Do Protocols and Checklists Improve PICU Outcomes?

Kyung Won Kim
THE CHECKLISTS
The problem is **not bad people** in health care

It is that **good people** are working in **bad systems** that need to be made safer

**Hospital-Acquired Infections**

**Central Line–Associated Bloodstream Infections (CLABSI)**
The first checklist in medicine

• Prevention of CLABSIs, 2001
  1. Wash their hands with soap
  2. Clean the patient’s skin with chlorhexidine antiseptic
  3. Put sterile drapes over the entire patient
  4. Wear a sterile mask, hat, gown, and gloves
  5. Put a sterile dressing over the catheter site once the line is in
Why a Checklist?

• Medical knowledge has both saved us and burdened us

• To improve patients’ safety and the quality of medical care
  – Ensure consistency of care
  – Reduce omission errors, inappropriate variation and human errors under stressful conditions
Checklists or Protocols

- Checklists for central line insertion
- Checklists to prevent ventilator-associated pneumonia
- Mandatory intensivist consultation for ICU level patients
- Protocols to treat septic shock
- Protocols to manage hyperglycemia
- Multidisciplinary ICU rounds
Checklists for Central Line Insertion

• Guideline for Prevention of Intravascular Device-Related Infections published in 1996
• The checklist for adult ICU in 2001
• Interventions for PICU reported in 2008
  – Implementing an educational intervention to increase provider awareness of evidence-based infection control practices
  – Creating a central catheter procedure cart
  – Implementing a checklist to be ensured by the bedside nurse
  – Empowering nurses to stop procedures if guidelines were not followed
  – Providing real-time weekly feedback to ICU directors and senior leaders on performance
• Catheter-associated bloodstream infections (CA-BSI)
  – $5.2 \pm 4.5 \rightarrow 3.0 \pm 1.9$ CA-BSI / 1,000 central catheter days

*Pediatric Crit Care Med 2008;9:40-6*
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*Pediatr Crit Care Med 2008;9:40-6*
Interventions to improve professional adherence to guidelines for prevention of device-related infections

Cochrane Database of Systematic Reviews 2013

- Risk factors associated with healthcare-associated infections (HAIs)
  - The use of invasive medical devices (e.g. central lines, urinary catheters and mechanical ventilators)
  - Poor staff adherence to infection prevention practices during insertion and care for the devices when in place.
    - The breakdown of aseptic technique
    - The duration of device use
- Interventions for central line associated blood stream infections (CLABSI)
  - The largest median effect but small effect size immediately after the implementation of an intervention, but not sustained
- Educational interventions consisting of more than one active element and that are repeatedly administered over time
- Interventions employing dedicated personnel
Electronic Medical Record–Enhanced Checklist

<table>
<thead>
<tr>
<th></th>
<th>Preintervention</th>
<th>Postintervention</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLABSI rate</strong></td>
<td>2.6</td>
<td>0.7</td>
<td>.02</td>
</tr>
<tr>
<td>Daily compliance with CLABSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Insertion bundle, %</td>
<td>67</td>
<td>62</td>
<td>.001</td>
</tr>
<tr>
<td>- Line necessity review and documentation, %</td>
<td>30</td>
<td>73</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>- Dressing change frequency, %</td>
<td>87</td>
<td>90</td>
<td>.003</td>
</tr>
<tr>
<td>- Cap change frequency, %</td>
<td>87</td>
<td>93</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>- Port needle change frequency, %</td>
<td>69</td>
<td>95</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>- Transition from IV to oral medications, %</td>
<td>NA</td>
<td>71</td>
<td>NA</td>
</tr>
<tr>
<td>- Laboratory frequency, %</td>
<td>NA</td>
<td>65</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Survey questions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- How effective is the current rounding format in the PICU for communicating your patient’s needs to all team members?</td>
<td>4.5</td>
<td>4.4</td>
<td>.73</td>
</tr>
<tr>
<td>- Does the medical team address central line necessity on rounds?</td>
<td>4.5</td>
<td>4.9</td>
<td>.02</td>
</tr>
<tr>
<td>- Do you know the components of the maintenance bundle for CLABSI prevention?</td>
<td>53 yes</td>
<td>49 yes</td>
<td>.39</td>
</tr>
<tr>
<td>- 3 no</td>
<td>9 no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 7 unsure</td>
<td>5 unsure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NA, not applicable.

a CLABSI per 1000 line-days. P represents analysis with 2-sample t test assuming equal variances.
b Percentage compliance with CLABSI prevention best practices. Analyzed by using χ² tests.
c Preintervention and postintervention results represent the average score on a scale of 1 to 6, where 1 means “very ineffective” and 6 means “very effective”. Analyzed with a Wilcoxon rank-sum test.
d Preintervention and postintervention results represent the average score on a scale of 1 to 6, where 1 means “never” and 6 means “every time I work”. Analyzed with a Wilcoxon rank-sum test.
e Analyzed with Fisher’s exact test.
Round Checklist

• Intervention: Daily goal sheets

• Outcome parameters (N=387)
  – Questionnaire-based measures of effectiveness of communication
  – Nurses' knowledge of physicians in charge
  – Length of stay (LOS) in the PICU

• Results
  – PICU daily patient goal sheet can improve all of them
Round Checklist

D  DNR status clear?
   "Jimmy is for full resuscitation"

E  Endotracheal tube and cuff is safe
   "Jimmy's FTT was retaped yesterday, is secure, the cuff is inflated and the cuff pressures are in range"

F  Fluid strategy/Feeding plan agreed
   "Jimmy is on 80 mls/kg, to commence feeding, if tolerated, increase to 100 mls/kg. On frusemide infusion aim of 200 mls negative balance by morning"

A  Analgesia/sedation
   "Jimmy is on morphine and midazolam infusions, to commence enteral sedation and reduce to 20 mcg morphine and 2 mcg midazolam"

U  Ulcer skin and gut
   "Jimmy is on ranitidine, and nursed on an airflow bed, however, his skin is fragile but not broken"

L  Lines out
   "Jimmy has one radial arterial, three peripheral and a right femoral line. The femoral line is to be removed today"

T  Tidal volumes <8 ml/kg
   "Jimmy has tidal volumes of 6 ml/kg. Or Jimmy is oscillated, tidal volumes not measured"

Crit Care 2013;17:R232
Prompting physicians to address a daily checklist and process of care and clinical outcomes

Am J Respir Crit Care Med 2011;184:680-6

<table>
<thead>
<tr>
<th>Nursing:</th>
<th>MICU Rounding Checklist - PG 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient:</td>
<td>Date:</td>
</tr>
<tr>
<td>Date of Admission:</td>
<td>ROOM NO:</td>
</tr>
<tr>
<td>ICU DAY:</td>
<td>A 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
<tr>
<td>Lines and Tubes bundle:</td>
<td>Give initial date and day number</td>
</tr>
<tr>
<td>Central Line 1: Site/Type/Insertion date:</td>
<td></td>
</tr>
<tr>
<td>Central Line 2: Site/Type/Insertion date:</td>
<td></td>
</tr>
<tr>
<td>Arterial Line: Site/Type/Insertion date:</td>
<td></td>
</tr>
<tr>
<td>Rectal tube:</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Check = yes</td>
</tr>
<tr>
<td>Patient care bundle:</td>
<td></td>
</tr>
<tr>
<td>Appropriate stool within past 24 hrs:</td>
<td>Check = yes</td>
</tr>
<tr>
<td>Any glucose &gt; 140</td>
<td></td>
</tr>
<tr>
<td>Restraints:</td>
<td></td>
</tr>
<tr>
<td>Foley:</td>
<td></td>
</tr>
<tr>
<td>Weight:</td>
<td></td>
</tr>
<tr>
<td>Nutrition:</td>
<td></td>
</tr>
<tr>
<td>Nutrition goal rate: % of goal:</td>
<td></td>
</tr>
<tr>
<td>Pressure Ulcer: LOCATION:</td>
<td>STAGE:</td>
</tr>
<tr>
<td>Pressure Ulcer: LOCATION:</td>
<td>STAGE:</td>
</tr>
<tr>
<td>Pressure Ulcer: LOCATION:</td>
<td>STAGE:</td>
</tr>
<tr>
<td>Pharmacy:</td>
<td>Give initial date and day number</td>
</tr>
<tr>
<td>Antibiotics (Name and Reason, eg. Vancomycin, F):</td>
<td></td>
</tr>
<tr>
<td>(Empiric, Pneumonia, Line, Abdominal, Urine, Other):</td>
<td></td>
</tr>
<tr>
<td>Antibiotic 1:</td>
<td></td>
</tr>
<tr>
<td>Antibiotic 2:</td>
<td></td>
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<tr>
<td>Antibiotic 3:</td>
<td></td>
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<tr>
<td>Antibiotic 4:</td>
<td></td>
</tr>
<tr>
<td>Antibiotic 5:</td>
<td></td>
</tr>
<tr>
<td>DVT prophylaxis (Heparin, Lovenox, SCD, Central Indicated, Other):</td>
<td></td>
</tr>
<tr>
<td>GI prophylaxis:</td>
<td></td>
</tr>
<tr>
<td>Physician:</td>
<td>Give day number</td>
</tr>
<tr>
<td>Ventilator bundle:</td>
<td></td>
</tr>
<tr>
<td>Intubated; initial date:</td>
<td></td>
</tr>
<tr>
<td>Can patient have daily walking?:</td>
<td>Check = yes</td>
</tr>
<tr>
<td>Can patient have weaning trial?:</td>
<td></td>
</tr>
<tr>
<td>PEEP &gt; 30</td>
<td></td>
</tr>
<tr>
<td>Family updated within 24 hrs:</td>
<td></td>
</tr>
<tr>
<td>Goal/adjustment discussed:</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Clinical Trial enrollment candidate (Give name: ARDS, sepsis, VAP):</td>
<td></td>
</tr>
<tr>
<td>Attending/Fellow Certification:</td>
<td></td>
</tr>
</tbody>
</table>
Prompting physicians to address a daily checklist and process of care and clinical outcomes

Am J Respir Crit Care Med 2011;184:680-6
Studies of Protocols or Checklists

Articles retrieved by searches (n = 5881)

Potentially relevant full text retrieved (n = 224)

Excluded based on irrelevant titles and abstracts (n = 5657)

Excluded (n = 215)
Reasons:
1: n = 188
2: n = 3
3: n = 15
4: n = 1
5: n = 8

Included studies (n = 9)

Some benefits of using safety checklists
Should be interpreted with caution

BMC Health Service Research 2011;11:211
How to use protocols or checklists?

- Determine need for the checklist
- Identify the goal and audience for the checklist
- Develop content using the following:
  - Broad spectrum of peer-reviewed literature
  - Expert judgment
  - Consensus among relevant opinion leaders
  - Multidisciplinary input
  - Consideration of current practices
- Design must consider (see Table 4) [26, 30]:
  - Context for the checklist
  - Readability
  - Proper categorization of information
  - Structure of checkpoints
  - Limited use of images
  - Appropriate use of colour
  - Avoid jargon — use common terminology
  - Flow of real-time user activities
  - Clinician state of mind
- Pilot test — validation in simulated clinical environment is a must
- Review with appropriate multidisciplinary representation
- Obtain approval from appropriate regulatory authorities as required, prior to implementation in the clinical environment
- Develop an education plan to properly train users
- Frequent review of evidence-based checklist content

Int J Qual Health Care 2008;20:22-30
Professional interventions
Financial interventions
Organisational interventions
Regulatory interventions
Take Home Messages

• Checklists and protocols have proven effective in various aspects of performance improvement and error prevention and management.

• Checklist-based intervention including prompting improved multiple processes of care, and may have improved clinical outcomes.

• The manner in which checklists are implemented is of great consequence in the care of critically ill patients.
Thank you for your attention