Measuring Whole System and Whole Person Harm

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Carol Haraden, PhD

Tuesday, December 8th
1:30 PM

Session Objectives

1. Distinguish between the two methods to measure whole system harm presented and the current method for harm measurement in your system.
2. Describe the concept of measuring whole person harm.
3. Identify the issues that are holding us back from improving the level of patient harm.
Outline for this session

- Quick Exercise
- Introduction to Measuring System Harm
- Global Trigger Tool Findings
- Whole Person Measure Findings
- Questions & Discussion

Exercise

On a piece of paper, list 3-5 inpatient harms your organization is focused on improving/reducing (something leadership talk about often and staff know are important).

(2-3 minutes)

Share your list with others at your table. Which harms are seeing the most improvement? Why?

(5 minutes)
A Different Question

What if we asked:

“What percent or number of inpatients experience any of the harms on your list during an admission?”

This session is about that transition in thinking.

Safety is a System Property

- It can not be understood using a number of disparate metrics
- Even good individual reliabilities do not equal reliability of the whole
Complex Systems

Probability of success, each step:

<table>
<thead>
<tr>
<th># of steps</th>
<th>95%</th>
<th>99%</th>
<th>99.9%</th>
<th>99.99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.95</td>
<td>0.99</td>
<td>0.999</td>
<td>0.9999</td>
</tr>
<tr>
<td>25</td>
<td>0.28</td>
<td>0.78</td>
<td>0.975</td>
<td>0.997</td>
</tr>
<tr>
<td>40</td>
<td>0.12</td>
<td>0.66</td>
<td>0.96</td>
<td>0.995</td>
</tr>
<tr>
<td>100</td>
<td>0.006</td>
<td>0.37</td>
<td>0.90</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Window on patient harm

Current Reporting
- **Internal**
  - Incident reporting system
  - Serious & Sentinel Event
  - Morbidity & Mortality Meetings
- **External**
  - Injury claims
  - CMS reporting (HUCs)
  - Regulatory/JCAHO
- **Patients**
  - Patient complaints
  - Patient surveys
  - Focus groups

Metrics
- **Routine data**
  - Surveillance systems
  - Audits
  - Quality Improvement
- **Patient Administration System**
  - Coding data
  - System level harm measure?
A View of System Safety Using Global Trigger Tool Findings

How much harm?

ERRORS & ADVERSE EVENTS

By David C. Classen, Roger Resar, Frances Griffin, Frank Federico, Terri Frankel, Nancy Kimmel, John C. Whittington, Allan Frankel, Andrew Seger, and Brent C. James

‘Global Trigger Tool’ Shows That Adverse Events In Hospitals May Be Ten Times Greater Than Previously Measured

Exemplar Hospital Validation Review

<table>
<thead>
<tr>
<th></th>
<th>Hospital A</th>
<th>Hospital B</th>
<th>Hospital C</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events/1000 patient days</td>
<td>79</td>
<td>90</td>
<td>85</td>
<td>83</td>
</tr>
<tr>
<td>Events/100 admissions</td>
<td>49</td>
<td>37</td>
<td>48</td>
<td>45</td>
</tr>
<tr>
<td>% of admissions with an event</td>
<td>35%</td>
<td>28%</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Methods of Detection

**ERRORS & ADVERSE EVENTS**

Exhibit 4

Adverse Event Detection by Severity Level and Hospital

<table>
<thead>
<tr>
<th>SEVERITY LEVEL</th>
<th>IHI Global Trigger Tool</th>
<th>AHRQ Patient Safety Indicators</th>
<th>Hospital voluntary reporting system</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>204</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>124</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>G</td>
<td>8</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>H</td>
<td>14</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>354</td>
<td>35</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital A</td>
<td>161</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Hospital B</td>
<td>92</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Hospital C</td>
<td>101</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>354</td>
<td>35</td>
<td>4</td>
</tr>
</tbody>
</table>

Additional GTT Reviews Plus Exemplar Hospitals

<table>
<thead>
<tr>
<th></th>
<th>3 Exemplar Hospitals (900 Charts)</th>
<th>40 Bed rural Hospital (300 Charts)</th>
<th>10 Hospital Research Project (240 charts)</th>
<th>7 Hospital System (3000 Charts)</th>
<th>Multi-state Tertiary System (2000 charts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events/1000 Days</td>
<td>83</td>
<td>90</td>
<td>NA</td>
<td>119</td>
<td>86</td>
</tr>
<tr>
<td>Events/100 admissions</td>
<td>45</td>
<td>40</td>
<td>37</td>
<td>41</td>
<td>38</td>
</tr>
<tr>
<td>Admissions with adverse events</td>
<td>32%</td>
<td>30%</td>
<td>30%</td>
<td>29%</td>
<td>30%</td>
</tr>
</tbody>
</table>

NZ Results

2011-2012
- Records Reviewed: 339
- Total events: 152
- Events/1,000 bed days: 64.34
- Events/100 admissions: 44.84
- Percent Patients harmed: 34.22

Event categories:
- E: 81 (53.29%)
- F: 65 (42.76%)
- G: 2 (1.32%)
- H: 3 (1.32%)
- I: 1 (0.66%)
OIG Study of Medicare Beneficiaries

- 780 patient records from October 2008
- 13.5% with adverse events (Excluding E’s)
- 13.5% with temporary harm (E’s)
- **27% of patients experiencing harm**
- 44% preventable
- $234 million excess cost

OIG Study #2: Adverse Events in Medicare Beneficiaries in Skilled Nursing Facilities

Sample
- 653 Medicare beneficiaries
  - All 50 States and DC
  - Drawn from 100,771 beneficiaries who met criteria
  - Included long-stay and short-stay population
Findings

All harm = 33%

AE = 22%

TH 11%

I H G F E

Are we improving in the US?

The NEW ENGLAND JOURNAL of MEDICINE

Temporal Trends in Rates of Patient Harm Resulting from Medical Care

Christopher P. Landrigan, M.D., M.P.H., Gareth J. Parry, Ph.D., Catherine B. Bones, M.S.W., Andrew D. Hackbarth, M.Phil., Donald A. Goldmann, M.D., and Paul J. Sharek, M.D., M.P.H.
North Carolina Harm Study

- 10 hospitals
- 2341 patient records from 5 year period

- 588 harms
  - 25 / 100 admissions

Conclusions:
- Harms remain common
- Little evidence of improvement


A View of System Safety Using A Whole Person Safety Measure
Great thinkers on “parts and wholes”

Aristotle (384-322 BC)
“The whole is greater than the sum of its parts”

Blaise Pascal (1623-1662)
“I find it impossible to know the parts without knowing the whole, let alone to know the whole without knowing the parts very specifically”

The whole patient is greater than the sum of their individual measures…
Kidney Stone Treatment

BMJ, Volume 292, 1986, p. 879-882

<table>
<thead>
<tr>
<th></th>
<th>Treatment A</th>
<th>Treatment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small stones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>93% (81/87)</td>
<td>87% (234/270)</td>
</tr>
<tr>
<td>Large stones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td>73% (192/263)</td>
<td>69% (55/80)</td>
</tr>
<tr>
<td>Both</td>
<td>78% (273/350)</td>
<td>83% (289/350)</td>
</tr>
</tbody>
</table>

# of successful cases / total patients

- The paradoxical conclusion is that treatment A is more effective with small stones and large stones individually, yet treatment B is more effective when considering both sizes at the same time.

- Stone size not previously known to be important (confounder)

Simpson’s Paradox

- Discovered by Edward H. Simpson, 1951
- Paradox in probability and statistics

“Situation where a trend appears in different groups of data but disappears or reverses when these groups are combined”
### Healthcare Paradox??

- Readmissions (all cause)
- DVT
- CAUTI
- Falls
- Pressure Ulcers
- HACs
- 15,000 deaths prevented
- 560,000 harms avoided
- $4.1 billion savings

- 22% of SNF beneficiaries harmed
- Additional 11% experienced temporary harm
- 60% events likely preventable
- $2.8 billion on harm treatment in 2011


### Parts vs. Whole

<table>
<thead>
<tr>
<th>Pneumonia vaccination</th>
<th>Falls</th>
<th>Urinary Tract Infection</th>
<th>Iatrogenic pneumothorax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of mortality</td>
<td>Pressure Ulcers</td>
<td>Ventilator Associated Pneumonia</td>
<td>Poor blood glucose control</td>
</tr>
<tr>
<td>Aspirin on arrival</td>
<td>CLABS</td>
<td>Accidental Puncture</td>
<td>30 Day Readmission</td>
</tr>
<tr>
<td>HbA1c</td>
<td>Wait time in ED</td>
<td>DVT</td>
<td>Air embolism</td>
</tr>
</tbody>
</table>


Safety Table

<table>
<thead>
<tr>
<th>Pt (n=9)</th>
<th>DVT</th>
<th>PV</th>
<th>Fall</th>
<th>Fall</th>
<th>Bl</th>
<th>Poor</th>
<th>GAVTi</th>
<th>Med</th>
<th>CAUTI</th>
<th>C.diff %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Tom</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Fran</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Eric</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Holly</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Bill</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Paula</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Lloyd</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
<tr>
<td>Kate</td>
<td>V</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>V</td>
<td>89%</td>
</tr>
</tbody>
</table>

Patient Compliance = 89%
Measure Compliance = 89%
Harm-free patients through the system = 0%

Whole-Patient Measure of Safety

- Focus on the entire care experience (hospitalization)
- Identifies a set of Highly Undesirable Events (HUE) that could happen to any patient during a hospitalization
  - global measure
  - really bad things (egregious/?never events)
- Employs UHC Clinical Database (ICD-9)
- POA = N or U
14 HUEs
Q: Can we think of these 14 things as one event?

<table>
<thead>
<tr>
<th>HUE</th>
<th>Condition</th>
<th>Agency</th>
<th>ICD-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.1</td>
<td>Air embolism</td>
<td>CMS-HAC</td>
<td>999.1</td>
</tr>
<tr>
<td>H.2</td>
<td>Blood incompatibility</td>
<td>CMS-HAC</td>
<td>999.6</td>
</tr>
<tr>
<td>H.3</td>
<td>Pressure ulcer</td>
<td>AHRQ-PSI03</td>
<td>707.00…(cont)</td>
</tr>
<tr>
<td>H.4</td>
<td>Falls and trauma</td>
<td>CMS-HAC</td>
<td>800-829.99…(cont)</td>
</tr>
<tr>
<td>H.5</td>
<td>Catheter-associated UTI</td>
<td>CMS-HAC</td>
<td>996.64, 599.0</td>
</tr>
<tr>
<td>H.6</td>
<td>CVC BSI</td>
<td>AHRQ-PSI07</td>
<td>999.31</td>
</tr>
<tr>
<td>H.7</td>
<td>Poor glycemic control</td>
<td>CMS-HAC</td>
<td>250.10-250.13…(cont)</td>
</tr>
<tr>
<td>H.8</td>
<td>Admission ROM =1 &amp; expired</td>
<td>UHC NA</td>
<td></td>
</tr>
<tr>
<td>H.9</td>
<td>Death in low mortality DRG</td>
<td>AHRQ-PSI02</td>
<td>See AQRQ list</td>
</tr>
<tr>
<td>H.10</td>
<td>DVT/PE</td>
<td>CMS-HAC</td>
<td>415.11…</td>
</tr>
<tr>
<td>H.11</td>
<td>Iatrogenic pneumothorax</td>
<td>AHRQ-PSI06</td>
<td>512.1</td>
</tr>
<tr>
<td>H.12</td>
<td>Accidental puncture/laceration</td>
<td>AHRQ-PSI15</td>
<td>E87.00…</td>
</tr>
<tr>
<td>H.13</td>
<td>All cause 72 h readmission</td>
<td>UHC NA</td>
<td></td>
</tr>
<tr>
<td>H.14</td>
<td>HAI – SCIP (any patient)</td>
<td>CMS</td>
<td>CMS</td>
</tr>
</tbody>
</table>

Note: additional criteria and exclusions are also defined in this model

Key Question WPMoS Asks:

“What proportion of hospitalized patients experience at least 1 Highly Undesirable Event during their hospitalization?”
What is a Safe Hospital?

Distribution of HUE Rates
(% admissions with at least 1 HUE for each hospital during 24 month study period)
Performance over time (Pts >18 yo)

Percent of HUEs over time at two different hospitals with similar number of monthly discharges (avg. for both hospitals is approximately 1,700). Both Hospital A and B are teaching hospitals.

Both hospitals produce stable results over time

Number of HUEs documented during a hospitalization and average LOS
Number of HUEs documented during a hospitalization and average total direct cost

Yes, there are really some patients who have 6 HUEs documented during a single hospitalization!

Swiss Cheese Model of Harm

- WPMoS shows that many patients move through this low probability situation multiple times during a single admission.
- This should be a focus area for Risk Managers.

Growing Momentum

- Health Systems
- States
- Regions
- Countries

NHS Safety Thermometer

Was the patient protected from harm?

<table>
<thead>
<tr>
<th>Patient</th>
<th>Pressure Ulcer</th>
<th>Fall (with harm)</th>
<th>Urine Infection (catheters)</th>
<th>VTE</th>
<th>Harm Free Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>No</td>
</tr>
<tr>
<td>Patient 2</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>No</td>
</tr>
<tr>
<td>Patient 3</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>No</td>
</tr>
<tr>
<td>Patient 4</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Patient 5</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Clinical Audit
Real Time

Don’t keep me free from pressure ulcers but let me get a urine infection - protect me from all these harms and keep me harm free.

95% of patients survived, only 49% experienced ‘textbook outcome’

Broader Safety Perspective
(not just hospitals)
What is a Safe Hospital Society?

“Deep Safety”

“Understanding and honouring the behavioural and cultural elements of what I might call ‘deep’ safety – as opposed to ‘compliant’ safety or ‘looking good’ safety – demands a level of maturity and psychological sophistication that are too often simply not in the repertoire of an organisation, a leadership system, or a political economy.”

Don Berwick

John Illingworth, Continuous improvement of patient safety, Health Foundation, 2015
Discussion

- Did these ideas resonate with you?
- Have you/could you apply this thinking in your setting?
- What might be the greatest barrier to whole system/person approaches?