the patient's illness, assist in sorting out insurance coverage issues, coordinate the patient's transfer from the intensive care unit, and find resources for care after hospitalization.

Dietitians/Nutritionists

Dietitians who work in hospitals commonly are registered dietitians. Some receive advanced certification in specialized areas of practices, such as pediatric or renal nutrition, which enables them to work with certain patient populations, such as those in the intensive care unit or pediatric intensive care unit. Dietitians who work in the intensive care unit consult with physicians, nurses, therapists, and others to ensure that patients receive adequate nutrition. For some patients, such as individuals diagnosed with diabetes or those who have experienced kidney failure, dietitians often provide information about special diets after these patients are discharged from the intensive care unit.[15]

Religious or Spiritual Care Workers

Religious or spiritual care workers address the spiritual needs of patients and their families during difficult situations, such as life-threatening illnesses. They help patients and families explore matters of personal concern, as well as issues of direct clinical relevance. They may be involved in offering personal support, mobilizing referrals to community resources, or exploring existential issues that emerge from encountering and addressing such circumstances. They can also assist family members when making difficult end-of-life decisions. These workers often are valued members of ethics committees and are involved in ethical issues that pertain to the delivery of patient care.

Religious or spiritual care workers should be knowledgeable about and often serve as the reference group for all of the following:

- Various religious and spiritual traditions
- Principles of health care and palliative care
- Cultural perspectives on spirituality, health, and illness
- Interpersonal processes involving how relationships are formed, how they develop, how change takes place, and how new insights can emerge

Other Team Support

Other supporting members of the multidisciplinary team may include physical and/or occupational therapists, who help patients adjust to daily activities of living following a critical illness or injury, as well as assist in placing splints. Support members such as physical therapists also help patients with range-of-motion exercises, stretching exercises, gait training, and other rehabilitation activities. Speech therapists help patients with speaking difficulties and evaluate their ability to swallow following a critical illness or injury. Intensive care unit technicians help nurses perform tasks such as bathing, turning, feeding, and transporting patients.

Medical Team Training

To make teamwork a common and effective practice in the intensive care unit, there is an imperative need to embed team training in professional development.[16] The U.S. Agency for Healthcare Research and Quality recommends that the health care community regard medical teamwork as an important facet of medical performance. One way to accomplish this is the implementation of a formal and mandatory error-reporting system. A second possible strategy is to require all intensive care providers to take part in newly developed team-training programs or refresher training at specified intervals. It may be useful to develop a board-certification test for teamwork, similar to the board exams mandated for medical specialties. Such an exam might combine a written test of knowledge and situational judgment with performance in a simulation scenario. Because the board examinations are designed to assess the requisite body of knowledge for each medical specialty, the teamwork component also could be configured to assess teamwork competencies inherent to the intensive care unit.

Variation in the structural features of the intensive care unit can affect the quality of care and therefore the potential for recovery from critical illness. For example, studies have suggested that patients managed in a closed intensive care unit by physicians with critical care team training have better outcomes than patients managed in open intensive care units by generalists without critical care team training.[16]

Delivering high-quality care in the intensive care unit requires the synchronous efforts of large numbers of clinical and nonclinical processes. Nonclinical processes of the intensive care unit, such as organizational management, can have an important effect on quality and patient safety. Quality improvement requires interdisciplinary teamwork that is incremental and continuous. Drawing on the collective resources of a network can be useful for small intensive care units with limited resources to build and sustain a successful quality improvement program.

For example, one neonatal intensive care unit in a 500-bed, urban teaching hospital described three broad organizational and interpersonal factors that influence how team members work together.[16] These factors included provider characteristics, workplace factors, and group influences. For example, the personal attributes of

the providers involved had a major influence on how they work together. Characteristics such as personality, reputation, and expertise were noted as important. Workplace factors influencing the way providers worked together included staffing, organization of work, and environment. Group influences, such as group communication and relationships, were noted by participants (particularly physicians) with emphasis on how much they rely on others for information. Researchers found that the neonatal intensive care unit providers had differing ideas about teamwork. Some never used the term, others thought of teams only for specific care processes or for single-provider types, and others had very broad notions of teams as "families" or groups working together so that the collective effort surpasses the effect achieved by an individual. That these providers had different ideas about teamwork is indicative of the need for caution when using certain terms in efforts to understand and improve the way providers work together.

Medical Emergency Teams

Critical events, such as cardiac, respiratory, and neurological events, are common and serious complications among intensive care unit patients. These critical events are often preceded by signs that the patient is in distress.

A medical emergency team consists of clinicians who bring quick critical care expertise to the patient bedside to assess the patient and then recommend or undertake interventions.[17] This team can respond when other hospital caregivers believe that a patient is showing signs of clinical deterioration. The goal of a medical emergency team is not to take away a physician's or nurse's patient management responsibilities; rather, the focus is on quickly doing what is required to prevent further deterioration of the patient's condition and to avoid an arrest. In an Australian hospital where the medical emergency team concept was first introduced, the hospital saw a 65% reduction in hospital cardiac arrest and a 24% reduction in overall hospital mortality.[18]

A medical emergency team is typically made up of a hospitalist or an intensivist, intensive care unit nurses, and a respiratory therapist. The purpose of the team is to get expertise to the bedside within three to four minutes every time there is a concern.

Organizations that have a medical emergency team encourage anyone—clinicians, patients, families, and so on—to call on the team whenever the patient meets certain criteria. These criteria are posted throughout the hospital, on medical/surgical units, in staff break rooms, and so on.

Upon arriving at a patient's bedside, the medical emergency team does the following[17]:

- *Assess the patient.* The medical emergency team works to identify the problem by discussing the patient's condition with the staff member who called the team, evaluating the symptom(s) that prompted the call, examining and questioning the patient to learn more about the symptom(s) (when possible), and reviewing the patient's chart for any other potential causes of the problem.
- *Stabilize the patient.* When the patient's problem has been identified, the medical emergency team may follow preestablished clinical protocols that allow team members to quickly treat and/or stabilize the patient.
- *Assist with communication among different care providers.* Medical emergency team members will work with nursing staff and others to prepare the necessary communication to inform the attending physician, hospitalist, and/or primary care physician about the event.
- *Educate and support the staff caring for the patient.* By going over the call with the nurse (or other staff member providing care), the medical emergency team members can educate the nurse about critical care issues and provide vital information that will aid in future care decisions about that patient.
- *Assist with transferring the patient to a higher level of care, such as the intensive care unit, when necessary.* If the patient's condition requires greater care, medical emergency team members will assist the staff in the appropriate procedures for having that patient transferred to a monitored bed or the intensive care unit.

Ideally, organizations build time for their medical emergency teams to round on patient floors before they are called for an emergency. This allows the team to get to know the nurses on the floor, proactively discuss any patients the nurses are concerned about, and lower the threshold for nurses to call the team in the event of a concern. If medical emergency team policies are not implemented with an emphasis on teamwork, frontline staff can be hesitant to call the team for fear of looking stupid. By rounding ahead of time, team members can reinforce the importance of calling them whenever there is a concern.

To further help frontline staff know when to trigger a medical emergency team, organizations should consider creating an early warning scoring system (EWSS) (*see* the "Intensive Care Resources" section, pages 104–105). An EWSS is a way of documenting patient vital signs so that abnormal vital signs trigger a call to the medical emergency team. Some hospitals use a form as their EWSS. This form highlights problematic vital signs in red. If the individual taking the vital signs—often a nursing assistant—notes that a vital sign is in the red area, he or she knows to call immediately the nurse and/or the medical emergency team. Effective teamwork and communication are critical to the success of medical emergency teams.

Professional Shortages and Other Barriers

Perhaps the biggest obstacle to implementation of the multidisciplinary approach in intensive care units is the lack of a sufficient number of clinicians with the appropriate specialized training to serve the growing number of intensive care patients. Hospitals report high vacancy rates and long recruitment times for critical care physicians (*see* Sidebar 3-2 on page 82 in Chapter 3), nurses, respiratory therapists, and pharmacists, according to one study.[19]

According to another study conducted by the Committee on Manpower for Pulmonary and Critical Care Specialties, current training programs cannot produce a sufficient number of qualified intensivists and nurses to meet the projected need for critical care services. Meanwhile, the demand for intensive care services is rapidly increasing, as the 78 million baby boomers approach the age of 65. Furthermore, Medicare enrollment is expected to grow by 50% over the next 30 years, at a time when the demand for services will grow quickly while the supply of critical care physicians will remain constant. If the current trend continues, a severe shortage of those specialists will continue to worsen until at least 2030.[20–22]

Exacerbating this situation is the reality that the nation's nursing shortage is projected to grow to more than one million nurses by 2020.[23] Based on findings from the Nursing Management Aging Workforce Survey released in July 2006, 55% of surveyed nurses reported their intention to retire between 2011 and 2020.[23] Adding to the problem is the fact that although enrollment in schools of nursing is increasing, it is not growing fast enough to meet the projected demand for nurses over the next 10 years. For example, in 2004 there was a 14.1% increase in enrollment in bachelor of science in nursing programs from the previous year, but growth will need to increase to at least 40% to meet the current demand.[24,25]

Hospital vacancy rates for respiratory therapists are increasing as well. According to the American Association for Respiratory Care, the vacancy rate for respiratory therapists in hospitals grew from 5.96% in 2000 to 8.65% in 2005; this translates to approximately 11,695 vacant full-time positions in 2005. Meanwhile, like nursing, this profession is aging. The mean age rose from 40 in 2000 to 44.59 in 2005.[26]

Team Support Solutions

To compensate for some of the professional shortages, some hospitals are bringing in other types of health care practitioners to assist the multidisciplinary team in devising alternative strategies to ensure that staffing is adequate for patient care.

Mid-Level Practitioners

A mid-level practitioner is any nonphysician who works in conjunction with an attending physician to provide direct patient care. Mid-level practitioners may

include nurse practitioners, nurse midwives, nurse anesthetists, clinical nurse specialists, and physician assistants, but in the intensive care unit, the mid-level practitioners are usually physician assistants and A.C.N.P.s.

Integrating physician assistants (P.A.s) and A.C.N.P.s into the care flow can result in improved outcomes for mechanically ventilated patients, can reduce length of stay and mortality, and has been proven to be particularly valuable in leading research and quality improvement initiatives.[27–29] Studies have also found that P.A.s and A.C.N.P.s can improve resident work hours without altering patient outcomes or direct hospital costs.[29]

Physician Assistants. The responsibilities of P.A.s focus on conducting physician exams, diagnosing and treating illnesses, ordering and interpreting tests, assisting in surgery, and writing prescriptions.[31] P.A.s work in conjunction with a physician, and their degree of autonomy varies from state to state. P.A.s take part in a two-year academic program and pass a certifying exam to obtain a license. P.A.s are also being employed in Australia, Canada, England, the Netherlands, Scotland, and South Africa,[31] and there are more than 68,000 PAs practicing in the United States.[30]

Acute Care Nurse Practitioners. A.C.N.P.s are nurse practitioners with specialized certification that allows them to perform many of the same tasks as physicians, including chest tube insertion, central line placement, and endotracheal intubation. A.C.N.P.s can examine patients, order and interpret diagnostic studies, diagnose disease, and in some states, prescribe medication. Although A.C.N.P.s practice in a multitude of settings, 68% of them work in intensive care units.[32]

Cross-Utilization

Another strategy for remedying staff shortages is cross-utilization in which cluster areas or similar units are defined, and then nurses are prepared to deliver care to patients within those clusters. Nurses are then assigned to the clusters to meet swings in census or acuity or to relieve other staff. The difference between cross-utilization and the practice known as "floating" is that the former allows for nursing staff to care for patients for whom they have appropriate knowledge and skills to treat, whereas floating merely temporarily reassigns nurses to a different unit than their home unit without providing them with additional training to address the care needs of the patients in the other unit.

Cross-training programs are easy to implement, timely, and cost-effective and could increase job satisfaction, decrease job stress, and increase skills by allowing staff to develop expertise in more than one specialty.

Nurse Extenders

Nurse extenders, or intensive care unit technicians, serve as technical assistants to experienced nurses. These nonlicensed staff members typically perform some technical tasks previously assigned to the nurse, thus freeing up nurses to provide professional nursing care. The responsibilities of the nurse extender and, consequently, the definition of the position vary by state. In general, nurse extenders have the following three main areas of responsibility[33]:

1. Providing specifically identified care under the direct/indirect supervision of the nurse who has overall responsibility for the patient
2. Assisting in clinical procedures
3. Performing a range of routine intensive care unit skills

Tasks performed by nurse extenders include bathing, turning, and feeding patients, as well as getting them out of bed, just to name a few. Nurse extenders might perform venipunctures, arterial line blood draws, and catheter setups, and they may monitor and record vital signs.

Measuring Nurse-to-Patient Ratios

In most hospitals, the nurse-to-patient ratio in the intensive care unit is 1:2 as a minimum standard for safe patient care. However, when nursing care hours are used instead of ratios, many intensive care units are staffed to a greater degree than 1:2.[9] For example, 12 nursing care hours translates to a nurse providing direct patient care half the time, which is less than a 1:2 ratio. Depending on the tasks that the nurse performs (for example, recov-

Sidebar 4-2: The Joint Commission's and Joint Commission International's Position on Staffing Ratios

Staffing issues have been identified as one of the top three most common root causes of sentinel events reported to The Joint Commission. The Joint Commission and Joint Commission International do not prescribe specific staff-to-patient ratios. Their position is that organizations should employ an adequate number of staff members who have the required mix of qualifications. That number is dictated by the needs of the organization and by the needs of the population it serves.

With the majority of health care organizations struggling with staffing shortages, attention has turned toward the issue of staffing effectiveness, given that staffing shortages can compromise both patient safety and health care quality. For example, high-acuity patients, such as those seen in the intensive care unit, and fewer health care workers or those who lack the right skill mix to care for such patients can seriously affect patient safety and quality of care.

Joint Commission and Joint Commission International standards and requirements related to staffing effectiveness can be found in the "Human Resources" and "Leadership" chapters of The Joint Commission's *Comprehensive Accreditation Manual for Hospitals* and in the "Governance, Leadership, and Direction" and "Staff Qualifications and Education" chapters in the *Joint Commission International Accreditation Standards for Hospitals.*

ering patients from general anesthesia after a direct admission to the intensive care unit or accompanying them on intrahospital transports) and the technology being used (for example, intra-aortic balloon pump or left ventricular assist device), nurse staffing between 14 and 17 nurse care hours is typical. Thus, staffing at the 17 nursing care–hour level allows for a ratio of about 1:1.

Although it may be a somewhat crude measure, the use of nurse-to-patient ratio in intensive care units is unlikely to disappear because it is easily understood and may actually be more accurate than hospital-level ratios. Therefore, the focus should be on defining the optimal nurse-to-patient ratio for an intensive care unit with a given severity of illness based on the decision process, diagnosis, and technology available. Several mathematical models can be used to assist with staffing decisions. Among them are the following[9,34]:

- Queuing theory, which uses key variables such as the mean arrival rate of patients per hour
- Mean hours of service provided to the patient
- Number of patients in the queue awaiting admission and idle time
- Expected utility theory, which can be used to assess the risk and benefit of established staffing levels
- Activity-based costing method, which captures variations in the demand placed on shared resources and identifies a cost driver that causes costs to increase

Among others, the AACN believes that an appropriate staffing plan should link patient outcomes to such variables as patient needs, cost delivery, competency of providers (for example, experience, training, certification), and staff mix with patient outcomes. Other variables to consider include fatigue and work load. A staffing plan should also provide for flexible resources that supply additional staff to meet the demands of sudden shifts in patients' needs because of the unpredictability of increasing patient acuity in the critical care setting (*see* Sidebar 4-2, above, Sidebar 4-3 on page 102, and Sidebar 4-4 on page 103).

When coverage by a multidisciplinary team is not always possible, new technologies are creating opportunities for off-site intensive care specialists to monitor patients via computer. Chapter 5 discusses the benefits and drawbacks of telemedicine.

Sidebar 4-3: Tracking Compliance—Staff Competencies and the Intensive Care Unit

Ongoing in-service and other education and training programs for staff in the intensive care unit and other patient care areas have two goals. The first goal is for staff to maintain and improve their competency; the second goal is to support a teamwork-oriented approach to patient care. Consequently, intensive care unit staff members are expected to participate in ongoing education to increase their knowledge of work-related issues relevant to the intensive care unit and to enhance the multidisciplinary approach to care.

These educational programs should emphasize specific job-related aspects of patient safety in the intensive care unit. When applicable, training should incorporate methods of team training to foster an interdisciplinary, collaborative approach to the delivery of patient care in the intensive care unit. This training should also reinforce the need for and method of reporting medical/health care errors.

In addition, continuing in-service and other education and training programs should be appropriate to the patient age groups that the hospital serves. For example, given that the majority of patients in the intensive care unit are elderly, staff should have some training in how to care for geriatric patients.

United States

To ensure that staff are indeed benefiting educationally from these opportunities, the hospital should periodically review the staff's abilities to carry out job responsibilities, particularly when introducing new procedures, techniques, technology, and equipment to the intensive care unit.

Problems with applying these standards typically arise when every staff member's competence is not assessed during the performance of new procedures and techniques and when new equipment is used in the intensive care unit. Other problems spring from some hospitals having an organizational approach to age-specific competency that is generic and not job specific or from the hospital's failure to consistently address the way current competencies are assessed. One means of establishing age-specific competence is to evaluate ability through the use of written tests, observation, or demonstration. Often, more than one technique is needed to assess competencies, as one approach does not fit all situations.

To overcome challenges that result from the failure to assess competence in performing new procedures and techniques and in the use of new equipment in the intensive care unit, an organization might decide which skills or activities are pertinent to the provision of care and then determine how to assess the related competencies. Frequently, written tests are too generic but do establish a baseline that enables the organization to pursue further assessment of the competencies through such methods as observation and simulation.

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

Sidebar 4-4: Tracking Compliance—Staff Qualifications and Education and the Intensive Care Unit

Health care organizations should provide staff with opportunities to learn and advance personally and professionally. Therefore, in-service education and other learning opportunities should be offered to staff in the intensive care unit.

The organization should collect data from several sources to understand intensive care unit staff's ongoing education needs. The results of quality and safety monitoring are one source of information for identifying education needs. In addition, monitoring data from the intensive care unit, the introduction of new technology, skill and knowledge areas identified through the review of job performance, new clinical procedures, and future plans to provide new services represent such sources of data. The organization should also have a process to gather and integrate data from various sources in order to plan the staff education. In addition, the organization should determine which staff, such as the critical care staff, are required to obtain continuing education to maintain credentials and how their continuing education will be monitored and documented.

International

To maintain acceptable staff performance, teach new skills, and provide training on new equipment and procedures, the organization should provide or arrange for facilities, educators, and time for ongoing in-service and other education. This education is relevant to each staff member in the intensive care unit, as well as to the continuing advancement of the organization in meeting patient needs. For example, medical staff members may receive education on infection prevention and control, advances in medical practice, or new technology. Each staff member's educational achievements should be documented in his or her personnel record.

To overcome these challenges, the organization's leaders should support the commitment to ongoing staff in-service education by making available space, equipment, and time for education and training programs. The availability of current scientific information should support the education and training.

The education and training can take place in a centralized location or in several smaller learning and skill-development locations throughout the facility. The education can be offered once to all or repeated for staff on a shift-by-shift basis to minimize the impact on patient care activities.

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

INTENSIVE CARE RESOURCES

Zero Defects in the Intensive Care Unit

"Zero defects" is a quality improvement concept that was originally used in aerospace engineering, but which can be adapted to nearly any enterprise. Its principles include the following:

1. Quality can be achieved by conforming to certain requirements or protocols.
2. It is better to prevent the defects from occurring than to catch them after the fact.
3. Zero defects (or zero errors) should be the quality standard.
4. Quality has a financial benefit, as every defect or error has a cost.

It is easy to see why "zero defects" is a standard that many hospitals are trying to achieve. Many experts question whether zero is a reachable goal,[1] but Joint Commission and Joint Commission International standards and patient safety goals, as well as standardized procedures such as the hand hygiene guidelines from the Centers for Disease Control and Prevention and the World Health Organization, have helped bring intensive care unit rates of health care–acquired infections down significantly.[2]

Collecting the Right Data

Many data collection methods can be used to gather patient safety data in the intensive care unit: Chart review, voluntary reporting, staff interviews, checklists, and other formats can all help intensive care units develop a picture of their safety status. However, the best data collection processes are valuable only if a skilled and appropriate analysis is applied to them.

Hospitals must be sure they are able to analyze and use the data in a way that allows them to make meaningful comparisons. The quality control department may be able to help identify statistical tools to provide context to the data and ensure that reasonable conclusions are being drawn.

One method that has produced valuable insight is direct observation.[3] This can be costly; observers must be trained in this method of data collection, but it can provide invaluable insight, particularly at the launch of a new safety initiative.

Direct observation allows a hospital to collect greater depth of data; for example, rather than simply identifying an error, an observer can provide more context and details on the severity of the incident. In addition, the observer can intervene in cases when an error may cause substantial pain or harm to the patient.[3]

Early Warning Scoring System

Because so many critical care patients are likely to suffer cardiac arrest, respiratory arrest, and other life-threatening medical events, it is important that care providers recognize the signs of deterioration as soon as possible in order to take preventive measures. Some hospitals have medical emergency teams to provide quick treatment to patients in decline, but an effective early warning scoring system (EWSS) in the intensive care unit can identify those patients even sooner.

A variety of formats can be used for EWSS—the most common are scoring forms that are on paper or computerized. These forms ask care providers to answer a series of questions about the patient's condition and score them accordingly; scored levels or patterns can indicate that a patient may be taking a bad turn (*see* Sidebar 4-5, page 105). Questions might include items on heart rate, oxygen saturation, mental status, blood pressure, respiration, or temperature, for example.[4,5] Many telemedicine systems include early warning features that gather this information automatically and notify the physician or nurse when the data indicate patient deterioration.

Care providers are then able to notify appropriate clinicians and/or make appropriate changes to the treatment regimen, depending on what the early warning protocols dictate, to prevent the type of decline that might warrant a call to the medical emer-

INTENSIVE CARE RESOURCES

Zero Defects in the Intensive Care Unit (continued)

Sidebar 4-5: Track and Trigger System

The National Institute for Health and Clinical Excellence has developed patient-scoring grades based on a physiological track and trigger system that can be used when a patient is identified as being at risk of clinical deterioration. The grades consist of the following three levels:

1. Low-Score Group:
   - Increased frequency of observations and the nurse in charge alerted

2. Medium-Score Group:
   - Urgent call to team with primary medical responsibility for the patient
   - A simultaneous call to personnel with core competencies for acute illness is placed. These competencies can be delivered by a variety of models at a local level, such as a critical care outreach team, a hospital-at-night team, or a specialist-trainee in an acute medical or surgical specialty.

3. High-Score Group:
   - An emergency call to the team with critical care competencies and diagnostic skills is made. The team should include a medical practitioner skilled in the assessment of the critically ill patient and who possesses advanced airway management and resuscitation skills. There should be an immediate response.

Source: National Institute for Health and Clinical Excellence: National Institute for Health and Clinical Excellence Guidelines on Acutely Ill Patients in Hospital: Recognition of and Response to Acute Illness in Adults in Hospital. Centre for Clinical Practice at the National Institute for Health and Clinical Excellence, 2007. http://www.nice.org.uk/nicemedia/pdf/CG50FullGuidance.pdf (accessed Nov. 18, 2009).

gency team or the code team, if the patient eventually requires resuscitation.

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Chapter 5
Patient Safety and Telemedicine in the Intensive Care Unit

The practice of intensive care has been revolutionized as new clinical technologies allow caregivers to more effectively treat patients' injuries and illnesses. Breakthroughs in communication technologies have also led to improved patient care, as critical care staff are enabled to communicate with each other, enter provider orders, monitor patients remotely, access patients' medical histories, and review the latest clinical research, all electronically. These systems, often called telemedicine or electronic intensive care units (e-intensive care units), help hospitals meet the increased staffing and monitoring needs of today's intensive care unit to ensure the safety of patients.

Telemedicine Today

In the past, *telemedicine* has referred primarily to defined encounters, via video, and audioconferencing, between individual physicians or between the physician and a patient. Today, however, that definition has been expanded to include systems that allow experienced intensivists and critical care nurses to continuously monitor multiple intensive care patients remotely via computer. This can be done from a physician's home or, in some cases, from a centralized workstation at another remote location in the health care system, or at another organization entirely, such as another health care organization or a third-party vendor. This type of system should not replace a physician's presence in the intensive care unit, but it does allow for 24-hour-a-day coverage of all intensive care patients.

Video and Data Transmission Technologies

With these systems, critical care physicians interact with patients and hospital staff while accessing clinical data via dedicated computer-based video and data-transmission equipment. Video technology allows the remote physician to monitor the patient visually; many systems allow the physician to control the camera as necessary. In addition, videoconferencing equipment enables clinicians to communicate in real time with on-site caregivers, patients, or patients' families, if necessary.

Monitors that are connected to the telemedicine system collect clinical data on the patient, such as vital signs, and transmit them in real time. Critical pieces of patient information, such as electrocardiograms, radiographs, consultant notes, laboratory test results, and bedside flow sheets, are also transmitted digitally.

Patient monitoring systems alert the remote medical staff immediately when there is a change in a patient's condition, and then the staff confer with on-site caregivers to make decisions about the patient's treatment.

Staffing

Typically, the remote facility that houses the clinicians who provide care is staffed by critical care physicians, critical care nurses, and health care assistants from the hospital. The size of the remote team depends on the number of patients being managed. One study showed that a critical care physician, critical care nurse, and health care assistant can effectively manage between 40 and 50 patients.[1] As the number of patients being monitored increases, so should the number of intensive care practitioners, including the addition of acute care nurse practitioners, physician assistants, and pharmacists.

Sidebar 5-1: Keys to Telemedicine Success

After Lehigh Valley Hospital and Health Network, an 800-bed tertiary care center in Pennsylvania, effectively implemented a telemedicine program in its intensive care units, it created a list of the factors that were instrumental to the program's success:

- Dedicated project leader and project team
- Complete installation of computer hardware and other necessary equipment prior to the go-live date
- Fluid time line that changed as challenges occurred, with emphasis on bringing the system live only once
- Nursing leadership's positive attitude and belief in the project's success
- Nursing leadership's support and visibility during the first week of go-live
- Insistence that the work load and work flow of the health care professional using the program be easier rather than more cumbersome
- Involvement of bedside caregivers in the creation of the documentation tool
- Praise for and recognition of the staff and accomplishments

Source: Rabert A.S., Sebastian M.C.: The future is now: Implementation of a tele-intensivist program. *J Nurs Adm* 36:49–54, Jan. 2006.

Benefits of Intensive Care Unit Telemedicine

If planned and implemented properly, a telemedicine program can provide numerous benefits, particularly to hospitals that struggle with obtaining the appropriate amount of intensive care unit coverage by critical care specialists. (Sidebar 5-1, above, offers one organization's keys to a successful implementation.) These benefits include increased physician coverage, improved patient outcomes, and enhanced data collection.

Increased Physician Coverage

The foremost benefit of telemedicine in the intensive care unit is the ability to achieve the level of physician coverage necessary for the optimal care of critically ill patients who require close monitoring and frequent interventions.[2] A telemedicine program can be arranged in a number of different ways, depending on the needs of the hospital. For example, the e-intensive care unit team can be linked electronically to several intensive care units within one hospital or system, or to other intensive care units in multiple hospitals.

Hospitals that have critical care physicians managing the intensive care unit during the day might choose to have them remotely manage the unit during off-hours. This arrangement would allow for the delivery of a consistent level of patient care 24 hours a day. Hospitals with an insufficient number of critical care physicians to provide continuous on-site coverage could also choose to build a telemedicine network with other facilities in the same geographic region, an arrangement that would pool the organizations' resources, allowing for a single intensivist to monitor patients in all of the hospitals simultaneously. Finally, rural hospitals that lack critical care physicians on staff might contract for intensivist coverage with tertiary care centers. This setup would bring in the needed expertise that the rural hospital could not offer on its own.

With the ability of off-site intensive care physicians to monitor and care for patients at multiple locations simultaneously, telemedicine is not limited to intensive care patients at one facility. Several teams from a single e-intensive care unit are able to provide care for 100 to 150 patients across multiple hospitals within a single geographic region.

For hospitals that do not have on-site critical care physician coverage around the clock, the e-intensive care unit offers the added benefit of potentially improving continuity of care during off-hours. Access to full-time intensivist coverage reduces the need for critical care staff to reconcile conflicting orders given by various attending and consulting physicians and to handle practice variations among clinicians. It also eliminates the problem of a nurse or other caregiver not being able to access expertise when necessary.

Improved Patient Outcomes

In essence, the use of e-intensive care units permits the leveraging of a limited supply of intensivists while

upgrading the level of care provided to intensive care patients. The benefits of an e-intensive care unit were apparent as early as the late 1970s, when the first reported attempt to use telemedicine in the intensive care unit occurred in Cleveland. Patients at an understaffed urban hospital with unsophisticated technology for whom university-based critical care physicians provided consultation via telemedicine experienced better clinical outcomes than hospitals that did not take advantage of the technology.[3] Numerous studies have found that telemedicine can significantly improve patient care and safety in the following ways[4–7]:

- At a medical center in northwest Kansas, implementation of an e-intensive care unit system resulted in a 50% drop in mortality in the intensive care unit and an 18% reduction in length of stay during the first five quarters following the unit's implementation.
- In a surgical intensive care unit in an academic hospital, remote monitoring by intensivists was instituted for two 16-week periods. During those times, intensive care unit mortality decreased by 68% and 46%, hospital mortality decreased by 33% and 30%, the incidence of intensive care unit complications decreased by 44% and 50%, and length of stay decreased by 34% and 30%. Intensive care unit costs were also lower by 33% and 36%, due to the lower rate of complications.
- A Missouri health center with extensive cardiology and open-heart surgery services saw intensive care unit patient mortality drop 24% after implementing a telemedicine system. Intensive care unit length of stay decreased 6%, and overall hospital length of stay for intensive care patients decreased 14%.
- A study of two intensive care units after telemedicine was implemented found that overall intensive care unit mortality decreased by 26.7%, average intensive care unit length of stay decreased 16%, and the cost per case was reduced by 24.6%, or $2,556 per case.

Enhanced Data Collection

Another benefit to telemedicine-based technology applied in the intensive care unit is its ability to automate the collection, evaluation, and presentation of clinical data generated in large volumes.[6] The ability to access intensive care unit data and to present it in a more usable format has the potential to improve the effectiveness of care and associated outcomes for critically ill patients. For example, such systems can potentially be used to identify patients who meet specific medical criteria, such as those who present with specific diseases or clinical events, and then to alert the physician to these conditions. Other systems may be able to automatically process patients' vital signs, alerting clinicians if they should fluctuate or change.

Disadvantages of Telemedicine

The use of telemedicine in the intensive care unit, despite its growing acceptance as a breakthrough in technology, is not without its disadvantages. Among the potential drawbacks of its use are the confidentiality issues that it raises, the alteration of the patient-physician relationship, the credentialing and privileging issues it raises for physicians who provide care off site, physician liability issues, and the cost of implementing this new technology.

Data Sharing and Maintaining Patient Confidentiality

Just as the use of computerized medical records and other technology raises confidentiality concerns and other legal questions, so does the use of telemedicine in the intensive care unit. Protecting patient confidentiality, securely storing patient information, and providing audit trails outside the traditional hospital walls are concerns that have to be addressed with this emerging technology.

Although technology to transmit patient information securely within an organization has been well established, the technology that allows that information to be sent to and received from a remote location must be equally secure. In addition, the remote location must have security in place (for example, encryption, as well as physical security, such as limited access to the workstations) to ensure that the information is accessible only to those who need it to provide care. When additional organizations are involved, such as third-party vendors, all contracts should ensure that the vendor maintains

proper security for patient data and has methods in place for disposing of data materials properly.[8] Organizations working with third-party vendors would be wise to conduct occasional security checks of the remote site.

All such systems should meet local or national security and privacy regulations, such as those detailed in modifications to the Health Insurance Portability and Accountability Act (HIPAA) of 1996, adopted by the U.S. Congress in 2002. Organizations outside of the United States should investigate and meet any local, regional, or national regulations.

Alteration of the Patient-Physician Relationship

Another disadvantage of this new technology is the way that it changes the traditional relationship between patients and physicians. With regard to patient care, the lack of physical proximity between the patient and physician alters the nature of the relationship between the two.[6] A physician 30 miles away obviously cannot conduct a physical examination, so he or she has to rely on the on-site staff to do so, and therefore the benefits of the one-on-one personal interaction between physician and patient can be limited or lost.

The use of telemedicine also raises questions about the nature of the relationship between the remote caregivers and the on-site staff, namely regarding the best way to integrate the services of both groups.

These changes are as disconcerting to the remote physicians as they are to the on-site staff and patients, at least at first. A recent study of clinicians who work at the remote monitoring site in a telemedicine system found that many had trouble adjusting early on to the new situation; for example, not only did some find that they missed the face-to-face patient contact, but they had some physical difficulties when they began sitting at a computer for a whole shift rather than walking the hospital floors. In addition, the remote caregivers had to learn new ways of communicating to ensure that they were not overstepping any boundaries with the on-site staff.[9]

Credentialing, Privileging, and Licensing

The use of telemedicine in the intensive care unit also raises credentialing and privileging questions for the off-site clinicians who provide care, such as how these individuals obtain clinical privileges at the organization whose patients they are monitoring, particularly if they are located in another state. Without universal privileges, these clinicians must obtain clinical privileges from each location at which they provide input on patient care. The Joint Commission and Joint Commission International require that these practitioners be credentialed and privileged for relevant services at the site where the patient is located. Sidebars 5-2 and 5-3, page 111, discuss how organizations may meet those requirements.

Also at issue are physicians' state, local, or other medical licenses if the remote location at which they monitor patients is in a different state than the patients they are helping to treat. To date, attempts to create a national medical license across the United States have failed.[10] In addition, many states or other localities have different requirements for obtaining a medical license, and some require that caregivers obtain a specialized license to practice telemedicine. If telemedicine is legally tested, it is not yet known whether the input of a physician licensed in another state could constitute practicing medicine without a license.[11] Hospitals should be aware of local, regional, and national regulations and should ensure that all caregivers providing medical input on patient care have the required licenses.[12]

Physician Liability

The issue of liability in a telemedicine situation has been largely unexplored to date.[8,13] If legal challenges arise, there will likely be questions raised as to whether the use of teleradiology establishes a patient-physician relationship and whether the clinician who provides the consult has liability, although real-time interactive videoconferencing does serve to establish such a relationship.[10] In addition, if a remote physician is not held liable, it is still possible that the contracting organization may be held responsible for failure to ensure proper medical licensure or another fault.[8]

Sidebar 5-2: Tracking Compliance—Privileging and Telemedicine

The Joint Commission requires all licensed independent practitioners who provide care and monitoring of patients via a telemedicine link to have the appropriate privileges and credentials at the originating site as required by the organization to which the patient was admitted. Therefore, any hospital that uses remote monitoring to care for patients in the intensive care unit must ensure the following:

- The originating site fully privileges and credentials the practitioner according to Joint Commission requirements.
- The originating site grants privileges to caregivers based on credentialing information from the remote site (only if it is a Joint Commission–accredited organization).
- The originating site uses the credentialing and privileging decision from the remote site to make a final privileging decision if all the following requirements are met:

United States

—The distant site is a Joint Commission–accredited hospital or ambulatory care organization.
—The practitioner is privileged at the remote site for those services to be provided at the originating site.
—The originating site provides the remote site with information that is useful to assess the practitioner's quality of care, treatment, and services for use in privileging and performance improvement. At a minimum, this information includes all adverse outcomes related to sentinel events considered reviewable by The Joint Commission that result from the telemedicine services provided and complaints about the distant site licensed independent practitioner from patients, licensed independent practitioners, or staff at the originating site.

This occurs in a manner consistent with any hospital policies or procedures intended to preserve any confidentiality or privilege of information established by applicable law.

***For complete standards and supporting information, consult the current* Comprehensive Accreditation Manual for Hospitals.**

Sidebar 5-3: Tracking Compliance—Leadership Oversight for Privileging in Telemedicine

Hospitals frequently have the option to provide clinical and management services directly or to arrange for such services through referral, consultation, contractual arrangements, or other agreements. Such services may range from radiology and diagnostic imaging services to financial accounting services. In all cases, there is leadership oversight for such contracts or other arrangements to ensure that the services meet patient needs, and are monitored as part of the organization's quality management and improvement activities. Leaders from clinical departments or services provide primary oversight for clinical contracts, and leaders from management provide primary oversight for management contracts.

International

Department managers receive and act on quality reports from contracting agencies and ensure the reports are integrated into the organization's quality monitoring process when appropriate.

All diagnostic, consultative, and treatment services provided by independent practitioners outside the organization, such as telemedicine and teleradiology, are privileged by the hospital to provide such services.

***For complete standards and supporting information, consult the current* Joint Commission International Accreditation Standards for Hospitals.**

Currently, off-site physicians who work in e-intensive care units are considered consultants and, as such, do not carry additional liability. However, physicians and hospitals practicing telemedicine would be wise to find malpractice insurance that covers medicine practiced in other states,[10] although many insurers have historically been wary of telemedicine coverage because of the uncertainty of the legal possibilities.[8]

Cost Factors

The additional equipment and communication systems required for telemedicine systems are costly. When the cost of support staff in the remote location is added, the use of telemedicine in the intensive care unit can be prohibitively high, particularly for small or rural hospitals—organizations that are most likely to be in need of such a system.[2,10] In addition, obtaining consistent reimbursement for remote clinical services from some payers can be difficult, thus ruling out this option for treating intensive care patients in a great number of hospitals.[8,13]

Future of Telemedicine

A 2006 report to the U.S. Congress by the Health Resources and Services Administration of the U.S. Department of Health & Human Services stated that there is a current shortage of intensivists in U.S. hospitals and that the shortage is expected to continue growing in the near future (*also see* Sidebar 3-2 in Chapter 3).[14] Therefore, the need for telemedicine and other options will probably continue so that hospitals can compensate for the deficiency. However, if telemedicine programs are to succeed, they will require changes in the processes and culture of intensive care units.

These new systems require that hospitals reengineer their usual intensive care unit processes to accommodate the input of the remote physician (*see* Sidebar 5-4, page 112). First, this system is focused primarily on potential adverse outcomes and quick response to any patient deterioration, rather than the ongoing care and monitoring provided by the on-site staff. In addition, communication procedures must be designed to ensure that on-site staff are able to take advantage of the remote physician's expertise while still allowing the on-site physician to be the primary caregiver.

Conclusion

Creating an environment that focuses on patient safety issues in the intensive care unit involves many aspects of care and presents many challenges. A wide variety of patient safety issues and failures, as well as efforts to improve care in the intensive care unit, were discussed in this book.

Chapter 1 presented data about the types of intensive care units, the levels of care they provide, and how those characteristics can affect patient care and safety. It discussed the importance of solid and clear intensive care unit admission policies to ensure that critical care resources are dedicated to patients who truly need them and who are likely to be helped by them. Also included were tips to help identify and eliminate system failures (assess systems) by using tools such as root cause analysis, failure mode and effects analysis, Six Sigma, and Robust Process Improvement™.

In Chapter 2, the discussion led to specific challenges, and strategies to overcome these challenges, within the intensive care unit, such as leadership and ethical challenges; medication-related incidents, such as errors, sedation, adverse drug reactions, and infection prevention and control; communication and teamwork; staff training; and challenges associated with special patient populations—the pediatric and neonatal patient.

Intensive care unit staffing issues were addressed in Chapter 3. The advantages of intensive care–based physician specialists called intensivists were reviewed, along with strategies for smaller hospitals that may not be able to afford intensivist staffing. The role of an intensivist as part of a multidisciplinary care team was also covered, along with some of the responsibilities of such a team. In addition, this chapter defined the advantages and disadvantages of open, closed, and hybrid systems for oversight of patient care.

Chapter 4 delved deeper into the concept of the multidisciplinary care team in the intensive care unit,

Sidebar 5-4: Positions on the Use of Telemedicine in the Intensive Care Unit

The Leapfrog Group (*also see* Chapter 3), in its recommendations for intensive care unit physician staffing, recommends that smaller hospitals that lack the economies of scale necessary to support full-time intensivists for their intensive care units either consolidate their intensive care unit care into larger hospitals or implement a telemedicine system. In addition, in the 2008 Leapfrog Group Hospital Survey, the consortium recommends the following:

- To meet the Leapfrog intensive care unit requirement for intensivist presence in the intensive care unit via telemonitoring, a hospital must affirm that its tele-intensivist presence fulfills the following key features:
  - —An intensivist who is physically present in the intensive care unit (on-site intensivist) performs a comprehensive review of each intensive care patient each day and establishes and/or revises the care plan. The tele-intensivist has immediate access to information regarding the on-site intensivist's care plan at the time monitoring responsibility is transferred to him or her by the on-site intensivist. When care is transferred back to the on-site intensivist, the tele-intensivist communicates (rounds) with the on-site intensivist to review the patient's progress and set direction.
  - —When an intensivist is not on site in the intensive care unit managing or comanaging all intensive care patients, a tele-intensivist is monitoring and able to manage all intensive care patients. *Monitoring* means the tele-intensivist has no other concurrent responsibilities, is immediately available to communicate with intensive care unit staff, and is in the physical presence of the tele-intensive care unit's patient monitoring and communications equipment. *Manage* means authorized to diagnose, treat, and write orders for a patient in the intensive care unit on his or her own authority.
  - —A tele-intensivist has immediate access to key patient data, including the following:
    - Physiologic bedside monitor data (in real time)
    - Laboratory orders and results
    - Medications ordered and administered
    - On-demand notes, radiographs, electrocardiograms, and so on
- Data links between the intensive care unit and the tele-intensivist are reliable (> 98% up-time) and secure (Health Insurance Portability and Accountability Act–compliant).
- Via audio/visual support, tele-intensivists are able to visualize patients with sufficient clarity to assess breathing patterns and are able to communicate with on-site personnel at the bedside in real time.
- Written standards for remote care are established and include, at a minimum, the following:
  - —Tele-intensivists are certified by a national medical specialty board in critical care medicine.
  - —Tele-intensivists are licensed to practice in the legal jurisdiction in which the intensive care unit is located.
  - —Tele-intensivists are credentialed in each hospital to which they provide remote care (can be special telemedicine credentialing).
  - —Activities of the tele-intensivist are reviewed within the hospital's quality assurance committee structure.
  - —There are explicit policies regarding roles and responsibilities of both the on-site intensivist and the tele-intensivist.
  - —There is a process for educating staff regarding the function, roles, and responsibilities of the tele-intensivist.
- Tele-intensive care unit care is proactive, with routine review of all patients at a frequency appropriate to their severity of illness.
- The tele-intensivist's patient work load ordinarily permits him or her to complete a comprehensive assessment of any patient within five minutes of the request for assistance being initiated by hospital staff.
- There is an established written process to ensure effective communication between the on-site care team and the tele-intensivist.
- The tele-intensivist documents patient care activities, and this documentation is incorporated into the patient record.

Sources:

The Leapfrog Group: *Factsheet: ICU Physician Staffing.* Washington, DC: Leapfrog Group, Apr. 9, 2008; Rosenfeld B., et al.: Intensive care unit telemedicine: Alternate paradigm for providing continuous intensivist care. *Crit Care Med* 28:3925–3931, Dec. 2000.

detailing the roles of the team members, such as the attending physician, nursing director, critical care nurse, pharmacist, and respiratory therapist. The roles of other supporting team members, such as social workers, dietitians, and pastoral care workers, were also discussed. The chapter addressed the professional shortages that may be barriers to staffing in the intensive care unit and offered some solutions.

In Chapter 5, the pros and cons of intensive care unit telemedicine were presented. Although telemedicine can be an excellent alternative for hospitals that are too small or too remote to offer full-time, on-site staffing, this relatively new technology has some drawbacks. For example, such systems can be costly and, depending on the location of the staffing center, can bring up concerns about credentialing and privileging, liability, and confidentiality. These issues, along with a discussion of telemedicine's future, were covered.

The next chapter (Chapter 6, "Patient Safety Success Stories in the Intensive Care Unit") offers case studies from hospitals in the United States and abroad that are well-respected critical care organizations and are at the forefront of patient safety in the intensive care unit. These organizations have taken steps to ensure that intensive care patients receive safe, high-quality care, and their results demonstrate their success.

By measuring and assessing intensive care unit processes and issues, and by working as a team to resolve challenges, your organization can improve the safety of patients in the intensive care unit.

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Chapter 6
Patient Safety Success Stories in the Intensive Care Unit

Safety, Surveys, and Success

Although most organizations have procedures in place to track adverse events, there is a growing body of evidence that these procedures work best as part of an overall culture of safety. In a culture of safety, caregivers feel empowered to report adverse events, to speak up in order to prevent an adverse event, and to offer ideas for improving patient safety in the organization.

Case Studies

Successful intensive care units have built on their cultures of safety by implementing focused programs and initiatives to further improve intensive care and safety and to reduce adverse events. Following are some organizations that have enhanced patient safety in their intensive care units.

Johns Hopkins Hospital: Comprehensive Unit-Based Safety Program

At-a-Glance

About the hospital: The Johns Hopkins Hospital is a 900-bed academic center, affiliated with the Johns Hopkins University School of Medicine. The hospital is one of three acute-care hospitals in the Johns Hopkins Health System.

About the improvement: As part of a greater organizational effort to improve patient safety and reduce errors, intensive care physicians at the hospital developed a program designed to enhance the culture of safety by increasing communication among caregivers and empowering them to eliminate patient safety risks.

In an effort to improve quality, safety, and communication in their intensive care units, intensive care physicians at Johns Hopkins Hospital developed the Comprehensive Unit-Based Safety Program (CUSP). The program was pilot tested in a 14-bed oncology surgical intensive care unit, known as the Weinberg ICU (WICU), and then later in a 15-bed surgical intensive care unit for general vascular surgery, trauma, and transplant patients. In both of these units, patients were comanaged by intensivist-led multidisciplinary teams.

Measuring the safety culture of both intensive care units using a medical derivative of aviation's Safety Climate Scale,[1] researchers found that the CUSP improved the culture of safety from 35% to 67% in the surgical intensive care unit and from 35% to 52% in the WICU. One year after implementation, each intensive care unit saw its length of stay decrease by a full day, and nursing turnover went from 8% or more to 2%.[1]

(continued on page 118)

Johns Hopkins Hospital: Comprehensive Unit-Based Safety Program (continued)

Although it was originally an eight-step process, the CUSP has been streamlined to the following five steps:

1. *Educate on the science of safety*. When a unit is about to initiate CUSP, the CUSP champion (usually the physician cochair of the patient safety committee or the nurse safety coordinator) gives a presentation to all unit staff about the science of safety. This presentation highlights information from the *To Err Is Human* report from the Institute of Medicine, as well as the ways in which systems affect adverse event risk. The goal of this step is to ensure that staff understand the importance of patient safety, realize that the focus in a patient safety program should be on systems and processes rather than finger-pointing, and see the importance of communication and other teamwork skills in improving patient safety.
2. *Identify potential hazards and defects*. Staff in the work unit complete a brief survey about their experiences with patient safety to help identify the areas to be addressed. The survey asks them to talk about the last patient who would have been harmed without intervention, how the next patient is likely to be harmed, and how such harm can be prevented in the future. The results of this survey are the basis for the interventions that will be emphasized in that unit.
3. *Assign an executive to "adopt" the unit*. In addition to giving the science of safety presentation, this executive reviews the safety hazard survey with staff and meets with staff at least once a month to discuss their safety concerns. These meetings are meant to break down the barriers to system improvement by providing a forum for staff to present problems, suggestions, and other feedback. They also demonstrate leadership's commitment to the culture of safety.
4. *Learn from a defect each month*. Every month, leadership and staff review an incident of patient harm or near miss to discuss what happened, what system broke down to allow it to happen, and what can be done to prevent the incident from occurring again. In addition, the staff discuss how they know that their actions actually reduced risk—what results they have seen. This step is vital in helping the organization learn from mistakes.
5. *Implement teamwork tools*. As part of the process of reviewing defects, staff and leadership also discuss where the communication problems may be. Teamwork tools such as the Situation–Background–Assessment–Recommendation (SBAR) technique are then put into place to improve communication between caregivers.

Since its initial implementation, the CUSP has been rolled out in more than 50 nursing units throughout Johns Hopkins Hospital.

"We regularly measure the culture of safety across the organization," explains Peter Pronovost, M.D., Ph.D., a critical care physician at Johns Hopkins and the researcher who led the development of the CUSP. "If any unit scores low, we go in and implement CUSP. The program is a nice balance between top down and bottom up—it has strong leadership support but allows frontline employees to offer input and have a platform to be heard. It provides a set strategy for improving the culture, but it is flexible enough so that units can learn what their own biggest risk is and work on that specifically," says Pronovost.

Among the interventions implemented in hospital units because of the CUSP are bundles to reduce catheter-related bloodstream infections (CRBSIs) and ventilator-associated pneumonia (VAP), rounds checklists, and establishment of daily goals. The following results have been significant:

- After researchers implemented a daily goals form in the oncology intensive care unit, the percent-

age of intensive care unit nurses and residents who understood the goals of patient care for the day rose from 10% to greater than 95%. In addition, the new system decreased intensive care unit length of stay from a mean of 2.2 days to 1.1 days.[2]

- Interventions to reduce CRBSIs included the following:
  - —Creation of a cart containing all the equipment needed for central line insertion
  - —An addition to the daily rounding form that asked whether any patients' central lines could be removed, and authorization for nurses to stop a procedure if evidence-based guidelines were not being followed. Before the intervention, physicians had followed evidence-based infection prevention and control guidelines for 62% of the procedures. During the intervention, the rate of CRBSIs decreased from 11.3 per 1,000 catheter days to zero. The morbidity, mortality, and costs of care for CRBSIs suggest that these interventions may have prevented 43 infections, 8 deaths, 559 additional intensive care unit days, and $1,824,447 in additional costs per year.[3,4]

The CUSP has been so successful that other health care organizations have adopted it as well: In 2003, 77 member hospitals of the Michigan Health and Hospital Association implemented the CUSP in their intensive care units, and within the first three months, the average number of hospital-acquired infections in the intensive care units in the state dropped from 2.7 per 1,000 patients to zero.[5,6] Meanwhile, 68 of the hospitals were able to eliminate VAP for six months or longer.[7]

Because of these results, the CUSP is in the process of implementation through the state hospital associations in 30 more states. A project in conjunction with the United States' Agency for Healthcare Research and Quality, the Health Research Education Trust, the Centers for Disease Control and Prevention, and Johns Hopkins' research group is also under way. E-learning modules on the program are available at http://www.safercare.net.

"The reason for the success of CUSP is that it creates system design within the framework of culture change," Pronovost says. "We have found that if we simply try to transfer the knowledge without changing culture, it doesn't go anywhere. When the culture changes, it allows the system to change as the needs of the organization change, so that old programs can be eliminated or sustained as needed and new programs can be added easily." To realize improvements in clinical outcomes, the culture of safety should be improved, work processes should be standardized and measured, and feedback should be provided on results.

Source: Johns Hopkins Hospital, Baltimore. Used with permission.

Missouri Baptist Medical Center: Implementing Care Bundles

AT-A-GLANCE

About the hospital: Missouri Baptist Medical Center (MBMC) is a 489-bed acute care hospital that is part of BJC HealthCare. The center offers a full continuum of medical and surgical services, as well as adult and pediatric 24-hour emergency services and a nationally recognized cancer-care program.

About the improvement: Over the last few years, MBMC has made significant strides in patient safety improvement through its participation in the Institute for Health Improvement (IHI)'s 5 Million Lives Campaign as well as other efforts. Implementation of the IHI's care bundles in the intensive care unit produced outstanding results.

MBMC already had 24-hour intensive care unit coverage by critical care physicians and a critical care nursing ratio of no more than 1:2. Yet, about three years ago, the organization decided to implement a number of initiatives to further improve patient care and safety while also using staff feedback and ideas to fine-tune those efforts.

The most successful example of this was the implementation of the IHI's care bundle for prevention of VAP. In addition to the four strategies detailed in the bundle, MBMC's critical care staff made their own additions based on their knowledge and experience with ventilated patients in the intensive care unit. These include the following:

- *Get patients moving*. Even when patients have an endotracheal tube and ventilator attached, staff found that having them sit up in the bed or in a chair and move as much as they are able could improve their outcomes. Physical therapists, respiratory therapists, and critical care nurses work together to determine which patients might be able to become more mobile more quickly.
- *Oral care*. This program was implemented before the VAP bundle was introduced. Staff realized that because the mouth often contains high levels of bacteria, cleansing patients' mouth secretions two to three times a day can prevent those bacteria from migrating to the respiratory system. When staff suggested and implemented this strategy, there was a significant drop in VAP.

Because of these strategies, combined with the VAP bundle, MBMC has not had any cases of VAP in its 20-bed intensive care unit in more than three years. (The Centers for Disease Control and Prevention's National Healthcare Safety Network benchmark is 2.7 events per 1,000 patient days on a ventilator.)

John Krettek, M.D., Ph.D., vice president of medical affairs and chief medical officer, believes strongly that the success of MBMC's intensive care unit interventions is largely due to the culture of safety at the organization. "Our staff feel empowered with regard to patient safety. They understand that it's their responsibility to identify opportunities for improvement on a daily basis," Krettek says. "We have monthly meetings of critical care physicians and nurses, quality improvement specialists, physical therapists, and other critical care staff which serve as forums to discuss safety issues and introduce new ideas. When these ideas translate into new programs, our staff know that they are being listened to and their expertise is respected." New initiatives are then monitored monthly by the intensive care unit multidisciplinary team, which conducts rounds every day.

Krettek believes that the culture of safety has also improved voluntary reporting of adverse events. "National statistics say that fewer than 5% of errors are reported for fear of reprisal," Krettek says. "When we have a culture that focuses on improvement rather than blame, we see that more attentiveness to reporting."

Missouri Baptist Medical Center: Implementing Care Bundles (continued)

Other intensive care unit patient safety improvement initiatives include the following:

- *Adverse event identification.* Each month, 20 charts from different units, including the intensive care unit, are reviewed to look for unreported or unidentified adverse events. "We need to find out what we don't know," Krettek explains. "We need to look at these events and ask how we could have identified them earlier."
- *Central line bundle.* Because of implementing the IHI's central line bundle, MBMC has had one case of central line–associated bacteremia in the past year. The National Healthcare Safety Network benchmark is 2.2 cases per 1,000 line days, whereas MBMC's rate is 0.43 cases per 1,000 days.
- *Glycemic control.* Because patients with elevated blood sugar have higher death rates and higher complication rates, controlling blood sugar levels can significantly improve outcomes. To do this, MBMC implemented continuous insulin infusion in the intensive care unit, as well as the post–cardiac surgery unit. Patients' blood sugars are now within acceptable levels 80% to 85% of the time.

Source: Missouri Baptist Medical Center, St. Louis. Used with permission.

Porter Valparaiso Hospital Campus: Transforming the Intensive Care Unit

AT-A-GLANCE

About the hospital: Porter Valparaiso Hospital Campus is the acute-care hub for Porter Health, a network of health care facilities in northwestern Indiana. The 333-bed community hospital provides a continuum of specialized services, including surgery, cardiology, and neonatal intensive care.

About the improvement: Porter Valparaiso implemented a program designed to promote utilization of evidence-based practices and to encourage caregivers to identify and enact other practices that they have seen improve patient safety.

In the fall of 2003 Porter Valparaiso Hospital Campus implemented its Transformation of the Intensive Care Unit (TICU) initiative in an effort to improve patient safety in its intensive care unit. The focus of the program is to encourage members of the patient care team to use specific evidence-based practices that have been associated with improved patient outcomes.

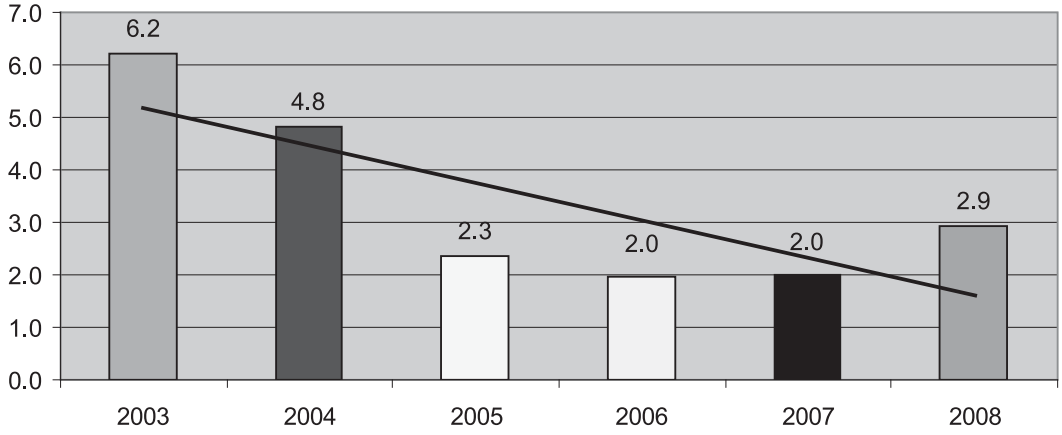
During the process of implementing the various elements of the TICU, the hospital has significantly improved patient safety in its intensive care unit and has learned valuable lessons along the way.

Start Small

To make it easier for caregivers to incorporate the new processes into their existing patient care activities, Porter Valparaiso's leadership decided to roll out changes incrementally. This plan has also allowed staff to see the positive outcomes produced by each change.

They began with the elevation portion of the ventilator care bundle, designed to help prevent VAP. This requires that patients on ventilators have the head of their beds elevated by at least 30 degrees to keep stomach acids from entering the lungs. The critical care nurses quickly came into compliance with this strategy, and the other elements of the bundle were implemented one by one afterward. As a result, the number of VAP cases in the intensive care unit went from 6.2 per 1,000 in 2003 to 2.9 per 1,000 in 2008 (*see* Figure 6-1).

Figure 6-1: Ventilator-Associated Pneumonia Cases in Porter Valparaiso Hospital Campus Intensive Care Unit



Source: Porter Valparaiso Hospital, Valparaiso, IN. Used with permission.

Porter Valparaiso Hospital Campus: Transforming the Intensive Care Unit (continued)

Be Flexible

"We learned that instead of simply following the protocols provided by another organization, we needed to listen to our in-house expert caregivers to see if any alterations were necessary to meet the needs of our patients and staff," says Terrie Fontenot, R.N., C.C.R.N., critical care director. "The toughest one was the insulin protocol, which is meant to control patients' blood sugar levels. We went through nine revisions until we had a protocol that the nurses were happy with in terms of how well it worked for the patients." Currently, Fontenot says, 80% to 85% of intensive care unit patients' blood glucose is maintained within the desired range.

In addition, the intensive care unit multidisciplinary team, which includes critical care physicians, continues to meet biweekly to discuss clinical practices and patient outcomes so that changes can be made as necessary. "Once a protocol is in place, it can't be set in stone. You have to keep reviewing it to make sure that it's producing good outcomes for patients," Fontenot says.

Think Outside the Unit

When intensive care unit staff took on the task of reducing central line–associated bloodstream infections (CLABSIs), they used evidence-based strategies, such as creating a line cart that included all of the necessary supplies for insertion of a central line, as well as a checklist to help nurses ensure that all appropriate infection prevention and control steps were followed. As a result, CLABSIs were reduced from 2.5 per 1,000 in 2003 to 0.6 per 1,000 in 2004.

However, peripherally inserted central catheter (PICC) lines were not included in that data, because those lines were not inserted in the intensive care unit. In 2005 Porter's leadership decided to include PICC lines in their statistics and found that the infection rate soared above previous levels to 2.8 per 1,000. Therefore, the protocols that had been so successful with central lines in the intensive care unit were provided to staff responsible for insertion of PICC lines—primarily radiologists and other caregivers in the radiology unit.

When those protocols were also being used for PICC lines, the bloodstream infection rate dropped once again. In 2008 it was down to 1.0 per 1,000 for all intensive care unit lines (*see* Figure 6-2, page 124); in fact, one unit had no bloodstream infections in 2008.

Communicate Results

To let nurses and other caregivers know how their patient safety efforts are truly affecting patients, Porter Valparaiso posts monthly, quarterly, and year-to-date results showing the rates of VAP, CLABSIs, methicillin-resistant *Staphylococcus aureus*, sepsis, and pressure ulcers for intensive care unit patients. Alongside the data are the rates of compliance with the evidence-based protocols for treatment and prevention of those conditions, allowing staff to see how increased rates of compliance affect patient safety.

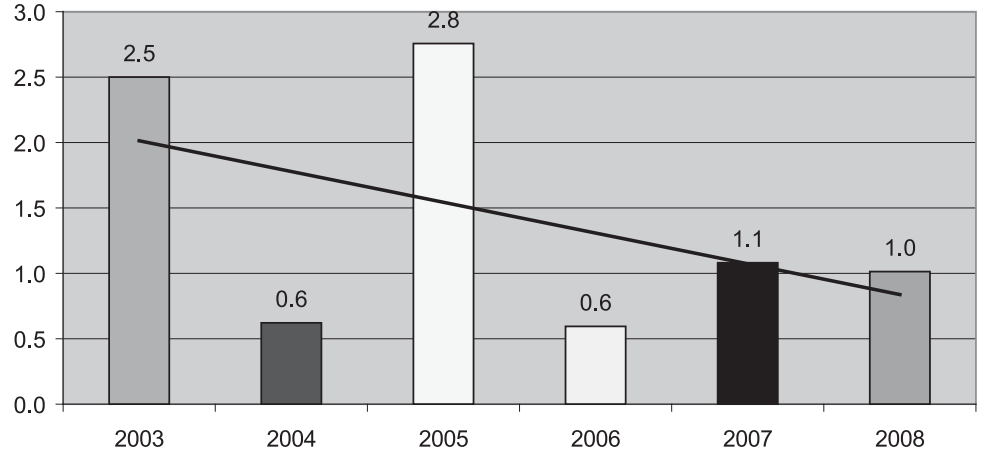
"We haven't had any major compliance problems," Fontenot says, "but using these protocols does sometimes require extra work on the part of nurses and other caregivers. When they see how their work has literally saved patient lives, they know that it's worth it."

These patient safety initiatives have also resulted in a reduced length of stay for intensive care unit patients, from 3.2 in 2005 to 2.9 in 2008 (*see* Figure 6-3, page 124).

(continued on page 124)

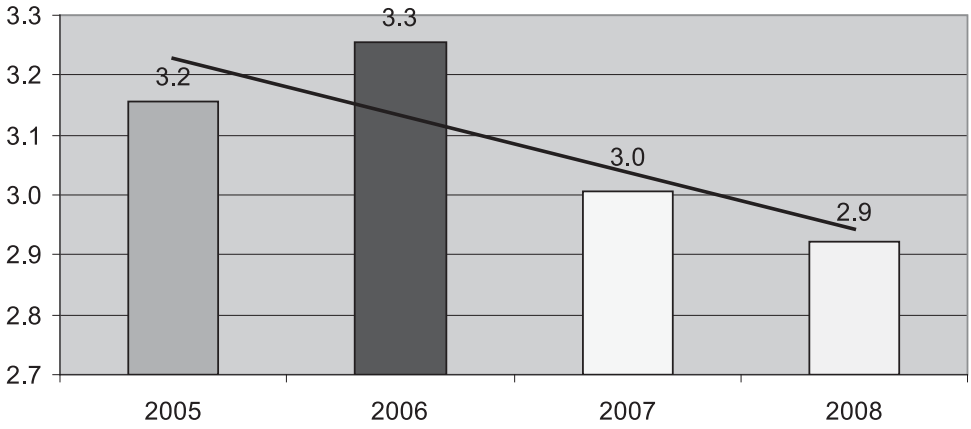
Porter Valparaiso Hospital Campus: Transforming the Intensive Care Unit (continued)

Figure 6-2: Bloodstream Infection Rate at Porter Valparaiso Hospital Campus



Source: Porter Valparaiso Hospital, Valparaiso, IN. Used with permission.

Figure 6-3: Length of Stay in the Intensive Care Unit at Porter Valparaiso Hospital



Source: Porter Valparaiso Hospital, Valparaiso, IN. Used with permission.

Thailand's Ministry of Public Health: Reducing Ventilator-Associated Pneumonia Project

AT-A-GLANCE

About the region: In 2000 Thailand's Ministry of Public Health requested that all secondary and tertiary hospitals undertake continuous quality improvement efforts to improve patient care. Despite improvements in many areas, VAP rates remained high.

About the improvement: Eighteen hospitals in the country participated in a collaborative project in an effort to prevent VAP. Initiatives included education for intensive care staff on VAP care bundles and other prevention strategies.

A number of interventions have been found to be effective at reducing VAP in developed countries.[8–10] However, such experience is still lacking in less developed countries where VAP is also common.[11]

In Thailand, in 2000, all secondary and tertiary care hospitals under the Ministry of Public Health were requested to apply continuous quality improvement (CQI) to improve their patient care practices. Although CQI successfully prevented some health care problems, the VAP incidence rate was still high.[12] Accordingly, the IHI's Breakthrough Series for collaborative improvement was adapted to enhance the strength of the interventions.

Eighteen secondary and tertiary care hospitals (17 government hospitals and 1 private hospital) were invited to participate in the project. All of these hospitals had an infection prevention and control committee, at least one infection prevention and control nurse (ICN) per 250 hospital beds, and an effective nosocomial infection surveillance system (efficiency of surveillance > 70%). The number of hospital beds ranged from 150 to 1,000. In addition, the intensive care unit head nurse, an ICN, and a physician team leader all participated in the project.

At each hospital, the local CQI-VAP team consisted of a physician (team leader), an ICN, an intensive care unit staff member, and other team members (for example, physiotherapist, nutritionist, pharmacist, chief of central sterile supply department). The hospital's directors signed project approval, and support of the collaboration was required for participation. The intensive care units with high VAP rates were chosen for the study—nine medical, four surgical, seven medical/surgical, and two neurological intensive care units, each with 8 to 10 beds.

Collaborative Interventions

The project entailed four face-to-face meetings for each hospital team—two national workshops conducted for all 18 hospitals and two regional workshops, each attended by 5 to 8 hospitals in each region. Four team members from each hospital participated in the workshops as follows:

- At the first national workshop, the collaborative method and the project interventions were introduced. CQI was reviewed; successful CQI projects were reviewed (for example, improvement of surveillance system, promotion of hand hygiene); and translation of the U.S. Centers for Disease Control and Prevention definition criteria of pneumonia and the VAP surveillance system and forms for VAP data collection, guidelines for prevention of nosocomial pneumonia, and VAP prevention gap analysis were all presented. After the first national workshop, a formal CQI-VAP team was established at each hospital.
- During the regional workshops, teams reported their interventions, their progress, changes in their practices, and other aspects; exchanged knowledge and experiences; and discussed different strategies

(continued on page 126)

Thailand's Ministry of Public Health: Reducing Ventilator-Associated Pneumonia Project (continued)

and solutions.

- At the final national workshop, team representatives presented improvement activities, such as training of respiratory care ward nurses, expansion of the collaborative approach to other intensive care units, and development of effective systems for sending and interpreting chest x-rays and for provision of oral care for mechanically ventilated patients. A brainstorming session was conducted to determine the effective VAP–prevention interventions and the appropriate collaborative model for hospitals in Thailand.

Education on VAP prevention, including the Centers for Disease Control and Prevention guideline on nosocomial pneumonia prevention and the IHI ventilator bundle, was conducted for intensive care unit staff and all relevant personnel. Hand hygiene and alcohol-based hand rubs were promoted. Oral care practices and management of respiratory care equipment were improved.

Results

During the project, the pooled VAP rate reported from 18 hospitals was 8.8 per 1,000 ventilator days. The VAP rate decreased from 13.3 to 8.3 per 1,000 ventilator days. The steepest decrease in rate was detected just after the first regional workshops (from 13.3 to 8.0), followed by a slow increase (to 9.9) at the sixth month and a slight decrease (to 6.6) after the second regional workshops.

VAP surveillance during this project revealed a gradual reduction of VAP rates. The project's relative overall success reflects a well-organized program, support from hospital directors, proven CQI methods and clinical interventions, enthusiastic teams prepared to make time for the work, availability of expert support from the collaborative organizers, and timely data showing the results of teams' actions. Of the respondents to the questionnaires, 71% raised the issue of the difficulty of conducting team meetings because of their other responsibilities and respective work shifts. The team leaders, most of whom were also chairpersons of the ICC who had to work in both inpatient and outpatient departments, were not always available for meetings, but they nonetheless monitored the progress of the projects, provided advice, and encouraged their teams as appropriate.

The project, as detected from the interviews and from the workshops, resulted in three important changes in care processes. First, staff in all units that provided care for mechanically ventilated patients reported more cooperation within the multidisciplinary teams and overall improved teamwork. Second, patient care improved. Nurses gained more knowledge and confidence as they complied with the project's VAP guidelines. Third, the VAP surveillance system became more reliable and timely. Physicians helped diagnose VAP, and the ICNs routinely assessed the quality of VAP–surveillance data collected by intensive care unit staff.

Lessons Learned

Lessons learned from this project are as follows:

- Collaborative projects should concentrate on problems perceived as serious and for which generalized, effective, and evidence-based interventions already exist. This will start the motivation, which will be maintained by the implementable intervention and the visible results. The experiences gained can then be applied to solve other problems.
- Multidisciplinary teams should include representatives from all relevant departments who are committed to the project and who have good team skills.
- Heads of all relevant departments should partici-

Thailand's Ministry of Public Health: Reducing Ventilator-Associated Pneumonia Project (continued)

pate in the first workshop to obtain information on the project's objectives, methodology, and planned activities.

- Attention needs to be given at workshops to create a friendly atmosphere that encourages participants to share their ideas and opinions widely and to facilitate networking after the project's end.
- To promote discussion and experience sharing at the workshops and enable hospitals to solve problems they might be embarrassed to ask about, the organizer should raise problems or frequently asked questions.
- Beyond the team's participation in the workshops, further supervision and monitoring are needed to ensure that the team follows up, as necessary, at the organization.
- Continuing staff training and education, monitoring, feedback, and evaluation are necessary for sustaining the benefits of a multidisciplinary effort.
- The ICNs can play an important role in coordinating and encouraging collaboration between all relevant departments. They can disseminate useful information, guide intensive care unit staff in conducting effective VAP surveillance and making use of VAP data, and spread the collaborative concept and VAP–prevention activities to other units in the hospital.

Severance Hospital: Preventing Unplanned Extubation of Tubing or Central Lines

AT-A-GLANCE

About the hospital: Severance Hospital is a 3,700-bed facility and part of the Yonsei University Health System. It is the oldest Western-style hospital in South Korea, and it cares for approximately one million inpatients and three million outpatients annually.

About the improvement: Intensive care unit patients often have numerous invasive tubes and lines inserted, and unplanned removal of those lines is a serious patient safety problem. Severance staff undertook an initiative to reduce the risk of unplanned extubation.

Most of the patients in the intensive care unit have various invasive tubes and lines that need to be maintained to ensure that the patient continues to receive vital medications and other treatments. However, these tubes and lines can sometimes come out unexpectedly, creating a significant patient safety risk. Therefore, as part of an ongoing intensive care unit patient safety initiative, Severance Hospital decided to focus on this safety concern.

Severance formed a team of six staff nurses, including the nurse manager, and two nursing assis-

Severance Hospital: Preventing Unplanned Extubation of Tubing or Central Lines (continued)

tants to analyze the issue. The team considered the risk factors for unplanned removal of tubes and lines and developed procedures to address them.

Patient's Mental and Consciousness Status

Patients who are under stress, in pain, undersedated, or in an altered mental state are more likely to attempt to remove tubes and lines. Many intensive care unit patients are restrained for these reasons, but restraint alone is not necessarily effective. Therefore, the team's protocols state the following:

1. Guidelines are provided to safely maintain endotracheal tube:
   - Restraints should be applied when the Ramsay score is lower than 4.
   - Pain control and sedation should be effectively managed.
   - Patient's alertness should be checked every hour.
   - The status of restraints should be checked after changing the patient's position and after treatments.
   - When the nurse needs to leave the patient's bedside, he or she should report the patient's condition to another nurse who will have oversight of the patient until the nurse returns.

2. The guidelines are provided to safely manage invasive lines to help prevent accidental dislodging. This includes the following processes:
   - When changing the patient's position, a nurse should be on the same side as the line insertion to ensure its safety.

   - A grip-lock should be used to secure the line at the midway point when applying a catheter dressing.

(continued on page 130)

Severance Hospital: Preventing Unplanned Extubation of Tubing or Central Lines (continued)

- When a line is in a location that could be reached by the patient, such as a femoral line, the patient's hands should be restrained.

- Large lines, such as the femoral line, should be exposed and managed.

- The status and functionality of central lines and dressings must be checked and documented on every shift.

3. Monthly reminders and safety updates are posted for staff to review the guidelines and see how the patient safety rates are improving.

Staff education on the new protocols for securing tubes and central lines began in August 2008. At that time, the removal rate for some types of tubes and lines was as high as 12% to 14%. In the following four months, the rate of unplanned removal was 4% or lower for all tubes and central lines—many of which have had a removal rate of 0%.

Other patient safety strategies that Severance has recently implemented in its intensive care units include implementation of the VAP bundle, which has reduced the incidence of VAP in all of its intensive care units. In addition, to ensure that staff remember hand hygiene protocols in the neonatal intensive care unit, the hospital installed hand gel dispensers that are connected to the doors to the unit; the doors open only if someone dispenses the hand gel. No conclusive data are yet available on this initiative, but given the role of hand hygiene in the prevention of the spread of infection, the hospital expects that this strategy will also result in patient safety improvements.

Severance Hospital: Preventing Unplanned Extubation of Tubing or Central Lines (continued)

Application of restraints		- Make sure there is no circulatory problems by checking pulse, skin color, temperature, and sensation around the restraint. - Restraint must be easily removable by using the knotting technique that makes it easy to untie during the emergency. - Restraint must be safe for the patient. Select the restraint that will not cause any injury.
Securing Central line		-Secure the line on midway point by using the grip lock so that the line does not get pulled. - Prevent disconnection or pulling of line by checking frequently. - Be extra careful of lines during position change and transfer.
Management of Femoral site line		- When there is an invasive line on femoral site, the site must be exposed for monitoring. - When a line is inserted into the large vessel such as Hemo-Cath, the site must be visual for monitoring.

Bulletin posted for education

"Let's secure central lines"

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INDEX