A Human Factors Approach to Root Cause Analysis

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Session Objectives

- Examine the need to trend underlying causes.
- Discuss use of underlying causes.
- Describe a standardized taxonomy for analyzing events.
- Detail taxonomy use in Common Cause Discovery.
- Analyze one organization's findings from Common Cause Discovery.
Greenville Hospital System

- 5 Medical Campuses with 1268 Beds
  - GMH = 750 Bed Tertiary Center
  - 2 Community Hospitals
  - Acute Surgical Hospital
  - LTACH
- > 10,000 Employees
  - > 1,250 Medical Staff
  - 731 Employed / Contracted Physicians
- $1.5B Net Revenue
  - > 42,000 Discharges
  - > 2.3 M Outpatient Visits
  - ~ 170,000 ETS Visits
- USC School of Medicine – Greenville
  - 7 Residencies / 7 Fellowships
  - > 5,000 Health Care Students

Common Cause Discovery

THE CASE FOR A NEW APPROACH
Institute of Medicine Reports

- “To Err is Human”: November 1999
  - Estimated 44,000–98,000 annual deaths due to medical error
  - Medical error would be the 8th leading cause of death
  - Equivalent to a jumbo jet crash every other day
  - Estimated a cost of $17 to $29 billion
  - Errors are caused primarily by faulty systems, processes, and conditions that lead people to make mistakes or fail to prevent them.

- “Crossing the Quality Chasm”: March 2001
  - Laid out a roadmap to improve the nation’s healthcare system
  - Six Aims for Improvement
    - Healthcare must be STEEEP
    - Safe, Timely, Effective, Efficient, Equitable, and Patient-centered

12 Years Later; How Safe Are We?

- “Temporal Trends in Rates of Patient Harm” (NEJM 2010)
  - Global Trigger Tool Harm Rates
  - No improvement between 2002 and 2007

- “Adverse Events in Hospitals” (OIG 2010)
  - 13.5% of patients experienced an adverse event w/ significant harm.
  - An additional 13.5% experienced an event w/ temporary harm.
  - 1.5% of patients experienced an adverse event that contributed to their death.
  - 44% of the adverse events were preventable.

- “…Adverse Events in Hospitals May Be Ten Times Greater Than Previously Measured” (Health Affairs 2011)
Current Quality Approach

- High Quality is Assumed to Equal High Patient Safety
- Quality Improvement is Project Based
  - Examples … Core Measures, CLABSI, Hand Hygiene, etc.
  - Too Many Things to Do!!! Not Sustainable!!!
- PI Methods are Inadequate
  - Failure to identify specific causes for performance and fix them.
  - Copy what someone else did and replicate it.
  - Use of inadequate PI methods (PDCA, Best Practice, etc.).
- Reactive, rather than Proactive
  - We will be talking about the same errors with the next case.
  - Punitive approach, rather than a system's based approach.

Future Quality Direction

The Ongoing Quality Improvement Journey: Next Stop, High Reliability

Abstract: Quality improvement in health care has a long history that includes such epic figures as Ignaz Semmelweiss, the nineteenth-century obstetrician who introduced hand washing to medical care, and Florence Nightingale, the English nurse who determined that poor living conditions were a leading cause of the deaths of soldiers in army hospitals. Systematic and sustained improvement in clinical quality in particular has a more brief and less heroic trajectory. Over the past fifty years, a variety of approaches have been tried, with only limited success. More recently, some health care organizations began to adopt the lessons of high-reliability science, which studies organizations such as those in the commercial aviation industry, which manage great hazard extremely well. We review the evolution of quality improvement in US health care and propose a framework that hospitals and other organizations can use to move toward high reliability.
## Stages of High Reliability

### Health Affairs: Chassin and Loeb: 2011

<table>
<thead>
<tr>
<th>Organizational characteristic</th>
<th>Leadership</th>
<th>Developing</th>
<th>Approaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage of maturity</td>
<td>Minimal</td>
<td>Developing</td>
<td>Approaching</td>
</tr>
<tr>
<td>Quality activities focused on regulatory requirements</td>
<td>Strategic importance of quality improvement not recognized</td>
<td>Chief executive officer leads proactive quality agenda</td>
<td>Organization commits to goal of high reliability for all clinical services</td>
</tr>
<tr>
<td>Strategic importance of quality improvement not recognized</td>
<td>Metrics for quality goals not part of strategic plan or incentive compensation</td>
<td>Board reviews adverse events</td>
<td>Organization aims for near-zero failure rates in vital clinical processes</td>
</tr>
<tr>
<td>Metrics for quality goals not part of strategic plan or incentive compensation</td>
<td>Information technology provides little support for quality improvement</td>
<td>Organization sets a few measurable quality aims</td>
<td>Some services demonstrate near-zero failure rates in some vital clinical processes</td>
</tr>
<tr>
<td>Information technology provides little support for quality improvement</td>
<td>Physicians not actively engaged in quality improvement</td>
<td>Information technology supports some quality and safety initiatives</td>
<td>Reward systems for staff promote personnel who reflect accomplishment of quality goals</td>
</tr>
<tr>
<td>Physicians not actively engaged in quality improvement</td>
<td></td>
<td>Physician leaders champion quality goals in some areas</td>
<td>Information technology integral to sustaining quality improvement</td>
</tr>
</tbody>
</table>

### Root Cause Analysis: Definitions

- **Root Cause**
  - Fundamental reason(s) for the failure or inefficiency of one or more processes.
  - Point(s) in the process where an intervention could reasonably be implemented to change performance and prevent an undesirable outcome.

- **Common Cause**
  - Aggregate of Root Causes over time for all events.
Frequently Identified Root Causes

<table>
<thead>
<tr>
<th>2010 (N=802)</th>
<th>2011 (N=1243)</th>
<th>1Q 2012 (N=225)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>710</td>
<td>Human Factors</td>
</tr>
<tr>
<td>Human Factors</td>
<td>899</td>
<td>Leadership</td>
</tr>
<tr>
<td>Communication</td>
<td>661</td>
<td>Communication</td>
</tr>
<tr>
<td>Assessment</td>
<td>555</td>
<td>Assessment</td>
</tr>
<tr>
<td>Physical Environment</td>
<td>284</td>
<td>Physical Environment</td>
</tr>
<tr>
<td>Information Management</td>
<td>226</td>
<td>Information Management</td>
</tr>
<tr>
<td>Operative Care</td>
<td>160</td>
<td>Operative Care</td>
</tr>
<tr>
<td>Care Planning</td>
<td>135</td>
<td>Care Planning</td>
</tr>
<tr>
<td>Continuum of Care</td>
<td>112</td>
<td>Continuum of Care</td>
</tr>
<tr>
<td>Medication Use</td>
<td>86</td>
<td>Medication Use</td>
</tr>
</tbody>
</table>

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Traditional Root Cause Analysis

- Facilitates a Culture of Blame
  - Focuses on What and Who, rather than Why
- Flawed Investigation Process
  - Inconsistent findings by investigators
  - Cases are handled one at a time, rather than a systematic view
- Root Causes are usually high level and not actionable
  - We can’t improve “poor communication”
- Corrective Actions don’t solve the problems, which then recur
  - Find who is at fault and punish them
  - Change a policy or process with variable outcomes
  - More education and training;
  - “Try harder”
Human Factors Analysis
Classification System (HFACS)

Insanity: doing the same thing over and over again and expecting different results.” – Albert Einstein

- Adverse Event (Root Cause Analysis) Investigation System
  - Based on James Reason’s Swiss Cheese Model of Accident Causation
  - Developed by Scott Shappell and Doug Weigmann for the US Navy and Marine Corps Aviation
  - Used in commercial aviation and several other industries
  - Highly effective at identifying the human behavior aspects of events
  - Modified for use in healthcare

Common Cause Discovery

HUMAN FACTORS ANALYSIS CLASSIFICATION SYSTEM (HFACS)
James Reason’s Swiss Cheese Model of Error

- University of Manchester
- 1990 “Human Error”
- 1997 “Managing the Risks of Organizational Accidents”

- Organizations create redundant system defense barriers to prevent error. Each defense barrier has its own inherent weakness.

- Organizations experience failure or error when the redundant system defense barrier weaknesses all align. Thus, usually adverse events have more than one cause.
ORGANIZATIONAL INFLUENCES

Supervision

Preconditions For Unsafe Acts

Unsafes Acts

Errors

Violations

Skill-based Errors

Decision Errors

Perceptual Errors

Routine

Exceptional

12/11/2012
Common Cause Discovery

**CASE REVIEW PROCESS**
Case Review

Introduction
- Process to identify events that can cause or have caused harm.
- Used to review and improve processes in order to build in safeguards.
- Used to drive high reliability and safety.

Process
- Event reported
- Investigation
- Decision to hold case review
- Meeting(s)
- Action Plan
- Report
- Trend

Event Investigation

What happened?
What normally happens?
What does procedure require?
Why did it happen?
How were we managing it?

Increasing value
Case Review Using HFACS

- Prior to meeting
  - Interviews to elicit facts and information for HFACS analysis
  - Literature search
  - Policies; staffing information; competencies
  - Review with Department(s) Vice Chair of Quality

- Preparation of materials to guide discussion
  - Attendance sheet
  - Summary – facts only
  - Timeline and/or Flow Chart
  - Ishikawa Diagram
  - HFACS worksheet

Sample Documents

[Flowchart or diagram related to case review using HFACS]
Cause and Effect Mapping

- Begin with undesirable outcome.
- Identify root cause.
- Discern preceding cause.
- Continue to ask, “why,” until all preceding causes are identified.

Ownership

- Process must have an owner
  - Probably some form of joint ownership
  - Allow for some decentralization
- The owner(s)
  - Collects
  - Sifts
  - Identifies and reaches out to the key players
- Follow up
The Review

- Pre-work has been completed and a timeline prepared
- Assemble the stakeholders
- Explain the process
- Review the timeline and comments
- Ask the right questions and facilitate discussion
- Close by bringing the group back to the central themes identified and ensure agreement
- Complete a draft action plan

Case Review

- Action Plan
  - Based on discussion during case review
  - Drafted with key stakeholders
  - Include action to be taken, individual assigned, timeframe for completion and how/when remonitoring will be accomplished
- Approval / Revision of Action Plan
  - SharePoint workflow process for in-turn revision / approval
- Report
  - Medical Staff Performance Improvement Committee
  - Quality Management Committee
  - Board of Trustees
Risk Reduction Strategy

- Ensure a match between each intervention and a underlying cause. Ineffective to use same intervention:
  - Unsafe Acts
    - Error
    - Violation
  - Preconditions for Unsafe Acts
    - Physical environment / Technological environment
    - Communication – May be handoff communication tool
  - Supervision
  - Organizational issue
- Can include referral for Peer Review
- For a small subset of cases, may simply track

Ensuring Effective Actions

<table>
<thead>
<tr>
<th>Stronger Actions</th>
<th>Intermediate Actions</th>
<th>Weaker Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Forcing functions</td>
<td>- Training or education</td>
</tr>
<tr>
<td></td>
<td>- Simplify process and remove unnecessary steps</td>
<td>- New procedure or policy</td>
</tr>
<tr>
<td></td>
<td>- Standardize process or equipment</td>
<td>- Warnings or labels</td>
</tr>
<tr>
<td></td>
<td>- New device with testing for results before implementation</td>
<td>- Double checks</td>
</tr>
<tr>
<td></td>
<td>- Change and physical changes</td>
<td>- Increase staffing</td>
</tr>
</tbody>
</table>
Follow Up

- Complete Risk Management file
- Complete HFACS worksheet
- Enter data into database for tracking
- Ensure completion of all items on Action Plan
- Close the loop with all involved departments
- Submit information into PSES (PSO)

Common Cause Discovery

GHS RESULTS
Event Opportunity Continuum

- Customer Complaints
  - Patient driven reporting
  - Focus is on immediate mitigation and patient satisfaction
  - Currently difficult to obtain systematic information

- Occurrences
  - Staff reported events and near misses
  - Identifies areas for process improvement
  - Captured in database, but <10% of events are reported

- Adverse Events
  - Intense investigation of adverse events by Risk Management and VCQ
  - Identifies both process and behavioral root causes

- Malpractice Claims
  - Limited data with several year lag time
  - Generally it is about money, not about process or behavior
  - Captured in database
Occurrence Reports

- Since 2010 … > 20,000 occurrence reports
- Handoffs
  - 196 Occurrence Reports / Mean Harm Score 2.96
- Communication
  - 848 Occurrence Reports / Mean Harm Score 3.17
- Staffing
  - 193 Occurrence Reports / Mean Harm Score 2.85
Causal Categories Most Common in Adverse Events

<table>
<thead>
<tr>
<th>Causal Category</th>
<th>Number of Cases</th>
<th>Percent of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel, Communication, Coordination, Planning</td>
<td>450</td>
<td>0.40</td>
</tr>
<tr>
<td>Error, Decision</td>
<td>436</td>
<td>0.33</td>
</tr>
<tr>
<td>Violation, Routine</td>
<td>270</td>
<td>0.23</td>
</tr>
<tr>
<td>Operator, Adverse Mental State</td>
<td>171</td>
<td>0.14</td>
</tr>
<tr>
<td>Error, Skill-Based</td>
<td>16</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Percentage of Cases: 0.40
Supervision

Inadequate Supervision Subcategories:
- Failed to communicate policies/procedures
- Failed to provide adequate training
- Failed to provide adequate oversight
- Failed to provide adequate mentoring/coaching/instruction

Failure To Address Problem Subcategories:
- Failed to report unsafe tendencies
- Failed to revise a policy
- Failed to ensure problem corrected
- Failed to initiate corrective action

Operational Planning Subcategories:
- Incorrect task prioritization
- Workload assignment
- Failure to match staff competency with task

Violation Subcategories:
- Authorized hazardous operation (compromised safety for efficiency)
- Failed to enforce policies/procedures/requirements

Preconditions for Unsafe Acts

Communication/Coordination Top Subcategories:
- Communication between departments
- Failed to use all available resources
- Did not disclose critical info
- Communication between providers

Communication/Coordination Top Subcategories:
- Inaccurate information provided
- Failure in leadership
- Communication with patient
- Confusing/conflicting directions
- Lack of teamwork

Operator Adverse Mental State Subcategories:
- Job related stress
- Complacency
- Inattention/Disruption
- Perceived pressure
- Task overload

Top Subcategories of Physical Environment:
- Clutter, debris, slippery surfaces
- Obstructed acusa visualization
- Inadequate design
Unsafe Acts

Decision Error Subcategories
- Caution/warning ignored or misinterpreted
- Critical-thinking failure
- Inadequate risk assessment

Skill-Based Error Top Subcategories
- Poor technique
- Lapse of memory / recall
- Work or motion at improper speed
- Safety checklist error
- Performed task at the wrong time

Routine Violations Subcategories
- Taking shortcuts
- Distracting behavior
- Documentation inadequate
- Failure to monitor patient
- Failure to assess patient
- Violation of policy / procedure

Exceptional Violation Subcategories
- Failure to follow orders
- Improper use of equipment
- Excessive risk taking
- Disabled safety devices
- Violation of policy / procedure

Findings Comparison

<table>
<thead>
<tr>
<th>Source</th>
<th>Pt. Safety Survey</th>
<th>Occurrence Reports</th>
<th>HFACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Mental State</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Communication</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Errors (Decision / Skill Based)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Handoffs and Transitions</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Organizational Learning</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Staffing (Resource Management)</td>
<td>Yes</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Violations</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Findings Comparison

- Prior to HFACS
  - No preceding cause
  - Lack of sufficient information
  - May have failed to address root causes
  - Non-actionable Root Causes

- With use of HFACS
  - Actionable Common Causes identified
  - Avoid unintended consequences
  - Identify commonalities across departments/services/units
  - System solutions

Lessons Learned

- HFACS required refining for the healthcare industry
  - Resource intensive and took over two years of adjustments
  - Future refinements should be expedited

- Retrospective application of HFACS was ineffective
  - Traditional reviews failed to address multiple failure modes or preceding causes

- Training for key staff (physician leaders and risk managers) is essential

- Excel database works well

- Identification of causes is only the beginning; appropriate solutions are essential
Next Steps

- Solutions
- Use common causes to develop intervention and mitigation strategies that target change
- Human Factors Intervention Matrix (HFIX)
  - Contrasts causal factors against intervention/mitigation approaches:
    - Organizational / Administrative
    - Human Factors
    - Technology / Engineering
    - Task / Mission
    - Operational / Physical Environment

Discussion / Questions

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Thank You