Date: June 12, 2019

Speaker(s) Name: Brandyn Lau, MPH, CPH

Speaker(s) Disclosure information: Please include the speaker’s relationships as they are listed on the MedStar Financial Disclosure form. If none, write ‘No relevant financial relationships to report’

Talk Title: Reducing Emergency Department Boarding Time, Hospital Length of Stay, and Inpatient Mortality for Hospitalized Patients after Implementation of an Electronic Throughput Dashboard

Learning Objectives:
1. Describe the burden of extended boarding hours in the emergency department.
2. Identify barriers to timely throughput from the emergency department to the inpatient setting.
3. Assess the effect of a real-time throughput dashboard on emergency department boarding hours and inpatient mortality.

Commercial Support for this activity has been provided by:
No commercial support has been provided.

The following Planning Committee members have reported no relevant financial relationships:
Ariana Longley, MPH; David Mayer, MD

Accreditation
In support of improving patient care, this activity has been planned and implemented by MedStar Health and the Patient Safety Network. MedStar Health is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Credit Designation
MedStar Health designates this live activity for a maximum of 1.00 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.
Agenda

• 10 Minutes: Introduction to Patient Safety Movement Foundation and Actionable Patient Safety Solutions (APSS)
• 40 Minutes: Patient Safety Movement Foundation’s Expert Presentation led by
  – Brandyn D. Lau, MPH, CPH
• 10 Minutes: Q & A
Fostering New Efforts and Building On Existing Patient Safety Programs Through Commitments to ZERO
Who Can Take Action?

- **Hospitals & Healthcare Organizations**
  - Make a *Commitment*

- **Committed Partners**
  - Sign the *Commitment to Action* letter

- **Healthcare Technology Companies**
  - Sign the *Open Data Pledge*

- **Patient & Family Advocates**
  - Share their *Patient Story*, Utilize Resources
Actionable Patient Safety Solutions (APSS)

- Culture of Safety
- Patient Blood Management
- Airway Safety
- Healthcare-associated Infections (HAIs)
- Hand-off Communications
- Early Detection and Treatment of Sepsis
- Medication Safety
- Neonatal Safety
- Systematic Prevention and Resuscitation of In-hospital Cardiac Arrest
- Monitoring for Opioid-Induced Respiratory Depression
- Optimizing Obstetric Safety
- Embolic Events
- Mental Health
- Falls and Fall Prevention
- Nasogastric Feeding Tube (NGT) Placement and Verification
- Person and Family Engagement
- Patient Safety Curriculum
- Post-operative Delirium in Older Adults

Download and share our APSS at www.patientsafetymovement.org/apss
Impact to Date

Hospitals Committed to ZERO

- 2013: 63 hospitals
- 2014: 100 hospitals
- 2015: 515 hospitals
- 2016: 1,624 hospitals
- 2017: 3,526 hospitals
- 2018: 4,598 hospitals
- 2019: 4,710 hospitals
Impact to Date

Lives Saved Annually by Hospitals*

*Numbers are based on self-reported data provided by hospitals
Reducing Emergency Department Boarding Time, Hospital Length of Stay, and Inpatient Mortality for Hospitalized Patients after Implementation of an Electronic Throughput Dashboard

Brandyn D. Lau, MPH, CPH
Assistant Professor of Radiology and Radiological Science & Health Sciences Informatics, Johns Hopkins School of Medicine
Associate Faculty, Armstrong Institute for Patient Safety and Quality
Emergency Department Boarding

• Boarding in the emergency department (ED) occurs when patients are held in the ED after they have been admitted to the hospital until they are physically in an inpatient bed.

• The Joint Commission considers long boarding times to increase health risks for patients, including delays to receiving care.

• Economic Implications: A 1-hour reduction in ED boarding time could increase daily revenue by up to $13,000.

• Longer boarding times have been identified as the main reason for overcrowding in the ED which have been associated with increased mortality.
Emergency Department Boarding

- In a study of ~41k patients admitted through ED, increasing boarding time was associated with increased mortality (Singer Acad Emerg Med 2011)
  - 2.5% with boarding < 2 hours
  - 4.5% with boarding ≥ 12 hours

- Another study ~39k patients admitted through ED, longer boarding hours were associated with higher mortality among non-ICU patients (Reznek Med Care 2018)
National Goals for Boarding Hours

• The Joint Commission recommends that boarding times average 4 hours or less

• Still, average ED boarding hours have ranged from 2 to >24 hours
Internal Medicine – Johns Hopkins Hospital

- 570+ Full-time faculty
- 3000+ Employees (nurses, fellows, staff)
- Cardiology, Pulmonary, GI, ID, Endocrine, Renal, Rheumatology, GIM, and Osler Residency Program, etc.
Department of Medicine

- ~275 open and staffed beds
- 13,500+ inpatient admissions
- 96,000+ outpatient clinic visits
Emergency Department

- 35,000 sq. ft.—three times the size of old ED
- 67+ private exam rooms
- 17-bed emergency acute care unit
- 6 trauma rooms
- 8 emergency psychiatry beds
- Expanded radiology suite—X-Ray, CT, MRI, and ultrasound
Operating Challenges

- No added capacity
- 30-day readmissions
- ACGME (Accreditation Council for Graduate Medical Education)
- Culture of no information
- Lack of effective communication between teams
• **23%**
  - total ED visits result in inpatient admissions

• **65%**
  - of those admissions come to Internal Medicine

• The daily patient workflow is affected by ED volumes and the ED relies on Internal Medicine for efficient throughput
Assignment process starts

Bed Request

Bed Available

283 Minutes

Unit Assigned

130 Minutes

ED Depart

90 Minutes

44% of total Boarding Time

56% of Boarding Time
Assignment process starts

Bed Request

283 Minutes

Bed Available

130 Minutes

Unit Assigned

90 Minutes

ED Depart

Bed Wait Time

56% of total Boarding Time

Process Time

44% of total Boarding Time
Bed Request (Decision to Admit)

Provider?

Service?

Team?

Pending Discharge

Dirty Bed

Clean Bed

Bed Dirty

Bed Clean

Nursing HandOff

Provider Handoff

Patient Depart ED

Look up units

Assign Unit

Assign Unit

If all conditions met

If one condition fails

Bed not dirty – pt still in bed

Dirty when requested

Bed Clean before request

Bed Clean after request

Bed Clean before request

Clean Bed

Clean Bed

Bed Clean before request

Provider Handoff

Provider Handoff

Bed Dirty

Bed Clean

Bed Dirty

Bed Clean

Bed Dirty
## Static (and Stale) Reports

The Johns Hopkins Hospital  
Summary: updated: Oct 16, 2010

### Access Dashboard Performance Indicators

<table>
<thead>
<tr>
<th></th>
<th>FY 2011</th>
<th>FY 2010</th>
<th>FY 2008</th>
<th>FY 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average LOS (days)</strong></td>
<td>Jul</td>
<td>Aug</td>
<td>Sep</td>
<td>Oct</td>
</tr>
<tr>
<td></td>
<td>5.73</td>
<td>6.02</td>
<td>5.91</td>
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<tr>
<td><strong>Avg. Daily Census (Midnight)</strong></td>
<td>778.1</td>
<td>767.2</td>
<td>772.9</td>
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<tr>
<td><strong>Bed Availability</strong></td>
<td>18.3%</td>
<td>19.2%</td>
<td>18.6%</td>
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<tr>
<td><strong>ED - Adult Boarding Hours</strong></td>
<td>6.09</td>
<td>5.02</td>
<td>5.42</td>
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<tr>
<td><strong>HAL Calls Admitted</strong></td>
<td>733</td>
<td>753</td>
<td>638</td>
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</tbody>
</table>

*note: data not available for FY 2008

The Johns Hopkins Hospital - Confidential
<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Date</th>
<th>Time</th>
<th>Specific Movement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>06/10/19</td>
<td>08:00</td>
<td>Walking</td>
<td>Normal</td>
</tr>
<tr>
<td>002</td>
<td>06/10/19</td>
<td>09:00</td>
<td>Running</td>
<td>IOC</td>
</tr>
<tr>
<td>003</td>
<td>06/10/19</td>
<td>10:00</td>
<td>Cycling</td>
<td>Sprint</td>
</tr>
<tr>
<td>004</td>
<td>06/10/19</td>
<td>11:00</td>
<td>Swimming</td>
<td>Breaststroke</td>
</tr>
<tr>
<td>005</td>
<td>06/10/19</td>
<td>12:00</td>
<td>Yoga</td>
<td>Vinyasa</td>
</tr>
<tr>
<td>006</td>
<td>06/10/19</td>
<td>13:00</td>
<td>Stretching</td>
<td>Deep Breath</td>
</tr>
<tr>
<td>007</td>
<td>06/10/19</td>
<td>14:00</td>
<td>Meditation</td>
<td>Zazen</td>
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<tr>
<td>008</td>
<td>06/10/19</td>
<td>15:00</td>
<td>Tai Chi</td>
<td>Taijiquan</td>
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<tr>
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<td>06/10/19</td>
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<td>Tai Chi</td>
<td>Taijiquan</td>
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<td>012</td>
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<td>19:00</td>
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<td>Long Run</td>
</tr>
</tbody>
</table>

*Note: IOC stands for Intermittent Onset Clonorchis.*
Combining Data from Multiple Sources

Clinical Systems
ADT Systems
ED Systems
Flat Files
OR Systems

ETL
Extract
Transform
Load

Data Warehouse
Meta Data
Summary Data
Raw Data

OLAP Analysis
Reporting
Data Mining

Patient Safety
MOVEMENT
Extracts data from the source system

Apply functions to conform data to a standard dimensional

Load the data into data mart for consumption

Load the data from the data mart into cube for browsing
Connecting in Real-Time

Access Anywhere
From any device

Home
Travelling
Office
Dashboard

- Real-time information regarding current demand and supply
- A five-stage alert system (heat map) is available to enhance decision making process where the referral source will change its color based on the volume from green to red.
- Allows users to identify any patients waiting in emergency department for more than 24 hours, prompting appropriate staff to get updated status on those patients and, if needed, send an internal medicine consultant to re-evaluate patient and decide further course of action.
Correlation Between Occupancy and Boarding Hours

Correlation – 0.60
P value – 0.000
Inflection Point – 211 beds or 84% occupancy
Median ED Boarding Hours
Outcomes

• Median boarding times for internal medicine patients significantly decreased by 51% (7.9 hours vs. 3.9 hours, p<0.001)

• Median length of hospitalization significantly decreased by 25% (4 days vs. 3 days, p<0.001)

• Inpatient mortality decreased significantly by 57% (3.5% vs. 1.5%, p<0.001) between the pre- and the full-implementation periods
  – Inpatient Mortality: 3.5% → 2.1% → 1.5%
Unintended Benefits

• Identified underlying workflow and staffing issues

• Predicting bed availability → Pre-assignment
Summary

- Reduced LOS (length of stay)
- Reduced ED-boarding hour time
- Changes to daily hospital operations
- Enhanced communication amongst patient care teams (attendings, nurses, social workers, case managers, and administrators)
Acknowledgements

- Hetal Rupani
- Sanjay Desai
- Omar Harfouch
- Laura Vail
- Angeline Aringo
Q & A
Save the Dates!

**Patient Safety E-Newsletter: July 2019 Issue**

To be released July 1, 2019

*Follow our progress!*

**Midyear Planning Meeting:** Tuesday, September 17, 2019 | World Patient Safety Day

Beckman Center of the National Academies of Sciences & Engineering, University of California, Irvine (UCI)

*Request your invitation today!*

**Next Quarterly Webinar:** September 4, 2019

Topic: APSS #10: The Advanced Resuscitation Training (ART) System of Care as a Potential Scaffolding for Reducing Preventable Death
Thank you!