Safety and Medicine

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The Problem Is Large

- In U.S. health care system
  - 44,000–98,000 deaths
  - $50 billion in total costs
- Similar results in Australia and the U.K.
### RAND Study Confirms Continued Quality Gap

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage of Recommended Care Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low back pain</td>
<td>68.5</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>68.0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>64.7</td>
</tr>
<tr>
<td>Depression</td>
<td>57.7</td>
</tr>
<tr>
<td>Orthopedic conditions</td>
<td>57.2</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>53.9</td>
</tr>
<tr>
<td>Asthma</td>
<td>53.5</td>
</tr>
<tr>
<td>Benign prostatic hyperplasia</td>
<td>53.0</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>48.6</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>45.4</td>
</tr>
<tr>
<td>Headaches</td>
<td>45.2</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>40.7</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>22.8</td>
</tr>
<tr>
<td>Alcohol dependence</td>
<td>10.5</td>
</tr>
</tbody>
</table>

172,263 preventable deaths in the ICU from failing to use five interventions

<table>
<thead>
<tr>
<th>Care process</th>
<th>% not receiving</th>
<th>Preventable deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU physician</td>
<td>77%</td>
<td>134,640</td>
</tr>
<tr>
<td>Sepsis drug</td>
<td>89%</td>
<td>10,311</td>
</tr>
<tr>
<td>Steroids in sepsis</td>
<td>50%</td>
<td>9,500</td>
</tr>
<tr>
<td>Glucose control</td>
<td>75%</td>
<td>12,347</td>
</tr>
<tr>
<td>Low tidal volume in ARDS</td>
<td>70%</td>
<td>5,465</td>
</tr>
</tbody>
</table>

How can this happen?

Need to view the delivery of health care as a science
How can we improve?

The system is a set of parts interacting to achieve a goal

Every system is perfectly designed to achieve the results it gets

Caregivers are not to blame
Patient suffers venous air embolism

Communication between resident and nurse

Inadequate training and supervision

Lack of protocol for catheter removal

Catheter pulled with patient sitting

System Factors Impact Safety

- Institutional Factors
- Hospital Factors
- Departmental Factors
- Work Environment
- Team Factors
- Individual Provider
- Task Factors
- Patient Characteristics
Medication Error Waiting to Happen

- Esmolol HCl (Brevibloc) distributed in dilute form and concentrated form
- Similar packaging for both, resulting in easy confusion and dosing errors (http://www.fda.gov/medbull/mederror.html)
Impact of ICU Organization on Performance

- Physicians
- Nurses
- Pharmacists

Aviation Accidents per Million Departures (1959–2001)
ICU Physicians and ICU RN Collaboration

% of respondents reporting above-adequate teamwork

- RN rates ICU Physician: 54%
- ICU Physician rates RN: 90%

Source: Intensive Care Unit Safety Reporting System (ICUSRS).
To improve reliability from $10^{-1}$ to $10^{-3}$ is contingent upon culture of safety

- Standardize what is done, when it is done
  - Reduce complexity
- Create independent checks for key processes
  - How often do we do what we should
- Learn from defects
  - How often do we learn from defects
Reliability Contingent upon Culture of Safety

- To improve reliability from $10^{-1}$ to $10^{-3}$ is contingent upon culture of safety
  - Standardize what is done, when it is done
    - Reduce complexity
  - Create independent checks for key processes
    - How often do we do what we should
  - Learn from defects
    - How often do we learn from defects
Improving Reliability

- Standardize
- Independent check
- Learn from defects

Glucose protocol
80% compliance

Independent check
by nurse, pharmacist
98% compliance

Failure mode analysis
Glucose rounds
99.9% compliance

Defects $10^{-1}$
Defects $10^{-2}$
Defects $10^{-3}$
CR-BSI Rate

Rate per 1000 cath days


VAD policy

Line cart

Checklist

Daily goals

Empower nursing
Summary of Science of Safety

- Accept that we will make mistakes
- Focus on systems rather than blame
- Speak up if you have concerns, listen when others do
- Create clear goals, ask questions early
- Standardize, create independent checks, and learn from mistakes

www.icusrs.org