I-PASS: Addressing Miscommunication and Medical Error

MMIC Webinar Series
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Principal Investigator, I-PASS Study Group

Disclosures

• Dr. Landrigan is a founder, equity holder, and consultant with the I-PASS Institute, which seeks to aid hospitals with the implementation of I-PASS improvement programs
• Dr. Landrigan has consulted with Virgin Pulse on development of a Sleep Health program, and has served as an expert witness in cases regarding sleep deprivation and safety
• The presentation will not involve discussion of unapproved or off-label, experimental or investigational use
• The presentation will show copyrighted materials for which permission has been obtained from Boston Children's Hospital and the I-PASS Study Group

Objectives

• Describe the role of communication failures in medical errors and preventable adverse events
• Articulate the need for high quality patient handoffs to reduce the likelihood of communication failures
• Describe the implementation of the evidence-based I-PASS handoff bundle and its impact on medical errors and patient safety
Background
Duty Hours, Patient Safety & Handoffs

Patient Safety in the U.S.:
Ongoing Problems

Institute of Medicine, 1999
- 44,000-98,000 deaths per year due to adverse events

Office of the Inspector General, 2010
- 180,000 deaths per year due to adverse events

Makary et al, BMJ, 2016
- 251,000 U.S. deaths per year due to medical error
- 3rd leading cause of death

North Carolina Pt Safety Study
- 2341 randomly selected admissions from ten randomly selected hospitals statewide

Advances in Patient Safety

Progress reducing specific types of adverse events
- Catheter related bloodstream infections
  - Pronovost et al
- Surgical Safety Checklists
  - Gawande et al
Intern Sleep and Patient Safety Study
Randomized Controlled Trial of extended shifts (24-30h) vs. 16h limit

Landrigan. NEJM 2004; 351: 1838-1848

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


Consequences of Shorter Shifts

Shorter shifts → Increased frequency of handoffs
Malpractice Liability Payouts

Communication failures are a factor in 30% of Claims.

1. Communication was a factor in 30% of 23,658 malpractice cases filed from 2009-2013. (CBS dataset represents approximately 30% of all US malpractice cases)

2. Those 7,149 cases incurred $1.7B in losses in which communication failures contributed to patient harm.

3. 37% of all high severity cases involve communication.

The I-PASS Pilot Study

I-PASS
I-PASS Pilot Study

- Boston Children’s Hospital in 2009-2010
- Involved the implementation of a resident handoff bundle


Results

Medical Errors & Preventable Adverse Events

<table>
<thead>
<tr>
<th></th>
<th>Pre-</th>
<th>Post-</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Errors</td>
<td>33.8</td>
<td>18.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Preventable Adverse Events</td>
<td>3.3</td>
<td>1.5</td>
<td>0.04</td>
</tr>
</tbody>
</table>


Limitations Of The Pilot Study

- Single institution: Unclear generalizability
- Limited ability to control for confounding factors
  - Learning over time
  - Seasonal variation
- Mnemonic (SIGNOUT) not memorable or sustained after research period
- Challenges with sustainability
- Lack of faculty engagement
Pilot Study ➔ Multisite Study

- Multisite study at 9 Children's Hospitals
- Implemented I-PASS handoff bundle for resident physician change of shift handoffs
- Supported by
  - Initiative for Innovation in Pediatric Education (IIPE)
  - Pediatric Research in Inpatient Settings (PRIS)
- Funded by grant from U.S. Dept of Health and Human Services (ARRA funding) September 2010

The I-PASS Study
Educational Intervention

6-Step Approach To Curriculum Development

- Needs Assessment
- Revision and Refinement
- Writing Goals and Objectives
- Developing Educational Activities
- Implementation and Evaluation
- Revision and Refinement

Challenges To Improving Handoffs

Handoffs are
- Non-standardized processes currently
- Not formally taught
- Variable
  - Institution to institution
  - Within institutions
- Implementing a change in handoff practice is a transformational change


The I-PASS Mnemonic

<table>
<thead>
<tr>
<th>I</th>
<th>Illness Severity</th>
<th>Stable, “watcher,” unstable</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Patient Summary</td>
<td>Summary statement</td>
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<tr>
<td></td>
<td></td>
<td>Events leading up to admission</td>
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<tr>
<td></td>
<td></td>
<td>Hospital course</td>
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<td></td>
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<td>Ongoing assessment</td>
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<td></td>
<td></td>
<td>Plan</td>
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<tr>
<td>A</td>
<td>Action List</td>
<td>To do list</td>
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<tr>
<td></td>
<td></td>
<td>Timeline and ownership</td>
</tr>
<tr>
<td>S</td>
<td>Situation</td>
<td>Know what’s going on</td>
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<td></td>
<td>Awareness and</td>
<td>Plan for what might happen</td>
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<td></td>
<td>Contingency</td>
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<td>Planning</td>
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<td>S</td>
<td>Synthesis by</td>
<td>Receiver summarizes what was heard</td>
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<td></td>
<td>Receiver</td>
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<tr>
<td></td>
<td></td>
<td>Asks questions</td>
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<td></td>
<td></td>
<td>Restates key action/to do items</td>
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Intervention: More Than Just A Mnemonic

I-PASS Handoff Bundle Components

All Handoff Bundle Components Available at www.ipasshandoffstudy.com
I-PASS Faculty Development
Faculty Are Key To Success!

• Development of “I-PASS Faculty Champions”
  ♦ I-PASS Champions Guide
  ♦ Opportunity for participation at multiple levels
  ♦ Physicians received Maintenance of Certification credit to encourage participation

I-PASS Handoff Assessment Tools
Development Process

• Expert panel identified key elements of effective handoffs
• Reviewed published literature for examples, items, and rating scales
• Created handoff assessment tool
  ♦ Multiple revisions
  ♦ Pilot tested and further revised
• Generated evidence to demonstrate and confirm tool validity

I-PASS Campaign Materials

• Study logo
• Posters
• Screen frames
• Pocket cards
• Badge clips
• I-PASS “tips of the day”
• “Just-in-Time” refresher training sessions
The I-PASS Study
Methods & Findings

I-PASS Study Aims

- To determine if implementation of I-PASS Handoff Bundle is associated with:
  - Reduction in overall error rates and preventable adverse events (primary outcome)
  - Improved written and verbal handoff communication (process outcomes)
  - Change in resident workflow patterns (balancing measure)

Study Design

General inpatient units at 9 North American pediatric residency training programs

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Jan</th>
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Legend:
- Yellow: Pre-intervention data collection
- Green: I-PASS bundle implementation
- Blue: Post-intervention data collection
Methods – Primary Outcome
Measurement Of Error Rates

- Standardized error surveillance methodology
- Study nurse reviews patient charts
  - Medication orders, MAR, progress notes, nursing notes, and discharge summary
  - Hospital incident reports
  - Daily solicited error reports from physicians
- Potential medical errors categorized
  - Two MDs blinded to pre- vs. post-status
  - Severity, preventability, type, non-error

Methods – Process Outcomes
Verbal & Written Handoff Miscommunications

- Audio recordings of evening verbal handoffs
  - Random selection of 12 per study period per site
  - Review all patients for presence or absence of 5 key data elements
- Electronic copies of printed handoff documents
  - Random selection of 24 handoff documents per study period per site
  - Review all patients for presence or absence of 9 key data elements

Methods – Balancing Measures
Time Motion Study

[Diagram showing time motion study results]
Results – Process Measures

% Of Verbal Handoffs With Key Elements Present

- All p-values < 0.001
- Pre-intervention vs. Post-intervention

<table>
<thead>
<tr>
<th>Illness assessment</th>
<th>Patient summary</th>
<th>To do list</th>
<th>Contingency</th>
<th>Readback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intervention</td>
<td>Post-intervention</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 207 verbal handoff sessions, 2281 unique patient handoffs


Results – Process Measures

% Of Written Handoffs With Key Data Elements

- All p-values < 0.001
- Pre-intervention vs. Post-intervention

<table>
<thead>
<tr>
<th>Illness assessment</th>
<th>Patient summary</th>
<th>To do list</th>
<th>Contingency</th>
<th>Readback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intervention</td>
<td>Post-intervention</td>
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</tbody>
</table>

N = 432 written handoff documents, 5752 unique patient entries


Results – Primary Outcome

Medical Error Rates

<table>
<thead>
<tr>
<th></th>
<th>Pre (&lt;50% admissions)</th>
<th>Post (&lt;50% admissions)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall rate of medical errors</td>
<td>24.6</td>
<td>18.8</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Preventable adverse events</td>
<td>4.7</td>
<td>3.3</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Near misses / non harmful medical errors</td>
<td>19.7</td>
<td>14.6</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Non-preventable Adverse Events</td>
<td>3.0</td>
<td>2.6</td>
<td>0.48</td>
</tr>
</tbody>
</table>

30% reduction
23% reduction

### Results – Balancing Measures

#### Resident Workflow

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of Time per 24 hr Period Spent in Activity</th>
<th>N = 3510 hours</th>
<th>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>

<table>
<thead>
<tr>
<th>Mean duration of verbal handoff per patient</th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.4 min</td>
<td>2.5 min</td>
<td>0.55</td>
</tr>
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</table>


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### I-PASS for Nurses

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### Handoff Related Care Failures

Bligham et al., Pediatrics 2014; 134: e572-e579
Quality of Verbal Handoff

Adapting and Disseminating

Distributing the Curriculum

I-PASS Study Website
AAMC's MedEdPORTAL

2,084 US Curricular Downloads
### I-PASS Use by Providers and Clinical Settings

**Providers**
- Physicians: 16.5%
- Medical students: 1.3%
- Nurses: 4.8%
- Other: 17.9%
- Unspecified: 71.0%

**Clinical Settings**
- Pediatrics: 21.5%
- Surgery: 7.9%
- Emergency Medicine: 8.1%
- Internal Medicine: 21.0%
- Obstetrics/Gynecology: 4.4%
- Intensive Care: 9.6%
- Family Medicine: 9.5%
- Neurology: 2.3%
- Psychiatry: 2.5%
- Other: 16%

### SHM-IPASS Mentored Implementation

16 Academic Institutions: Phase 1
- Virginia Commonwealth University Hospital
- Mayo Clinic
- New York Hospital Queens
- Maimonides Medical Center
- University of Cincinnati
- Brigham and Women’s Hospital (IM and Surgery)
- Levine Children’s Hospital at Carolinas HealthCare System
- Hurley Medical Center
- Children’s Hospital of Michigan
- Tridel Medical Center
- University of Hawaii John A. Burns School of Medicine
- Sunnybrook Hospital, Ontario
- Boston Medical Center

16 Academic Institutions: Phase 2
- Children’s Hospital of Philadelphia (CHOP)
- New Hanover
- Lankenau Medical Center
- Children’s Hospital of Pennsylvania
- University Medical Center Colorado
- University of New Mexico
- Hackensack UMC Mountainside
- Medical University of South Carolina
- Sparrow Hospital / Michigan State University
- Johns Hopkins, Baltimore
- Children’s National, DC
- Children’s Hospital, Cincinnati
- AlbertCare, New Jersey
- Sanford Children’s Hospital, South Dakota
- Gwinnett Medical Center, Georgia
- Children’s Mercy, Kansas City

### I-PASS Mentored Implementation (1st 16 sites)

- % adherence to all 5 elements mnemonic
- Provider-reported adverse event rate
Adapting I-PASS For Patient & Family Centered Rounds

- Patient and Family I-PASS Study
  - Funded by a grant from PCORI
  - Aim: To determine if improving communication and integrating patients/families into all aspects of decision making during hospitalization will
    - Improve patient safety
    - Improve patient and family experience

Scaling I-PASS

Crossing The Dissemination Chasm...
### Positive Financial Return for Healthcare System

<table>
<thead>
<tr>
<th>Estimated Cost of Adverse Event</th>
<th>$5,000$¹</th>
<th>$12,000$²</th>
<th>$27,000$³</th>
</tr>
</thead>
</table>

- I-PASS program prevents ~1.5 adverse events per 100 hospital admissions per year.

<table>
<thead>
<tr>
<th>Hospital admissions/year</th>
<th>Hospital Savings over 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hospital</td>
</tr>
<tr>
<td>10,000</td>
<td>$2.2M</td>
</tr>
<tr>
<td>25,000</td>
<td>$5.5M</td>
</tr>
<tr>
<td>50,000</td>
<td>$11.3M</td>
</tr>
<tr>
<td>75,000</td>
<td>$16.6M</td>
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</tbody>
</table>

2. [Source](#): [American Journal of Medical Quality, p1-7, DOI:10.1177/1062860615608938]

### Harvard Business School Health Acceleration Challenge

- **Question:** How do we continue to spread?

  - **Selected as finalist in HAC**
    - Access to healthcare business community
    - Identified CEO / VP Business Development

- **Formed I-PASS Institute**
  - Patient Safety Improvement Company
  - Training and Consulting

### I-PASS Institute Solutions

- **We help hospitals...**

<table>
<thead>
<tr>
<th>Assess and Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess needs and identify vulnerabilities</td>
</tr>
<tr>
<td>Engage stakeholders and build team</td>
</tr>
<tr>
<td>Adapt I-PASS to your institution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Train and Implement</th>
</tr>
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<tbody>
<tr>
<td>Train front-line providers (cost effective and efficient)</td>
</tr>
<tr>
<td>Observe and give feedback in the workplace to support learning</td>
</tr>
<tr>
<td>Integrate into workflow</td>
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<tr>
<th>Improve and Sustain</th>
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<tbody>
<tr>
<td>Provide benchmark analytics</td>
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<tr>
<td>Improve, refine and sustain I-PASS over time</td>
</tr>
<tr>
<td>Get providers to use I-PASS every day to improve patient safety</td>
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</table>
Using our Evidence Based Bundle of Interventions

The i-PASS Institute provides hospitals with a proven blueprint for implementation, making it easier for hospitals to implement with real-world experience and technology-enabled tools. This includes the following package of solutions:

- **Custimized for Your Institution to Support Communication & Collaboration**
  - **Implementation Guide & Web Portal**
  - **Virtual Interactive Learning**

**Custimized for Your Institution to Support Communication & Collaboration**

- **I-PASS Institute Mentorship Services**
  - Certified mentors with years of real-world implementation experience guide hospitals every step of the way.

- **I-PASS Institute Web-Based Training Tools**
  - Interactive, online simulation training makes initial and ongoing training engaging, efficient, and effective for permanent and rotating staff.

- **I-PASS Institute Handoff Observational Software**
  - A privacy web-based handoff tool facilitates direct observational reinforcement.

**I-PASS Institute Electronic Health Record (EHR) Integration**

- A library of pre-configured i-PASS templates for the most common specialties/departments.
  - The I-PASS Institute will work with your IT department to integrate i-PASS Institute templates into your EHR system.

**I-PASS Institute Implementation Guide**

- A cloud-based, customizable roadmap for each hospital including sum-key documentation, visual checklists, timelines and supporting documentation.

**Virtual Interactive Learning**

- **Learn, Practice, Self-assess**

**Welcome to I-PASS at St. Jude**

Confidential - Do Not Distribute
• Communication and handoff errors are common
• Training and multi-faceted approach needed to standardize and improve patient handoffs
• I-PASS Handoff Bundle → Decreased rates of medical errors and adverse events
  ▪ No negative impact on physician workflow once hardwired
• I-PASS can be adapted for use in diverse settings and scaled for institution-wide adoption
Funding Sources

• Department of Health and Human Services (I-PASS Study)
  • Additional funding for I-PASS Study 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)

• CRICO (Pilot Study and CRICO 5-hospital implementation project)
• AHRQ (Mentored Implementation I-PASS)
• PCORI (Patient and Family Centered I-PASS)

Thank you!!
Questions? clandrigan@partners.org