TOWARDS HIGH RELIABILITY ORGANIZATION IN HEALTHCARE

Contents

Present applications of OR techniques in three domains related to health:
1. Introduce work related to Healthcare by members of CORL.
2. Forthcoming book *Learning from Failures* where he uses FTA and RBD to study root causes of some major disasters and outline generic lessons. I will explore possible extension of this work that can relate to learning from failures in healthcare.
3. HRO in Healthcare.
Dr. Djamila Ouelhadj

Fairness in nurse rostering

Related Publications:


Professor Dylan F. Jones

Combining Methodologies For Informing Health Care Decisions: Case Studies From UK And China:

Case Study 1 – Resource Allocation In A Medical Assessment Unit, Portsmouth, Uk

Case Study 2 – Bed Allocation In A For-profit Hospital, Zichan, China.

• Related publications:

• Case Study 1:

• Methodology
  • KO Willis, DF Jones (2008) Multi-objective simulation through search heuristics and relational database analysis, Decision Support Systems, 46, 277-286

• Case Study 2:

• Sensitivity Analysis
Professor Ashraf W. Labib

Case Study 1: The Prioritisation Of Organ Transplant Patient Waiting Lists: Application Of Fuzzy Logic And Multiple Criteria Decision Making

Case Study 2 – Breast Cancer Monitoring Policy – University of Toronto, Canada.

Case Study 3 – Creating High Reliability In Critical Care Units To Reduce Medication Errors – New proposal idea.

• Related publications:

  • Case Study 1:

  • Case Study 2:

  • Case Study 3:

POSSIBLE RESEARCH PROPOSAL

Paul Schmidt, David Prytherch, Ashraf Labib, Maria Barbati, and Sajid Siraj

VitalPAC: The largest database of vital signs collection (Ref: Paul Schmidt)


Reliability & Failure

Reliability: The ability of an item to perform a required function under stated conditions for a stated period of time.

Failure: The termination of the ability of an item to perform a required function.

Table of Contents:

• Part One: Background of Analytical methods used in investigation of disasters:
  – Chapter 1: Introduction to the concept of Learning from Failures
  – Chapter 2: Introduction to Failure Analysis Techniques in Reliability Modelling.
  – Chapter 3: Introduction to the Analytic Hierarchy Process.

• Part Two: A-Z of Disastrous Case Studies:
  – Chapter 4: Bhopal Disaster.
  – Chapter 6: BP Texas City Incident.
  – Chapter 7: Chernobyl Disaster.
  – Chapter 8: Concorde Accident.
  – Chapter 9: Fukushima Nuclear Disaster.
  – Chapter 10: Hurricane Katrina Disaster.
  – Chapter 11: NASA’s Space Shuttle Columbia Accident.
  – Chapter 12: Titanic – The Unsinkable Ship that Sank.

• Part Three: Generic Lessons, other models of learning from failures and research directions:
  – Chapter 13: Generic Lessons of Learning from Failures
  – Chapter 14: A Model of learning and Unlearning from Failures.
Possible Extensions...?

• High reliability principles have been applied successfully in high reliability organizations (HROs), such as nuclear power plants and aircraft carriers, striving for zero defects to achieve maximum safety performance.
• Hospitals and HROs such as commercial aircrafts have many common characteristics. They both have a continuously changing organizational environment, with many interactive and interdependent processes, whose interactions may lead to unpredictable, unintentional consequences (Sutcliffe, 2011).
• They both require high reliability performance while dealing with non-routine situations.
• However, healthcare systems are currently far from being HROs. In 2002-2011, 1.6 deaths occurred per million flights, while it is estimated that 1300 to 2800 deaths occur per million hospitalizations in the U.S. due to medical errors. This indicates that hospital care is 800 to 1750 times less safe than airlines (Chassin, 2013).

High-reliability organizations

• Includes commercial aviation, aircraft carriers and nuclear power industry.

Commonalities in operations
  • Unforgiving social and political environments
  • High potential for technological errors
  • No experimental learning: consequences are fatal
  • Complex processes to manage complex technologies

Courtesy: Sajid Siraj
To Err is Human

• The two streams in high-hazard studies
  – Normal accident theory (NAT\textsuperscript{[1,2]})
    – By Charles Perrow [Yale University]
      » Normal accidents may be common or rare
  – High-reliability organization (HRO\textsuperscript{[3-6]}) theory
    – Rochlin, LaPorte, Roberts [UC Berkeley]
      » later... (Weick, Schulman, Sutcliffe)

HRO Approach

• Approach towards issues/errors!
  – Prevention
    • An anticipation approach
  – Resilience
    • A containment approach
Prevention

• To anticipate and identify those
  – events and occurrences
    • that must not happen

  – To identify all the possible precursors
    • And then to redefine procedures accordingly

Resilience

• To continue operations in the presence of a
  continuous stress and/or after a major mishap
  1. the ability to absorb strain and preserve functioning
     in spite of the presence of adversity
        rapid change, ineffective leadership, performance and
        production pressures, increasing demands from
        stakeholders
  2. an ability to recover or bounce back from untoward
     events; and
  3. an ability to learn and grow from previous episodes

Courtesy: Sajid Siraj
HRO Culture

• Respectful interaction
  – Trust, honesty and self-respect

• Heedful interrelating
  – Seeing the big-picture

Necessary but not sufficient

Courtesy: Sajid Siraj

HRO Practices

• are preoccupied with failure
• avoid simplifying interpretations
• are sensitive to current operations
• cultivate resilience
• encourage flexible decision-making structures

Courtesy: Sajid Siraj
Seeking versus Achieving

• There are no safe organisations
  – Past records do not guarantee future events
    • “History may predict but does not tell Future”

• Think of HROs as
  – reliability-seeking
    • Not reliability-achieving organizations


Courtesy: Sajid Siraj

HRO IN

HEALTHCARE
Adverse events in hospitals

Table 1
Relevant studies on adverse events in hospitals (adapted from Vincent, 2006).

<table>
<thead>
<tr>
<th>Area</th>
<th>Year of the study</th>
<th>Number of patients</th>
<th>Adverse events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>1984</td>
<td>30.195</td>
<td>3,7</td>
</tr>
<tr>
<td>(Brennan et al., 1991)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utah—Colorado</td>
<td>1992</td>
<td>14.052</td>
<td>2,9</td>
</tr>
<tr>
<td>(Gawande et al., 1999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>1992</td>
<td>14.179</td>
<td>16,6</td>
</tr>
<tr>
<td>(Wilson et al., 1995)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1999</td>
<td>1.014</td>
<td>10,8</td>
</tr>
<tr>
<td>(Vincent et al., 2001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>1998</td>
<td>1.097</td>
<td>9,0</td>
</tr>
<tr>
<td>(Schioler et al., 2001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>1998</td>
<td>6.579</td>
<td>11,2</td>
</tr>
<tr>
<td>(Davis et al., 2002)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>2002</td>
<td>778</td>
<td>14,5</td>
</tr>
<tr>
<td>(Michel et al., 2004)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>2000</td>
<td>3.745</td>
<td>7,5</td>
</tr>
<tr>
<td>(Baker et al., 2004)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Adverse events in hospitals

- In the United States
  - **Medication errors:**
    - ~millions/year
      - (Aspden et al. 2007; Klevans et al. 2007)
  - **Wrong patient/body part:**
    - ~50/week
      - (Minnesota Department of Health 2013)
  - **Fires in operation theatres during surgery:**
    - ~600/year
      - (ECRI Institute 2013)

Courtesy: Sajid Siraj
Adverse events in hospitals

• In the United Kingdom
  – NHS spent **£1.258 billion on clinical negligence[^1]** claims in 2012/2013
    • which is 11% higher than the previous year

  – Introducing the models of **high reliability organizations** will help mitigate medication errors
    • and possibly **reducing the number of such claims**


Are hospitals becoming HRO?

Table 2
Main differences between hospitals and traditional HROs.

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>High-risky organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small but frequent accidents</td>
<td>Few accidents</td>
</tr>
<tr>
<td>Epidemics</td>
<td>Catastrophes</td>
</tr>
<tr>
<td>Designated victim: patient</td>
<td>Designated victim: operator</td>
</tr>
<tr>
<td>Double human-beings systems</td>
<td>Human–artifact systems,</td>
</tr>
<tr>
<td>Emotional, negotiation based decision-making</td>
<td>Rational decision-making</td>
</tr>
<tr>
<td>Ever-changing organizations</td>
<td>Stable organizations</td>
</tr>
<tr>
<td>Diverse interactions</td>
<td>Defined interactions</td>
</tr>
<tr>
<td>Experimentation-based practice</td>
<td>Procedure-based practice</td>
</tr>
</tbody>
</table>

Our online presence

https://sites.google.com/a/port.ac.uk/hro-in-health/