Better Handoffs and Safer Care: Preliminary Results of the I-PASS Study

Glenn Rosenbluth, M.D.
Associate Professor, Pediatrics
Associate Director, Residency Program
Director of Quality and Safety Programs, GME

Daniel C. West, M.D.
Professor and Vice Chair, Pediatrics
Director, Pediatric Residency Program
Disclosures

Drs. Rosenbluth and West have

• Identified that they have no conflicts of interest to disclose
• Documented that his presentation will not involve discussion of unapproved or off-label, experimental or investigational use

Drs. Rosenbluth and West will

• Present copyrighted materials and have obtained permission from Boston Children’s Hospital and the I-PASS Study Group.

The I-PASS Handoff Study Curriculum includes materials adapted from TeamSTEPPS™, an evidence-based teamwork curriculum developed by the Department of Defense and the Agency for Healthcare Research and Quality. All materials are used with permission.
Objectives

• Describe the role of communication failures in medical errors and preventable adverse events
• Articulate the need for high quality patient handoffs to reduce likelihood of communication failures
• Describe the key components of I-PASS
  – Evidence-based handoff bundle
  – Impact on medical errors and patient safety
Take Home Points

• Duty hour standards → More handoffs
• Training needed to
  – Standardize approach to handoffs
• Multi-site study of Resident Handoff Bundle demonstrated
  – Decreased medical errors
  – Decreased preventable adverse events
  – No change in resident workflow
• Handoff curriculum and educational materials available online
  – www.ipasshandoffstudy.com
Overview

• Background
  – Patient safety
  – Duty hours
  – Communication failures

• I-PASS intervention study
  – Pilot study
  – Multi-site study
    • Educational intervention
    • Impact on medical errors, adverse events

• Summary
• **Background**
  – Patient safety
  – Duty hours
  – Communication failures

• **I-PASS intervention study**
  – Pilot study
  – Multi-site study
    • Educational intervention
    • Impact on medical errors, adverse events

• **Summary**
Patient Safety Movement

• IOM Report
• Estimated 98,000 preventable deaths
Adverse Events are Common

Adverse event identified: 3.7% of inpatients

14% led to death

69% preventable

Harvard Medical Practice Study: Brennan. NEJM 1991; 324: 370-76
No Change in Adverse Events

North Carolina Patient Safety Study

– Study of 2341 randomly selected admissions from 10 randomly selected hospitals statewide

Landrigan. NEJM 2010; 363: 2124-34
Sleep Deprivation in Trainees

Major Factors

• Biological time of day (circadian rhythms)
• Consecutive waking hours
• Nightly sleep duration
• Sleep inertia
New Duty Hour Standards in 2003

• ACGME under pressure to regulate

• New duty hour standards in Common Requirements
  – 80h work week
  – Shifts limited to 24h + 6h for rounds and transfer of care
  – 1 day off in 7
Intern Sleep and Patient Safety Study

Randomized Controlled Trial of extended shifts (24-30h) vs. 16h limit

Errors per 1000 pt days

- Serious Medical Errors - Total
- Serious Medication Error
- Serious Diagnostic Error

p<0.001

p=0.03

p<0.001

Traditional "q3" 24-30 hour shifts

Intervention Schedule - <16 hour scheduled shifts

Landrigan. NEJM 2004; 351: 1838-1848
## Systematic Review of Effects of Reducing or Eliminating Shifts >16h

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of studies with outcome</th>
<th>Significant improvement</th>
<th>No change</th>
<th>Significant decrement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident Quality of Life</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Resident Education</td>
<td>14</td>
<td>4</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Patient Safety/Quality</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Modified from Levine. Sleep 2010; 33: 1043-1053; Rosenbluth et al. 2013
IOM Report on Resident Duty Hours

- Released in December 2008
- Concluded that it is unsafe for residents to work more than 16 consecutive hours without sleep
- Two solutions proposed
  - Mandatory 5h nap during a 30h shift
  - 16h shift limit
- Called for improved handoff processes and increased supervision
2011 ACGME Duty Hour Standards

• Imposed 16h consecutive work limit for interns
• Allowed PGY2s and higher continue to work 24h shifts
  – Plus an additional 4h to transfer care
• Required programs to
  – Ensure and monitor structured handoff processes
  – Teach resident handoff skills and ensure competence

http://www.acgme.org/acWebsite/home/Common_Program_Requirements_07012011.pdf
Consequences of Shorter Shifts

Shorter shifts

Increased frequency of handoffs
Poor Quality Handoffs Cause Communication Failures

- Residents overestimate effectiveness of handoff communication
  - Most important piece of information not communicated 60% of time
    - Post-call resident believed it was communicated
  - Despite lack of agreement on content and rationale, peer ratings of handoff quality were high

Standardized Handoff Needed

- Short shifts → More frequent handoffs
- Work compression
- Higher patient acuity and complexity
• Background
  – Patient safety
  – Duty hours
  – Communication failures

• I-PASS intervention study
  – Pilot study
  – Multi-site study
    • Educational intervention
    • Impact on medical errors, adverse events

• Summary
Pilot Study: Resident Handoff Bundle

Communication and Handoff Skills Training + Standardization of Verbal Handoffs + Computerized Handoff Tool = Resident Handoff Bundle (RHB)

Starmer AJ et al. JAMA 2013
Pilot Study Aims

Study changes in:

- Rates of serious medical errors (primary outcome)
- Written and verbal communications
- Resident workflow (time-motion study)

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### Unit 1

- **Baseline data (3 mo)**: Traditional Handoff
- **Wash-in (1 mo)**: FULL RHB
- **Post intervention (3 mo)**: FULL RHB

### Unit 2

- **Baseline data (3 mo)**: Traditional Handoff
- **Wash-in (1 mo)**: RHB without computerized tool
- **Post intervention (3 mo)**: RHB without computerized tool

---

Starmer AJ et al. JAMA 2013
Results: Medical Error Rates

% of Admissions with Medical Error

Total admissions reviewed: 1255

<table>
<thead>
<tr>
<th></th>
<th>Pre-RHB</th>
<th>Post-RHB</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit 1</strong></td>
<td>32%</td>
<td>19%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>(Full RHB)</td>
<td>(n=117)</td>
<td>(n=68)</td>
<td></td>
</tr>
<tr>
<td><strong>Unit 2</strong></td>
<td>45%</td>
<td>25%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>(No Computer Tool)</td>
<td>(n=128)</td>
<td>(n=62)</td>
<td></td>
</tr>
</tbody>
</table>

Starmer AJ et al. JAMA 2013
Background
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Summary
Targeted Needs Assessment

• Surveyed 9 sites regarding
  – Current handoff practices
  – Handoff tools
  – Handoff education and resources
• Found great variability
  – 2 sites had multiple team members present
  – 5 used standardized computerized documents that auto-imported data from EMR
  – 1 used a standardized verbal mnemonic
  – 2 had protected time for handoffs
  – No program had a formal curriculum

I-PASS Educational Framework

Developed by Jennifer K. O’Toole and the I-PASS Study Group
Intervention: More Than Just a Mnemonic

I-PASS Handoff Bundle Components

- Introductory Workshop
- TeamSTEPPS Training
- Simulation Exercises
- Faculty Development
- Faculty Observations & Feedback
- I-PASS Printed Handoff Document
- I-PASS Campaign
- I-PASS Mnemonic
Overview of 3-hour Workshop

2-Hour Session of Didactic and Interactive Exercises
- TeamSTEPPSTM training
  - Communication skills
  - Briefs, debriefs, huddles
- Learning styles exercise
- Handoff skills training
  - Verbal Mnemonic
  - Written Handoff Document

1-Hour Handoff Simulation Exercise
- 3 Role Play Scenarios that will allow residents the opportunity to be
  - Giver
  - Receiver
  - Observer
- 1 Role Play Scenario
  - Developing a Shared Mental Model

Followed by

# TeamSTEPPS Skills in Handoffs

<table>
<thead>
<tr>
<th>Cross Monitoring</th>
<th>Night team recognizes medication error during handoff and informs the day team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brief</td>
<td>Night team goes over action list and divides tasks and new admits and plans for time to regroup</td>
</tr>
<tr>
<td>Debrief</td>
<td>In the morning, the night team and day team discuss what went well with the handoff and items the night team would have liked to know</td>
</tr>
<tr>
<td>Huddle</td>
<td>A patient is unstable, the day and night team examines the patient together and discusses plans for the night with the nurse</td>
</tr>
<tr>
<td>Check-Back</td>
<td>The intern obtains new information to add to the handoff from the senior resident, this information is repeated by the intern to confirm communication</td>
</tr>
</tbody>
</table>
The I-PASS Mnemonic

I  Illness Severity
   Stable, “Watcher,” Unstable

P  Patient Summary
   Summary statement; events leading up to admission; hospital course; ongoing assessment; plan

A  Action List
   To do list; timeline and ownership

S  Situation Awareness & Contingency Planning
   Know what’s going on; plan for what might happen

S  Synthesis by Receiver
   Receiver summarizes what was heard; asks questions; restates key action/to do items

Starmer AJ et al Pediatrics 2012
Faculty Roles in Implementation

Potential Faculty Roles

I-PASS Workshop Leader/Facilitator
Facilitate the 2-hour interactive didactic training

Handoff Simulation Small Group Facilitators
Facilitate the hour long handoff simulations with small groups of residents that occur at the end of the workshop

“Live” Handoff Faculty Observers
Observe live handoffs with residents after the RHB has been implemented and provide feedback on faculty observation forms

I-PASS Campaign
Marketing as well as “Just in Time” refreshers for the residents
Implementation of Curriculum Institutional Campaign

- Logo
- Pocket Cards
- Posters
- Computer screen-surrounds
- Flip charts
  - Tips of the day
- Fortune cookies with I-PASS tips inside
Multisite study to determine if implementation of a resident handoff bundle is associated with:

• A significant reduction in overall error rates and preventable adverse events
• Improved written and verbal handoff communication
• Impact on resident workflow patterns
# Multisite Study

General inpatient units at 9 North American pediatric residency training programs

<table>
<thead>
<tr>
<th>Site Name</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>General inpatient units at 9 North American pediatric residency training programs</td>
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</tr>
</tbody>
</table>

- **Yellow** = pre-intervention data collection
- **Green** = I-PASS bundle implementation
- **Blue** = post-intervention data collection
Outcomes:

• Process Measures
  – Audio recordings of evening verbal handoffs
  – Copies of printed handoff documents

• Outcome Measures (Error Rates)
  – Standardized error surveillance methodology
    • Chart review by study nurse
    • Daily solicited error reports from physicians
  – Categorized severity, preventability, type
  – Dual review by blinded physicians

• Outcome Measures (Work flow)
Percentage of Oral Handoffs That Included Key Data Elements (All Sites Combined)

Incidence of Medical Errors, Preventable Adverse Events, and Medical-Error Subtypes before and after Implementation of the I-PASS Handoff Bundle.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before Implementation (N = 5516)</th>
<th>After Implementation (N = 5224)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall medical errors</td>
<td>1349 (24.5)</td>
<td>981 (18.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Preventable adverse events</td>
<td>261 (4.7)</td>
<td>173 (3.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Near misses and nonharmful medical errors</td>
<td>1088 (19.7)</td>
<td>808 (15.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Medical-error subtype</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Errors related to diagnosis (incorrect, delayed, omitted)</td>
<td>184 (3.3)</td>
<td>111 (2.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Errors related to therapy other than medication or procedure</td>
<td>112 (2.0)</td>
<td>77 (1.5)</td>
<td>0.04</td>
</tr>
<tr>
<td>Errors related to history and physical examination</td>
<td>43 (0.8)</td>
<td>0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Other and multifactorial errors</td>
<td>239 (4.3)</td>
<td>106 (2.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Medication-related errors</td>
<td>660 (12.0)</td>
<td>580 (11.1)</td>
<td>0.28</td>
</tr>
<tr>
<td>Procedure-related errors</td>
<td>83 (1.5)</td>
<td>85 (1.6)</td>
<td>0.49</td>
</tr>
<tr>
<td>Falls</td>
<td>13 (0.2)</td>
<td>8 (0.2)</td>
<td>0.37</td>
</tr>
<tr>
<td>Nosocomial infections</td>
<td>15 (0.3)</td>
<td>14 (0.3)</td>
<td>0.79</td>
</tr>
</tbody>
</table>
Time Motion Study

- Computer - read
  - Sign out
  - Patient record
  - Email
  - Article
  - Drug reference
  - Textbook
  - Literature search
  - Search engine
  - ECG
  - Radiograph
  - Other

- Computer - writing
  - Sign out (EMR based)
  - Sign out (Other)
  - Email
  - Paging colleague
  - History/physical
  - Progress note
  - Discharge summary
  - Order
  - Prescription
  - Event note
  - Incident report
  - Consult
  - Other

- Patient/family contact
  - Patient history
  - Casual conversation
  - Physical exam
  - Explaining plan
  - Educating patient
  - Obtaining consent
  - Advance directives
  - IV
  - Phlebotomy
  - Other procedure
  - Unspecified/RA outside room
  - Other
## Resident Workflow

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of Time per 24 hr Period Spent in Activity</th>
<th>Pre-Intervention N = 3510 hours</th>
<th>Post-Intervention N = 4618 hours</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Family Contact</td>
<td></td>
<td>11.8%</td>
<td>12.5%</td>
<td>0.41</td>
</tr>
<tr>
<td>Creating written or computerized handoff document</td>
<td></td>
<td>1.6%</td>
<td>1.3%</td>
<td>0.54</td>
</tr>
<tr>
<td>Other Computer Time</td>
<td></td>
<td>16.2%</td>
<td>16.5%</td>
<td>0.81</td>
</tr>
</tbody>
</table>

| Mean duration of verbal handoff per patient   | Pre-Intervention 2.4 min | Post-Intervention 2.5 min | P-Value 0.55 |
Conclusions of the Multisite Study

• I-PASS Handoff Bundle implementation was associated with
  – Reduction in overall error rates and preventable adverse events
  – Improvements in verbal and written handoff communications
  – No significant adverse effect on resident workflow or handoff duration
I-PASS at UCSF

• Recommended handoff bundle
• Currently at least 15 UCSF programs use I-PASS
  – Peds, Internal Med, Ob-Gyn, General Surgery, Neurological Surgery
• Built into APeX
I-PASS Fields formatted as EPiC sticky notes, with EPiC Problem List below Patient Summary (these are not yet populated)
In this view, I can see the major I-PASS fields as column headings.
<table>
<thead>
<tr>
<th>Bed (Location)</th>
<th>MRN</th>
<th>Patient Name/Age/Sex</th>
<th>Weight (kg)</th>
<th>Code Status Text</th>
<th>Problem</th>
<th>Cosign Ord</th>
<th>Admission Date</th>
<th>Expected D/C Date</th>
<th>Illness Severity</th>
<th>Patient Summary Statement One Liner</th>
<th>Action List - To Do</th>
<th>Situation Awareness</th>
<th>Contingency Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>620-L1</td>
<td>97527091</td>
<td>Pediatric, Test O (6 y.o. M)</td>
<td>24.9</td>
<td>Not on file</td>
<td>(None Found)</td>
<td></td>
<td>11/14/13</td>
<td></td>
<td>stable</td>
<td>Gyo admitted for asthma and pneumonia, doing well on RA and albuterol 3hrs. Getting ready for d/c home soon.</td>
<td>update PCP - DONE asthma teaching</td>
<td>- if grandma comes, page HO</td>
<td></td>
</tr>
</tbody>
</table>

TOFU Properties (29646)

**General**
- Name: TOFU
- Owner: JASIK, CAROLYN B [5015]

**Layout**
- Available Columns: Bed (Location) MRN Patient Name/Age/Sex Weight (kg) Code Status Text Problem Cosign Ord Admission Date
- Selected Columns: Expected D/C Date Illness Severity

**Additional Options**
- Properties
- Default List
- Add Patient
- Create My List
- Delete My List

**Available Sections**
- My Lists
- Recent Searches
- System Lists
- EpicCare Link Admitted Patients
<table>
<thead>
<tr>
<th>Bed (Location)</th>
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<th>Patient Name/Age/Sex</th>
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<th>Code Status Text</th>
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<td></td>
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</table>

1 Patient(s)
Reports can be wrenched in:

- Signout Notes – Primary Team
- Signout Notes – Other Teams
- Primary Signout (Condensed)
- Primary Signout (Expanded)
Better Handoffs. Safer Care.
Summary

• Duty hour standards → More handoffs
• Training needed to
  – Standardize approach to handoffs
• I-PASS Handoff Bundle → decreased rates of medical errors and adverse events
Future Directions

• Since launch of I-PASS Study Website (www.ipasshandoffstudy.com) and publication of materials on MedEdPORTAL
  – 1007 individuals from 517 institutions and 20 countries have downloaded I-PASS curricular materials

• Partnership with Society for Hospital Medicine and AHRQ to mentor I-PASS implementation at 16 pediatric and 16 adult hospitals

• Application and adaptation of I-PASS concepts to family centered and inter-professional communication (PCORI)
Funding and Resources

• Primary funding
  – Department of Health and Human Services

• Additional funding for I-PASS provided by:
  – Oregon Comparative Effectiveness Research K12 Program, Agency for Healthcare Research and Quality (AHRQ)
  – Medical Research Foundation of Oregon
  – Physician Services Incorporated Foundation (of Ontario)
  – Pfizer (unrestricted medical education grant)

• Pediatric Research in Inpatient Settings (PRIS) Network
• Initiative for Innovation in Pediatrics Education (IIPE)
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• Chet Meinzer and Ashley Diaz
• Carolyn Jasik, MD
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Better handoffs.
Safer care.
Any Questions?
www.ipasshandoffstudy.com