



Representing approximately 30 percent of acute care costs or \$180 billion annually, intensive care is one of the largest and most expensive components of U.S. healthcare. More than five million people are admitted to ICUs annually, and studies suggest that nearly every one of those patients admitted to an ICU suffers a potentially life-threatening adverse event. Healthcare leaders should ask themselves: How often do we harm patients? How often do patients receive the interventions they should receive? How well have we improved our culture of safety?

# Improving ICU Care: It Takes a Team

by Peter Pronovost, M.D., Ph.D., and Chris Goeschel, R.N.

In late 2003, patient safety experts at The Johns Hopkins University partnered with the Michigan Health & Hospital Association Keystone Center for Patient Safety & Quality on *Keystone ICU*, a two-year project involving 72 hospitals. The project focuses on implementing field-tested best practices to reduce the risk of medical errors and enhance patient protections in the ICU.

Thus far, demonstrated impacts of *Keystone ICU* include a strengthened sense of teamwork among executives and physicians all the way to the bedside, better outcomes for patients, and enhanced communication among caregivers. Taken together, these translate into an improved culture of safety. The best part is, the model and interventions lend themselves to replication by those with the will and the courage to embrace major change on behalf of safer ICU care. So, how do you get there?

## A Five-Step Approach

Each participating organization has a team assigned to the project, composed of—at a minimum—a physician leader, nurse leader, staff nurse,

pharmacist, and senior executive.

The teamwork is focused on patients, evidence, and a dedication to improvement based on collecting meaningful data and sharing project-related successes and challenges.

Our experience suggests that there is unique potential for successful patient safety initiatives where organizers bring clinical experts together with healthcare providers that have a shared locus of affiliation—for example, a state hospital association, a safety coalition, or a large health system. The affiliating organization serves as the neutral facilitator of the learning process. A willingness to excuse lack of performance because of variation in group demographics seems less likely to occur if participants are aligned in ways beyond the collaborative itself. Indeed, we have found that the teams bring each other along.

Teams are improving ICU culture, learning from errors, ensuring that patients are receiving evidence-based intervention, and reducing harm through a framework that focuses on five structured interventions and the use of standardized data collection

tools. The teams will also monitor ICU mortality and length of stay. Two of the interventions focus on staff education, training, and improved team communication. The three subsequent activities are centered on specific clinical targets. The five areas of concentration are:

1. Develop a comprehensive patient safety program that includes a Web-based error-reporting system.
2. Implement the use of specialists who coordinate ICU care and a checklist approach to daily rounds that encourages communication among multiple caregivers.
3. Attempt to eliminate bloodstream infections.
4. Attempt to eliminate ventilator-associated pneumonia by ensuring patients on breathing machines receive evidence-based intervention.
5. Ensure patients with severe infections receive evidence-based intervention.

As the first step, or intervention, patient safety programs were developed. Each of the other four interventions are being added one at a

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time, every three to six months (see page 18).

The process employed to keep teams moving through the hard work of transformational change is built on continuous nurturing of valued relationships. The hospital teams, Keystone Center staff, and Hopkins safety specialists meet face-to-face at least twice a year. Keystone Center and Hopkins host monthly conference calls that are rich in content and provide ample opportunity for Q&A. Keystone Center also sponsors conference calls at least twice a month that are focused on “coaching” via shared experiences. A participant Web site contains tools, reference documents, and blinded data, and a bulletin board is used for hospital-to-hospital conversations. An electronic newsletter every other month shares stories “from the trenches,” brings a message from the project leaders, and answers frequently asked questions. Keystone Center project staff visit participating sites to meet with teams and see *Keystone ICU* in action. Keystone Center and Hopkins project leaders send written *Keystone ICU* updates and requests for assistance directly to hospital CEOs and medical staff leaders based on identified need. In essence, the project is treated like any other critical strategic initiative.

## The Executive’s Role on the Team

We recognized that senior leader support is essential for improving

quality of care. That’s why each team was assigned a senior leader who agreed to “adopt the unit.” The principal investigator and project director send CEOs bimonthly letters asking them to do specific interventions. These interventions are framed by literature review and review of the work of the *Keystone ICU* teams, including perceived barriers to success. The letters delineate specific executive activities and a suggested time frame for implementation and response.

We believe that executives are absolutely committed to improving safety. Asking executives to address and report back on a specific issue within an identified time frame—while providing them with the rationale for the request and suggesting mechanisms to address the issue—demonstrates respect for demands on executive time but does not minimize their accountability for quality and safety. The ICU project leader at the unit level is copied on the letter and asked to coordinate with the executive on completion of the activity.

This method of engaging executives and their team leaders using targeted letters was initially introduced to expedite the use of chlorhexidine, a solution used to clean the skin during insertion of central venous catheters (see page 20). The method was viewed positively by both the executives and the teams. Clear direction, backed by clinical evi-

dence and communication to each executive leader and ICU team leader, resulted in a rapid transformation of the standard of care. Impressed by the outcome when senior leaders and ICU leaders were contacted to address the chlorhexidine challenge, we responded in a similar fashion to evidence revealing team confusion about how to **maintain** active engagement of their executive in *Keystone ICU*. A second targeted letter was sent requesting that CEOs meet monthly with their ICU team, review clinical data on a regular basis, invite the ICU team to present *Keystone ICU* at a board or leadership meeting, and write a story about the team’s extraordinary commitment and efforts in their internal newsletter. Each of these requests has been similarly successful.

Beyond tangible results, on project conference calls teams are reporting a new sense of support from executive leadership. Executives assert improved communication with ICU physicians, frontline staff, and managers, and a better appreciation for work accomplished at the bedside. Many units report a significant improvement in ICU culture and safety attitudes. *Keystone ICU* executives can say that ICU staff perceptions of patient safety are better today than when the project began.

The executives uniformly report that this program has been informative and rewarding. Nearly all report

# The Interventions

*Keystone ICU* teams begin by implementing the Comprehensive Unit-based Safety Program and establishing expectations for improved communication and staffing in the ICU. These interventions provide a framework to improve culture and learn from errors. Next, the teams work on interventions to decrease catheter-related bloodstream infections, ventilator-associated pneumonias, and mortality in severe sepsis. These interventions are based on a patient safety program developed by patient safety leaders at Johns Hopkins, which demonstrated dramatic improvements in quality, safety, and staff satisfaction. As a result of the interventions, patient outcomes improved and ICU length of stay decreased. This freed up bed capacity and allowed increased admissions to the ICU.

## 1. Implement Comprehensive Unit-Based Safety Program.

**Goal:** Implement and evaluate the impact of the CUSP.

**Hypothesis:** The CUSP will help teams learn from mistakes and improve the safety climate.

### Implementation

1. Evaluate culture of safety.
  2. Educate on the sciences of safety.
  3. Identify preventable errors. Determine how the next patient might be harmed.
  4. Assign a senior executive to adopt team.
  5. Learn from one preventable error per month.
  6. Re-evaluate culture.
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2. Implement Daily Goals Sheet and Other Communication Tools.

**Goal:** Implement and evaluate the effect of an intervention to improve communication and staffing in ICUs.

**Hypothesis:** The use of targeted interventions will lead to significant improvements in ICU mortality and length of stay.

### Implementation

1. Have intensivists\* lead interdisciplinary rounds.
2. Use Daily Goals Sheets with clear and explicit expectations to guide care.
3. Implement teamwork training and communication strategies.

## 3. Eliminate Bloodstream Infections (BSI) through the BSI Bundle.

**Goal:** Implement and evaluate the effect of an intervention to reduce or eliminate catheter-related bloodstream infections in ICUs.

**Hypothesis:** With this intervention, catheter-related bloodstream infections can be reduced or eliminated.

### Implementation

1. Educate staff on bloodstream infection control practices.
2. Create a central-line cart that contains all equipment needed to comply with evidence-based guidelines for central-line insertion.
3. Institute a policy that requires nurses to assist in central-line insertion.
4. Require use of a checklist to ensure compliance with evidence-based guidelines for central-line insertion.
5. Provide regular feedback to staff on infection rates.

## 4. Eliminate Ventilator-Associated Pneumonia through the Vent Bundle.

**Goal:** Implement and evaluate the effect of an intervention in improving the care of ventilated patients in ICUs.

**Hypothesis:** With this intervention, ventilator-associated pneumonia, duration of mechanical ventilation, and length of ICU stay will be reduced or eliminated.

### Implementation

1. Elevate the head of the bed.
  2. Provide peptic ulcer and venous thrombosis prophylaxis to ventilated patients.
  3. Appropriately sedate ventilated patients.
  4. Test daily if patients can be extubated.
  5. Use continuous subglottic suctioning.
  6. Implement mouth care and oral decontamination.
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5. Reduce Mortality in Severe Sepsis with the Sepsis Bundle.

**Goal:** Implement and evaluate an intervention to reduce mortality in patients with severe sepsis.

**Hypothesis:** With this focused intervention, mortality can be reduced in patients with severe sepsis and septic shock.

### Implementation

1. Ensure rapid initiation of appropriate antibiotics.
2. Ensure use of steroids in patients with septic shock.
3. Provide activated protein C that meets hospital-specific guidelines.
4. Remove unnecessary antibiotics at day four.

\* In cases where intensivists are not available, have a physician champion or unit director lead interdisciplinary rounds.

—PP/CG

# The Chlorhexidine Story

Evidence suggests that using chlorhexidine to clean the skin prior to placing a central venous catheter can cut the risk of catheter-related bloodstream infections in half with minimal, if any, increase in costs. Yet it is infrequently used.

This defect, like all defects, involves system properties. The capacity to reduce catheter-related bloodstream infections by adhering to evidence-based practice is predicated by administrative and clinical *system* parameters. Using chlorhexidine hinges on the product being available in the hospital and in central-line kits. Availability is contingent upon procuring the product, an administrative function and also a system property.

Procurement rooted in evidence-based evaluation, rather than merely front-end costs or habit, describes an administrative system structured to minimize defects. Likewise, ICU protocols that mandate adherence to standardized, evidence-based techniques (such as sterilizing with chlorhexidine before line insertion, rather than accepting personal provider preference) represents a clinical system designed to reduce defects. We speculated that a focused and coordinated awareness campaign about chlorhexidine use among a group of motivated clinical and administrative leaders could improve system properties and quickly result in a tipping point for the availability and use of chlorhexidine for central-line insertions in *Keystone ICU* hospitals. The potential impact: a dramatic

decrease in bloodstream infection rates from central-line placement.

To accomplish this, we targeted ICU clinical leaders participating in the project and hospital chief executive officers. During a project meeting with participating teams, we presented the evidence regarding chlorhexidine. Teams were then asked to work with their supply purchasers and infection control staff to ensure that chlorhexidine is included in their central-line kits, ICUs, and other clinical units for skin sterilization. The target implementation date was explicitly stated as “within six weeks.” Hospital CEOs were sent a letter requesting the same chlorhexidine intervention in the six-week time frame.

The results have been astounding. Twenty-eight hospitals (39 percent) had no chlorhexidine in their facility at the time of our request, yet 18 (64 percent) of these hospitals were able to stock it in their hospital, ICU, and central-line kits within the targeted time frame. The remaining facilities had mixed availability of the product at the time the request was made. Their efforts involved rapid expansion of availability and use. Within six weeks, 56 hospitals (78 percent) reported stocking chlorhexidine in their hospital, 46 hospitals (64 percent) had it



available in their ICUs, and 43 hospitals (60 percent) had chlorhexidine in their central line insertion kits.

In addition, every hospital CEO except one committed to meeting all three expectations and demonstrated that they had begun the conversion process within six weeks. One small facility with a limited number of central-line insertions each year could not justify the line kit expense. However, it now stocks chlorhexidine, wrote a central-line insertion protocol that requires use of chlorhexidine for skin cleansing, and monitors adherence to the new protocol with each central-line insertion. Teams continue to report when they have completed phasing in chlorhexidine. Teams also report that the chlorhexidine central-line protocol is spreading to other high-intensity settings where central lines are placed, such as surgery and emergency departments. *Keystone ICU* executives can say that this system defect has been eliminated in their ICUs and is being eliminated throughout their hospitals.

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identifying and mitigating hazards in the ICU—generally with no or low-cost solutions. The monthly meeting with teams allows senior leaders to get closer to their customers, and surface and mitigate system problems that would otherwise have been invisible. Our experience with *Keystone ICU* demonstrates that senior leaders are uniformly aware of the patient safety problem and are generally committed to improving safety yet nearly universally lack clarity on exactly what they can do to improve patient safety. In *Keystone ICU*, we provided clarity; senior leaders responded.

## The Results

After six months of data collection, 22 Michigan ICUs dropped catheter-related bloodstream infection rates to zero. Aggregate rates plummeted from above the 25th National Nosocomial Infection Surveillance System percentile, to below the 10th percentile. Ventilator-associated pneumonias declined in equally dramatic fashion. Re-measure of the culture won't occur until one year into the project, but anecdotally teams are reporting an amazing change in the work environment. The level of participation on conference calls and attendance at workshops suggests the enthusiasm is consistent and genuine. Medical staff champions and hospital administrators are equally enthusiastic about their shared efforts to strategically address patient safety and their shared commitment to the principle that harm is untenable.

These leaders are beginning to develop answers to questions: How often do we harm patients? How often do patients receive the interventions they should receive? How often do we learn from defects? How well have we improved our culture of safety? They are putting in place systems so that they can confidently answer these questions: Is my hospital safer today than it was yesterday? How do I know?

The science of safety is evolving, and the need for clear and feasible evidence-based interventions that improve patient outcomes deserves national attention and additional research funding. The path toward a safer future, however, is before us now. We believe the five interventions developed at Johns Hopkins and implemented now in more than 100 ICUs as part of *Keystone ICU* allow any hospital with an ICU to join us on that path.

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