A3/B3: Improvement in the Intensive Care Unit

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Session Objectives

• Structure a safety program for the ICU
• Use measurement effectively to drive change in the ICU
• Explain how and why to use bundles most effectively for ICU patients
Quality Improvement in the ICU
What is Quality and how do you improve it?
The IOM’s Six Aims

- **Safe** – no needless deaths
- **Effective** – no needless pain or suffering
- **Patient-Centered** – no helplessness in those served or serving
- **Timely** – no unwanted waiting
- **Efficient** – no waste
- **Equitable** – for all

“Between the health care we have and the healthcare we should have lies not a gap but a chasm”
Number of encounters for each fatality

HAZARDOUS
(>1/1000)

Health Care

REGULATED

Driving

ULTRA-SAFE
(<1/100K)

Scheduled Airlines

European Railroads

Nuclear Power

Total lives lost per year

Number of encounters for each fatality
“Quality Improvement”

The combined and unceasing efforts of everyone – health care professionals, patients and their families, researchers, payers, planners, administrators, educators – to make changes that will lead to

better patient outcome, better system performance, and better professional development.

Aim: Reduce Avoidable Medical Harm by 50% by May 2015

Primary Drivers

- Implement evidence-based clinical changes
- Establish Clinical Stewardship & Effective Leadership
- Develop Continuous Measurement & Feedback Systems
- Build Improvement Capability & Expert Coaching
- Manage the Day-to-Day Effort

Secondary Drivers

- Reduce Hospital Acquired Infections
- Reduce Medication Errors
- Reduce VTE
- Reduce Errors in Maternity Care
- Improve Perioperative Care
- Involvement of Clinical Champions & Physician Leaders
- Engagement & Alignment of Governance Structures
- Visible on Senior Leaders Agenda
- Alignment to National Health Strategy; Harmonized Measures
- Effective Data Collection System established
- Transparency of Data Reporting
- Effective data feedback loops to front-line
- Front-line Care Givers
- Improvement Experts; CCITP; Improvement Advisors; PSOs
- Everyone at HMC; Open School
- Faculty experts in Improvement; Flow; Safety
- Program Offices Infrastructure in place
- Regular Campaign Workflow and Process
- Microsystems

Evidence-based changes; Support from clinical societies; Measurement Improves Flow;
Adverse Event Rate

![Graph showing adverse event rate with values 24.53 and 20.43 highlighted]
Med. Rec. Improvement Across the Whole Region

Patients with no medicines reconciliation

50% reduction!!
VTE risk assessment on admission
VTE Risk Assessment

CC15: Patients with completed VTE risk assessment on admission- ITU
Region-VTE Prophylaxis

VTE prophylaxis

- 82.47
- 94.92
Impact of VTE prophylaxis

DVT/PE ratio of discharges

Ratio of Discharges with DVT/PE per 1000 discharges

Special Cause Flag

Gloucestershire Hospitals NHS Foundation Trust data
Patientsikkert Sygehus
Critical Care Driver Diagram and Change Package Step 1

**Outcome**
- Improve Critical Care Outcomes by reducing mortality, infections and other adverse events.
  - Central line infections are eliminated or 300 days between
  - Ventilator associated pneumonias are eliminated or 300 days between
  - Reduce hospital acquired pressure ulcers by at least 50%

**Primary Drivers**
- Provide appropriate, reliable and timely care to critically ill patients using evidence-based therapies
- Reliable infrastructure, care planning, communication and collaboration of a multi disciplinary team

**Secondary Drivers**
- Prevent healthcare associated infections from ventilators, central lines, peripheral lines, and bladder catheters.
- Proper sepsis recognition and treatment
- Reduce the incidence of hospital acquired pressure ulcers
- Prevent healthcare associated infections and cross contamination
- Institute unit based safety briefings
- Standardize clinical communications and handoffs
Improving Critical Care Outcomes

Decrease:
- Mortality
- Infections
- Complications
- Cost

Appropriate, reliable and timely care using evidence based therapies

Integrate patient and family into care

Develop an infrastructure that promotes quality care

Effective and collaborative multidisciplinary team

Reduce VAP

Reduce CVC complications

Optimal glucose control

VTE prophylaxis

Reduce infections

Involve patient and family in daily goal setting

“Promote open communication amongst team and family

Staff with improvement skills

Leadership for reliable care

Improve ICU throughput

Competent staff

Communication

Multidisciplinary decisions

Patient and family involvement

SW/IHI Patient Safety and Quality Programme
Improving safety and quality in ICU: How do we do it?

- Measurement – understand where we are
- Improvement
- Building reliable processes
- Reducing variation
- Change the culture
- Teamwork and communication
Construct (simple) practical solutions

- Aims – what exactly do you want to do
- Measurement
- What are the good improvement ideas
- Test ideas before implementing changes

**Model for improvement**

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in the improvements that we seek?

VAP Rate
Compliance with central line bundle

![Compliance with Central Line Bundle](image-url)
Days Between VAP/VAP Rate

Days between ventilator acquired pneumonia

- Plymouth Hospitals NHS Trust
  CC08: Days Between a Ventilator Acquired Pneumonia - Penrose/Pencarrow
  293 days since last event (today 3/1/2012)
  Goal = 300.00

- Royal Devon and Exeter NHS Foundation Trust
  CC08: Days Between a Ventilator Acquired Pneumonia - Series 1
  475 days since last event (today 3/1/2012)

- North Bristol NHS Trust (SPI-2)
  CC07: Ventilator Acquired Pneumonia Rate - Combined data CC07

In collaboration with Institute for Healthcare Improvement
Central line infection rate
(per thousand line days)

March 2011: zero central line infections in whole country
Getting to Zero!

Feb 2011 no central line infections in the whole region for 3 months

Scotland took 3 years … the SW took 16 months!!
Successes – SW England ICU Collaborative

• Measurement – never done before
• Variation reduced
• Teamwork and Sharing
• Many more people involved in team work
• New teams built
• New champions and stars developed
  – Staff engagement and development
The Change Curve

1) Shock & immobilisation
2) Denial & minimisation
3) Depression & incompetence
4) Acceptance & letting go
5) Testing
6) Search for meaning
7) Integration

Self-esteem and Performance

Time
Definition of a Bundle

• A small set of evidence-based interventions for a defined patient segment / population and care setting that, when implemented together, will result in significantly better outcomes than when implemented individually.
Bundle Design Guidelines

• 3 – 5 interventions, with strong clinical agreement
• Each element is relatively independent
• Used in a defined population in one location
• Multidisciplinary team develop the bundle
• Descriptive rather than prescriptive
• Compliance is measured using all or none measurement with a goal of 95%
• Focus on organisational aspects of performing the intervention rather than how well the intervention is performed
Why do bundles produce better outcomes

• Change the assumption that evidence-based care is being delivered reliably
• Promote awareness that the entire care team must work together in a system designed for reliability
• Promote the use of improvement methods to redesign care processes
Evidence base to Delivery Base

- Evidence Base
  - RCT is gold standard
  - Excellence=knowledge
  - Context not an issue
  - One patient at a time
  - Individual based
  - Use drugs X and Y

- Delivery Base
  - Delivery and Reliability
  - Excellence in application
  - Context is key
  - Patients and Populations
  - System based
  - Do X and Y reliably

Adapted from Lachman, Leitch, Mountford and Dean
Construct (simple) practical solutions

Model for improvement

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in the improvements that we seek?

Act

Plan

Study

Do

Aims – what exactly do you want to do

Measurement

What are the good improvement ideas

Test ideas before implementing changes

The Sequence: Step 1

We decide to start by working on the **Primary Driver**: Provide appropriate, reliable and timely care to critically ill patients using evidence-based therapies.

We then decide to work on the **Secondary Driver**: Reduce Complications from CVCs.
Primary Driver: Provide appropriate, reliable and timely care to critically ill patients using evidence-based therapies in Hospital X, Pilot Site Y, by May 2014

<table>
<thead>
<tr>
<th>Secondary Drivers</th>
<th>Clinical Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications from Ventilators</td>
<td>Change Concept 1</td>
</tr>
<tr>
<td>Complications from CVCs</td>
<td>Change Concept 1</td>
</tr>
<tr>
<td>Optimal Glucose Control</td>
<td>Change Concept 1</td>
</tr>
<tr>
<td>Hospital Acquired Infections</td>
<td>Change Concept 1</td>
</tr>
<tr>
<td>Sepsis Recognition and Treatment</td>
<td>Change Concept 1</td>
</tr>
</tbody>
</table>
PDSA cycle – the next project is brakes!

“My next big project is brakes.”
The Sequence: Step 2

What do we have to work on to reduce complications from CVCs?

We decide to start with the CVC Maintenance Bundle
**Aim**: Reduce Complications from CVCs in Hospital X, Pilot Site by May 2014

- **Central Line Insertion Bundle**
- **Standardise Process**: Line Carts and Dressing Kits
- **CVC Maintenance Bundle**
- **Partner with Accident and Emergency and Operating Theatres for Standardisation**

**Lead 1**

**Lead 2**

**Lead 3**
The Sequence: Step 3

There are many changes within the CVC Maintenance Bundle that must be tested and implemented.
Aim: Design a Reliable Process for CVC Maintenance Bundle by November 2011

Daily Checking and Need for CVC

Dressing in Tact and Changed w/i 7 Days

CVC Hub Decontamination

Chlorhexidine

Hand Hygiene Prior to Access

Lead A

Lead A

Lead B

Lead B

Lead C
Reduction in central line-associated bloodstream infections by implementation of a postinsertion care bundle

Karen Guerin, MSN,a Julia Wagner, RN, MS, CCRN,a Keith Rains, BSN, CICP,a and Mary Bessesen, MDa,b
Denver, Colorado

Background: Central line-associated bloodstream infections (CLABSIs) cause substantial morbidity and incur excess costs. The use of a central line insertion bundle has been shown to reduce the incidence of CLABSI. Postinsertion care has been included in some studies of CLABSI, but this has not been studied independently of other interventions.

Methods: Surveillance for CLABSI was conducted by trained infection preventionists using National Health Safety Network case definitions and device-day measurement methods. During the intervention period, nursing staff used a postinsertion care bundle consisting of daily inspection of the insertion site; site care if the dressing was wet, soiled, or had not been changed for 7 days; documentation of ongoing need for the catheter; proper application of a chlorhexidine gluconate-impregnated sponge at the insertion site; performance of hand hygiene before handling the intravenous system; and application of an alcohol scrub to the infusion hub for 15 seconds before each entry.

Results: During the preintervention period, there were 4415 documented catheter-days and 25 CLABSIs, for an incidence density of 5.7 CLABSIs per 1000 catheter-days. After implementation of the interventions, there were 2825 catheter-days and 3 CLABSIs, for an incidence density of 1.1 per 1000 catheter-days. The relative risk for a CLABSI occurring during the postintervention period compared with the preintervention period was 0.19 (95% confidence interval, 0.06-0.63; P = .004).

Conclusion: This study demonstrates that implementation of a central venous catheter postinsertion care bundle was associated with a significant reduction in CLABSI in a setting where compliance with the central line insertion bundle was already high.

Key Words: Bacteremia; central venous catheterization; infection control; catheter-related infections; line care bundle.

Published by Elsevier Inc. on behalf of the Association for Professionals in Infection Control and Epidemiology, Inc. (Am J Infect Control 2010;38:430-3.)
Sustained significant improvement in CLABSI and VAP and an increase in the use of evidenced based interventions.

*Quality and Safety in Health Care* 2010;19:555-561
Health Care Processes

**Current** - Variable, lots of autonomy not owned, poor if any feedback for improvement, constantly altered by individual changes, performance stable at low levels

**Desired** - variation based on clinical criteria, no individual autonomy to change the process, process owned from start to finish, can learn from defects before harm occurs, constantly improved by collective wisdom - variation

Terry Borman, MD Mayo Health System
(Federico/Resar Presentation on Reliability)
Lancet 2008; Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial) Girard et al.
“Efforts to reduce duration of mechanical ventilation in ICU via ventilator weaning protocols and sedation protocols can improve clinical outcomes. Unfortunately, only a few patients are managed with these strategies since there is ongoing disagreement among health-care professionals with regard to benefits and risks and because weaning protocols and sedation protocols are viewed as separate concerns—often handled in a cumbersome fashion by different members of the patient-care team”
Teamwork and Communication
Use of a structured checklist and standard team training produced a statistically significant reduction in morbidity.

- Historical control 23.6% complication rate
- Team training only 15.9% complication rate
- Checklist and team training 8.2% complication rate

Journal Am Coll Surg 2012;215;766-776
SBAR

S = Situation
B = Background
A = Assessment
R = Recommendation
Communication Errors

• Communication errors most common contributing factor for all types of adverse events reported
• Over 80% of staff responding to the question, “how will the next patient be harmed” list communication failure
Multidisciplinary Rounds

• What is the evidence?
  — Improved outcomes with MD rounds
• IHI website. Multidisciplinary rounds: How To Guide
What Are They?

• Multidisciplinary rounds are a patient-centered model of care, emphasizing safety and efficiency, that enable all members of the team caring for patients to offer individual expertise and contribute to patient care in a concerted fashion.
**Daily Goals Worksheet**

<table>
<thead>
<tr>
<th>GOAL</th>
<th>NOTES</th>
<th>16:00-18:00</th>
<th>20:00-21:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carevue admissions page complete?</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the patient likely to be discharged from ICU in the next 72 hours?</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which consultant will the patient be discharged to?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is this patient’s greatest safety risk?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tasks that need to be done today (e.g. goals set, tests, procedures, results, communication)**

**Date of last communication note in Carevue**

**REMEMBER to ask the Nurse to Ask the 5 Questions**

- **Ventilator Bundle:**
  - HOB 30 degrees or greater
  - Yes No
  - Reason if no:

- **Oral Chlorhexidine:**
  - Yes No

- **Sedation Vacation:**
  - Specify time to stop sedation:
  - Reason if not done:

- **Ready to Wean / Extubate:**
  - Yes No
  - Reason if no:

- **Weaning plan:**
  - VENTILATOR TARGET:
  - Describe the level of respiratory support to get down to

**Tasks that need to be done tomorrow**

**CAREVUE is completed**

Checked
Positive Effects

• Reinforced teamwork and communication
• Greater adherence to process measures
• Establish daily goals
• Discharge planning
• Improved medication safety
• Continuity of care
• Identify safety risks
• “All teach, all learn”
Scottish Patient Safety Campaign

Number of boards - Statistically Significant Improvements

• Mortality: 15% reduction
• Adverse Events: 30% reduction
• Ventilator Associated Pneumonia: 0 or 300 days between
• Central Line Bloodstream Infection: 0 or 300 days between
• Blood Sugars w/in Range (ITU/HDU): 80% or > w/in range
• Staph aureus bacteraemias: 30% reduction
• Crash Calls: 30% reduction
• Harm from Anti-coagulation: 30% reduction in INRs > 6
• Surgical Site Infections: 50% reduction in population of
How can we partner with patients and families?

• What do patients and families want in your ICU?
• What would you want if you were the patient or a family member?
• What are the barriers to providing those needs?
Involvement of the patient - challenge the status quo
What matters most to your patient and family?
Keys and Barriers to Success

**Keys**
- PDSA cycles
  - Small, rapid cycle
  - Seek usefulness not perfection - stickers
  - Improve as fast as you test
- Multidisciplinary approach
  - Early adopters
  - ‘having made a difference’
- Leadership
- Evidenced based
- Measurement over time
  - Outcome & process measures
  - Run charts - feedback
  - Monthly review

**Barriers**
- Resistance to change
  - ‘not invented here’
  - ‘already doing this’
  - ‘this week’s gimmick’
- Culture & behaviour
  - Educate, educate
- Clinician engagement
  - Scepticism
- Resources
  - Data collection
- Person dependence
  - Sustainable process
What are we trying to achieve?

A health care system that ensures every patient consistently receives evidence-based, effective care every time he or she needs it.

That is.... Reliable care. Making it easier for people to do the right thing every time.

“Reliability means keeping promises” Don Berwick