Better Handoffs, Safer Care: An Overview of the I-PASS Handoff Program

Amy J. Starmer, M.D., MPH
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 development and implementation of I-PASS
  - Evidence-based handoff bundle
  - Impact on medical errors and patient safety
Background
Patient Safety Movement

- Institute of Medicine Report (1999)
- Estimated 98,000 preventable deaths per year due to medical errors
  - More common reason for death than
    - Breast Cancer
    - AIDS
    - Motor Vehicle Accidents
Medical Error and Causes of Death in USA in 2013

- Cancer: 585k
- Heart Disease: 611k
- COPD: 149k
- Suicide: 41k
- Motor Vehicles: 34k
- Firearms: 34k
- Medical Error: 251k

Total Causes: 2,597k
Communication Failures

Poor Quality Handoffs Cause Communication Failures

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

Handoff Video Clip
Improving Handoffs Take 1: Single Institution Pilot Study
Resident Handoff Bundle: Boston Children’s Hospital

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

Starmer AJ et al. JAMA 2013
Results: Medical Error and Preventable Adverse Events

Rates per 100 Admissions

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

Starmer AJ et al. JAMA 2013
Single Institution Pilot Study: Limitations

- 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
Improving Handoffs Take 2: The I-PASS Study - Development of an Enhanced Educational Intervention
IIPE-PRIS Accelerating Safe Sign-outs

- 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 $3 million grant from U.S. Dept of Health and Human Services September 2010
Challenges of Improving Handoffs

Handoffs are

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

Handoffs Are A Complex Skill

Concept Model For Handoffs

Development of the I-PASS Curriculum

Needs Assessment

Revision and Refinement

Writing Goals and Objectives

Implementation and Evaluation

Developing Educational Activities

Intervention:
I-PASS Handoff Bundle Components

- Introductory Workshop
- TeamSTEPPS Training
- Simulation Exercises
- Faculty Development
- Structured Observation & Feedback
- I-PASS Handoff Document
- I-PASS Printed Handoff Document
- I-PASS Mnemonic
- I-PASS Campaign
Standardized Structure for Communication: The I-PASS Mnemonic

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

**Importancia de la enfermedad**
Estable, en observación, inestable

**Paciente (resumen)**
Situación resumida; acontecimientos que condujeron a la admisión; curso hospitalario; plan

**Acciones (lista)**
Lista de tareas, tiempo y responsabilidad

**Situaciones & planes de contingencia**
Saber qué está pasando, cuál es el plan si...

**Síntesis del receptor**
El receptor resume lo importante, hace preguntas y repite las acciones importantes
Key I-PASS Concept: Synthesis by Receiver

COMMUNICATION

Sender initiates message

CLOSED

Receiver accepts message, provides feedback confirmation

LOOP

Sender verifies message was received
Key I-PASS Concept: Synthesis by Receiver
Core Training Workshop

2-Hour Session of Didactic and Interactive Exercises
• TeamSTEPPS Training
• Handoff skills training, including introduction to the Verbal Mnemonic

Followed by

1-Hour Handoff Simulation Session
• 3 Scenarios that allowed residents the opportunity to give, receive, and evaluate a handoff
• Faculty facilitators provide feedback and guide discussion
Simulation: An Integral Component of the I-PASS Curriculum
I-PASS Faculty Development

- Development of “I-PASS Faculty Champions”
  - I-PASS Champions Guide
  - Physicians received Maintenance of Certification and CME credit to encourage participation
  - Opportunity for participation at multiple levels
I-PASS Direct Observation Tools
Development Process

- Expert panel identified key elements of effective handoffs
- Reviewed published literature for examples, items, and rating scales
- Created direct observation tool
  - multiple revisions
  - pilot tested and further revised
- Generated robust validity evidence
I-PASS Printed Handoff Document

I-PASS Provider Sign Out Notes - Peds Hospitalist

Illness Severity: Stable

Patient Summary:
18 month old ex 24 week premature infant with h/o severe BPD, seizure disorder and FTT s/p G-tube, admitted for bronchiolitis

Presented with 2 days of fever, one day of cough, and acute respiratory distress with severe substernal retractions.

Bronchiolitis- had been improving on 1 L O2 NC but this afternoon had deep retractions and crackles, CXR ordered today, on racemic epi nebs

Now fever today - Has had negative blood and urine cultures but is febrile today, not on antibiotics

FTT - on g-tube feeds at maintenance rate

Seizures - stable, none since admission, continue home meds

Action List:
[ ] Assess baseline respiratory status after handoff and every few hours
[ ] Follow up CXR
[ ] Monitor INs and OUTs
[ ] Monitor fever curve

Situation Awareness and Contingency Planning:
[ ] If no improvement after racemic epi, call ICU eval
[ ] If CXR suggestive of pneumonia or persistently febrile, discuss antibiotics with senior
[ ] If continues on IVF order electrolytes in the morning
[ ] If seizure > 5 min give ativan

Problem List: Bronchiolitis, BPD (bronchopulmonary dysplasia), Failure to thrive, Gastrostomy tube dependent, GERD (gastroesophageal reflux disease), Prematurity ex 24 week infant, Seizure disorder

Admission Wt.: 12.00 kg

Last Wt.: 12 kg (26 lb 7.3 oz) (04/27 0600)

Last Vitals

24 Hr VS Range

Diet:

Scheduled Meds:
- EPINEPHrine , ONCE
- levetiracetam, 5 mg/kg, DID

Continuous Meds:
- dextrose 5%-NaCl 0.225%-KCl 20 mEq/L
I-PASS Campaign Materials

- Posters
- Pocket cards
- Study Logo
- Badge Clips
- “just in time” refresher training sessions

I-PASS Campaign Materials

• Briefs are great for short-term planning to review roles, responsibilities, and available resources. They may be “brief” but they’re worth the time!
The I-PASS Study: Methods and Findings
Objective: to determine if implementation of I-PASS Handoff Bundle is associated with:

- Reduction in overall error rates and preventable adverse events
- Improved written and verbal handoff communication
- Change in resident workflow patterns
I-PASS Study Design

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>
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<tr>
<td></td>
<td>Jan Jun</td>
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<td>Feb Aug</td>
<td>Mar Aug</td>
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<td>Jun Sep</td>
<td>Jul Sep</td>
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<td>Oct Dec</td>
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<td>May Sep</td>
<td>Jun Sep</td>
<td>Jul Sep</td>
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<td></td>
<td>Oct Dec</td>
<td>Nov Dec</td>
<td>Dec Dec</td>
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<tr>
<td>UCSF</td>
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<td>Stanford</td>
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<td>Washington University</td>
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<td>Cincinnati</td>
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<td>Utah</td>
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<td>St. Christophers</td>
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<tr>
<td>National Capital Consortium</td>
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<tr>
<td>Sick Kids</td>
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<tr>
<td>OHSU</td>
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- **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 and 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: 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
Quality Improvement Study Methods: Faculty Observations to Measure Mnemonic Adherence

- Handing off patients is a skill which requires feedback
- Training programs required to “ensure and monitor structured handoffs”
- Observation tools developed to assist with feedback and measure adherence
- American Board of Pediatrics Maintenance of Certification credit offered to incentivize faculty participation
Results – Process Measures

% of Verbal Handoffs with Key Elements Present

* P < 0.001

N = 207 verbal handoff sessions, 2281 unique patient handoffs

Results – Process Measures
% of Written Handoffs with Key Data Elements
* P < 0.001

N = 432 written handoff documents, 5752 unique patient entries

Implementation Measures: I-PASS Adherence as Quality Improvement

I-PASS Faculty Champion MOC Project: Percent of Residents Adhering to 5 Elements of I-PASS Mnemonic

Monthly Averages

Monthly Average

Median

Goal (90)
## Results – Primary Outcome

### Medical Error Rates

<table>
<thead>
<tr>
<th></th>
<th>Pre (n=5516 admissions)</th>
<th>Post (n=5571 admissions)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall rate of medical errors</strong></td>
<td>24.5</td>
<td><strong>18.8</strong></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Preventable adverse events</strong></td>
<td>4.7</td>
<td><strong>3.3</strong></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Near misses / non harmful medical errors</strong></td>
<td>19.7</td>
<td>14.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Non-preventable Adverse Events</strong></td>
<td>3.0</td>
<td>2.6</td>
<td>0.48</td>
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</table>

*Starmer AJ, Spector ND, Srivastava R et al. Changes in Medical Errors After Implementation of a Handoff Program. NEJM 2014*
### Results – Balancing Measures

#### Resident Workflow

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

*Starmer AJ, Spector ND, Srivastava R et al. Changes in Medical Errors After Implementation of a Handoff Program. NEJM 2014*
Evidence of Culture Change

Sent: Thursday, October 25, 2012 4:46 AM  
To: Amy Starmer  <starmer@ohsu.edu>  
Subject: IPASS

Amy,

I am just writing to let you know that I am an IPASS fan!!! The idea of the "shared mental model" that the IPASS team emphasized in a morning report IPASS huddle a few months ago was very helpful. I am now the night senior on the wards and have been timing sign-out every night. This standardized method of sign-out is thorough, efficient, and focused, and takes less time than expected. Tonight, in fact, one of the teams tried to give very informal sign-out (not in our new IPASS format) and it was horrible. Our night team actually asked for repeat sign-out in the IPASS format which resulted in a much improved sign-out.

So, I have to admit, when we first started doing IPASS, I loved to say, "I pass on IPASS", but now I am a huge supporter. Thanks for starting this in our residency. It really is resulting in better patient care, per my perspective.

See you soon,

Charlotte
Better Handoffs. Safer Care.
Ongoing Work and Future Directions
I-PASS Website and MedEdPORTAL

www.ipasshandoffstudy.com
United States I-PASS Downloads

3,079 US Curricular Downloads
Updated April 21st, 2017
International I-PASS Downloads

735 International Downloads
Updated April 21st, 2017
I-PASS By Provider Type And Clinical Setting

I-PASS

Updated April 21st, 2017
Adapting I-PASS For Other Providers

- Nurses and Medical Students
- Specialties beyond Pediatrics
  - Society for Hospital Medicine Mentored Implementation Program
  - CRICO Mentored implementation Program
- Patient and Family I-PASS Study
  - Structured communication, health literacy, family centered rounds
I-PASS Implementation for Nurses

Nursing I-PASS Implementation

- Increased inclusion of
  - Illness severity assessment (37% vs 67%)
  - Patient summary (81% vs 95%)
  - To do list (35% vs 100%)
  - Opportunity for receiving nurse to ask questions (34% vs 73%).

- Overall, 13/21 (62%) of verbal handoff data elements were more likely to be present following implementation

- Decrease in interruption frequency (67% vs 40% of handoffs with interruptions)

- No change in the median handoff duration (18.8 min vs 19.9 min, p=0.48) or other workflow activities
I-PASS Mentored Implementation

- I-PASS Study Group partnered with the Society for Hospital Medicine: Mentored Implementation approach
- Selection of 32 institutions across North America
- Adaptation of all curricular materials
  - Materials for adult providers
  - Implementation guide specifying key milestones
  - Focus on more independent and flexible learning (e.g. “flipped classroom” approach)
- Mentorship team and QI collaborative
Mentored Implementation Results

Adherence to All 5 I-PASS Mnemonic Elements (% Usually or Always)

Handoff-Related Adverse Event Rate (Mean Patients per Rotation Experiencing Any Harm)

= Wave 1  = Wave 2  = Goal Line
Moving beyond end of shift / inpatient settings
- Vast majority of health care takes place in ambulatory setting, yet most research has focused on the inpatient setting
  - Post discharge adverse event rate may be as many as 5-6 times as high as in-hospital

Current Projects
- Inpatient to Outpatient transitions (hospital to home)
- Ambulatory care to the Emergency Room
  - “receiver driven” handoff
Next Step:
International I-PASS Adaptation!
Summary / Take Home Points

• High frequency of communication and handoff errors
• Training and multi-faceted approach needed to standardize and improve patient handoffs
• I-PASS Handoff Bundle → decreased rates of medical errors and adverse events
Acknowledgements

I-PASS Study Group