Aligning Resilience Engineering with the right type of cognitive science

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2 Guy’s and St Thomas’ NHS Foundation Trust (GSTT)
Nine points, some of which I have probably made before

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SAFETY MANAGEMENT:
A QUALITATIVE SYSTEMS APPROACH

JOHN DAVIES, ALASTAIR ROSS,
BRENDAN WALLACE, LINDA WRIGHT

Also available as a printed book
see title verso for ISBN details
A ground-breaking new book, Beyond Human Error: Taxonomies and Safety Science deconstructs the conventional concept of “human error” and provides a whole new way of looking at accidents and how they might be prevented. Based on research carried out in the rail, nuclear, and defense industries, the authors show how, by concentrating solely on “human error,” systems and sociological factors are frequently ignored in contemporary safety science. They also argue that the “information processing” view of human cognition, the foundation of the majority of safety science and ergonomics, is hopelessly simplistic and leads to ineffective or even misguided intervention strategies.

Wallace and Ross explore how what they call the “technically rational” view of science can hamper the process of creating a taxonomy of error events, and the implications this has for the current orthodoxy. In laying out the limitations of the “technically rational” viewpoint, they clearly define their own alternative approach. They begin...
Review of simulation studies in anaesthesia journals, 2001–2010: mapping and content analysis

A. J. Ross1*, N. Kodate1, J. E. Anderson1, L. Thomas2 and P. Jaye2

Simulation training for improving the quality of care for older people: an independent evaluation of an innovative programme for inter-professional education

Alastair J Ross,1 Janet E Anderson,2 Naonori Kodate,3 Libby Thomas,1 Kellie Thompson,4 Beth Thomas,1 Suzie Key,5 Heidi Jensen,6 Rebekah Schiff,6 Peter Jaye1

Abstract This paper describes the evaluation of a 2-day simulation training programme for staff designed to improve teamwork and inpatient care and compassion in older persons' units.

Objective The programme was designed to improve inpatient care for older people by using mixed modality simulation exercises to enhance teamwork and empathetic and compassionate care.

Methods Healthcare professionals took part in: (a) a 1-day human patient simulation course with six scenarios

Inpatient diabetes care: complexity, resilience and quality of care

A. J. Ross • J. E. Anderson • N. Kodate • K. Thompson • A. Cox • R. Malik

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Abstract It is estimated that 10–15% of UK hospital inpatients have diabetes. Poor glycaemic control is a care quality problem that has been linked to organizational factors such as inadequate training, inadequate protocols, problems with communication and teamwork, and difficulty coordinating mealtimes. Interventions using specialist knowledge elicitation technique, was adapted to guide interview schedules, which explored key decisions, gaps and discontinuities in care and strategies for work system improvement. Care is delivered through the coordination of a multinational team of different professionals. Specialists provide expertise and problem solving through case-based
Point 1

• I make this Safety III (at least)
Tolman (1948) blocked path experiment

Rats learned to run a simple maze. Upon entering the maze, they ran across a round table to a path that would eventually lead them to a reward.
Then, the maze was changed to a sunburst pattern. The path they had used before was blocked and they had to select between 12 other paths.

- the insights that have been achieved in the laboratories of the reinforcement theorist, though quite genuine, can be applied to complex human behavior only in the most gross and superficial way [...]
ERROR TYPES

Unsafe acts

Intended actions

Unintended actions

Basic error types

Violations

Mistakes

Lapses

Slips
Experience the situation in a changing context

Seek more information
Reassess situation

Is the situation familiar?

Yes

Recognition has four aspects:

Goals  Cues
Expectancies  Actions 1..N

Mental simulation of action (n)

Will it work?

Yes, but
Modify

No

Will it work?

Yes

Implement

No

Are expectancies violated?

Yes

No
NUCLEAR ACCIDENT AT THREE MILE ISLAND

On March 28, 1979, and for several days thereafter - as a result of technical malfunctions and human error - Three Mile Island's Unit 2 Nuclear Generating Station was the scene of the nation's worst commercial nuclear accident. Radiation was released, a part of the nuclear core was damaged, and thousands of residents evacuated the area. Events here would cause basic changes throughout the world's nuclear power industry.
How Many Performance Shaping Factors are Necessary for Human Reliability Analysis?

Ronald L. Boring

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Abstract: It has been argued that human reliability analysis (HRA) has expended considerable energy on creating detailed representations of human performance through an increasingly long list of performance shaping factors (PSFs). It is not clear, however, to what extent this refinement and expansion of PSFs has enhanced the quality of HRA. Indeed, there is considerable range in the number of PSFs provided by individual HRA methods, ranging from single factor models such as time-reliability curves, up to 50 or more PSFs in some current HRA models. The US Nuclear Regulatory Commission advocates 15 PSFs in its HRA Good Practices (NUREG-1792), while its SPAR-H method (NUREG/CR-6883) espouses the use of eight PSFs and its ATHEANA method (NUREG-1624) features an open-ended number of PSFs. The apparent differences in the optimal number of PSFs can be explained in terms of the diverse functions of PSFs in HRA. The purpose of this paper is to explore the role of PSFs across different stages of HRA, including identification of potential human errors, modeling of these errors into an overall probabilistic risk assessment, quantifying errors, and preventing errors.

Keywords: Human reliability analysis, performance shaping factors, orthogonality
Cognition [...] cannot be isolated in the mind of a thoughtful individual, but involves people and artefacts distributed in space or time, and organised in larger groups, organisations, and institutions that together define the conditions for work – the constraints and demands as well as the resources
The Mind, the Body and the World
Psychology after Cognitivism?

edited by
Brendan Wallace, Alastair Ross
John Davies & Tony Anderson
« JumpSTART » Triage pédiatrique

- Peut marcher?
  - Oui → Vert
  - Non
    - Respiration spontanée?
      - Non → Dégager voies respiratoires → Respire → Rouge
      - Oui → Apnéique → Présence de pouls?
        - Non → Noir
        - Oui → Apnéique → 5 ventilations → Respiration spontanée → Rouge
    - Oui → Fréquence respiratoire
      - < 15 ou > 45 → Rouge
      - 15 à 45
        - Pouls palpable?
          - Non → Rouge
          - Oui → AVPU
            - Inapproprié ou « U » → Rouge
            - A-V-P approprié → Jaune

Utiliser le « JumpSTART » si le patient « paraît être » un enfant 12 ans et moins.
Utiliser le « START » si le patient « paraît être » un jeune adulte.
Pour les enfants qui ne peuvent marcher dû à leur âge ou trouble de développement, etc., appliquer la méthode « JumpSTART ». Si l'enfant mérite l'appellation « JAUNE », vérifier pour des évidences externes de trauma significatifs, tels une plaie pénétrante au torse, un saignement important, des brûlures ou plaies complexes. Si présent, trier l'enfant comme « JAUNE ». Si tels signes cliniques sont absents, trier l'enfant comme « VERT ». 
Adult Advanced Life Support Algorithm

Unresponsive?

Open airway
Look for signs of life

Call Resuscitation Team

CPR 30:2
Until defibrillator/monitor attached

Assess rhythm

Shockable
(VF / pulseless VT)

1 Shock
150-300 J biphasic
or 360 J monophasic

Immediately resume
CPR 30:2
for 2 min

During CPR:
- Correct reversible causes*
  - Check electrode position
  and contact
  - Attempt/verify:
    IV access
    airway and oxygen
  - Give uninterrupted
    compressions when
    airway secure
  - Give adrenaline
    every 3-5 min
  - Consider: amiodarone,
    etidronate, magnesium

Non-Shockable
(PEA / Asystole)

Immediately resume
CPR 30:2
for 2 min

* Reversible Causes
  - Hypoxia
  - Hypo/hyperoalaninaemia/metabolic
  - Hypothermia
  - Tension pneumothorax
  - Tamponade, cardiac
  - Toxins
  - Thrombosis (coronary or pulmonary)
Point 2

• We are creative beings, not passive slaves to prescription
1+2+3+4......+100 = ?
Point 3

• Whilst people are not rational they will tell you they are
Point 4

• It’s easy to mistake the map for the territory
Extract from Design Office Working Diagram for Jobs 104 and 201, showing Mr Hemingway's Pencil Additions.
Fig 11. A view of the relay room, looking towards the entrance, showing the relay racks, and the trees of the wiring. Relays TRR DM and TRR DN are on the bottom shelf on the right in the last section towards the door.
Point 5

• There exists a psychological need to reify
Sorry everyone, but it didn't work (p = 0.06)

Abstract

The more or less ubiquitous use of Fisher-type statistics in quantitative/numeric evaluations of drug and alcohol education initiatives takes place within the context of a literature of long standing which suggests there are areas in which null hypothesis testing and the use of conventional cut-off points (i.e. the 1% and 5% probability levels) are inappropriate. This literature is largely ignored. The paper identifies some of these issues in terms of their relevance to the problems of evaluation of drug/alcohol programmes. The paper argues that the qualitative approach does not solve these problems but may help overcome them.
Borges J.L. 1964, *Other Inquisitions*  
Austin: University of Texas Press

• ‘**Animals are divided into:** those that belong to the Emperor; embalmed ones; those that are trained; suckling pigs; mermaids; fabulous ones; stray dogs; those that are included in this classification; those that tremble as if they were mad; innumerable ones; those drawn with a very fine camel's hair brush; others; those that have just broken a flower vase; those that resemble flies from a distance’
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W0L0</td>
<td>Swab left in wound</td>
</tr>
<tr>
<td>W0L1</td>
<td>Instrument left in wound</td>
</tr>
<tr>
<td>W0L2</td>
<td>Wound infection</td>
</tr>
<tr>
<td></td>
<td>W0L20 Wound abscess</td>
</tr>
<tr>
<td></td>
<td>W0L21 Cellulites</td>
</tr>
<tr>
<td></td>
<td>W0L22 Fasciitis</td>
</tr>
<tr>
<td>W0L3</td>
<td>Seroma</td>
</tr>
<tr>
<td>W0L4</td>
<td>Wound dehiscence</td>
</tr>
<tr>
<td></td>
<td>W0L40 Deep wound dehiscence</td>
</tr>
<tr>
<td></td>
<td>W0L41 Superficial dehiscence</td>
</tr>
<tr>
<td>W0L5</td>
<td>Failure of wound healing</td>
</tr>
<tr>
<td>W0L6</td>
<td>Wound skin necrosis</td>
</tr>
<tr>
<td></td>
<td>W0L60 Minor wound necrosis</td>
</tr>
<tr>
<td></td>
<td>requiring dressings</td>
</tr>
<tr>
<td></td>
<td>W0L61 Major wound necrosis</td>
</tr>
<tr>
<td></td>
<td>requiring surgery</td>
</tr>
</tbody>
</table>
• [...] saying that leaving something in a wound is a wound problem is like saying that leaving something in a taxi is a taxi problem [...] Thinking of things that could happen in a hospital [...] instrument left in wound is more like bucket left in corridor [...] than it is like Seroma
Hypothetical network model of 128 Discrete Categories
All have a degree score of 0 and a Betweenness Centrality of 0
Highest Betweenness Centrality: “Communication”
Unfortunately.....

• The most attractive categories are the most unreliable
  • Correlation between number of Heath Boards using a Category and Degree (.571**; P<.001); and Betweenness Centrality (.472**; P<.001)
  • Familiar concepts become less discrete and less well-defined over time
Technical note: measurement issues in taxonomic reliability

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Adverse event categorisation across NHS Scotland

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2Ross Abernethy Ltd, Glasgow, UK
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ABSTRACT

Objective This paper describes a scoping of adverse event categories and definitions in use across NHS Scotland and makes recommendations about the categories used.

Methods The design involved a network analysis making use of categories and subcategories supplied by 17 different Health Boards via their risk management/clinical governance functions. A total of 480 adverse event categories were identified.

Reporting systems and taxonomies

Taxonomies of adverse event codes should allow for reliable data retrieval via a set of mutually exclusive categories. A single taxonomy system, adapted from the Agency (NPSA) and the Australian Advanced Information Management System (AIMS) as well as WHO classifications in the area of disease and health-related problems, could simplify this.
Point 6

• People + lists = counting
• People can’t count
Which is the random pattern?

- 5, 20, 21, 7, 47, 9
- 1, 2, 3, 4, 5, 6
p(e/i) ≠ p(i/e)
Point 7

• Explanation is deeply social
Similarity bias

• Shultz and Ravinsky (1977)
• Properties of cause are similar to those of effect
• Conspiracy theories (McCauley and Jacques, 1979)
• CE399
• (Genesis 3:12-13) The man said, ‘The woman whom you gave to be with me, she gave me fruit from the tree, and I ate.’ Then the LORD God said to the woman, ‘What is this that you have done?’ The woman said, ‘The serpent tricked me, and I ate.’
If these idiots would just take the bus, I could be home by now.

If these idiots would just take the bus, I could be home by now.
‘Belief in a just world’

- In a “just world” people get what they deserve (Lerner 1977)
Stereotype consistent; affect inconsistent

A evaluates

Brave
Generous
Determined

B evaluates

Risk-taking
Extravagant
Inflexible

Cowardly
Mean
Changeable

Careful
Thrifty
Flexible
Stereotype consistent; affect inconsistent

<table>
<thead>
<tr>
<th></th>
<th>Safety I</th>
<th>Safety II</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Scientific</td>
<td>Unhelpful</td>
</tr>
<tr>
<td></td>
<td>Evidence-based</td>
<td>Complicated</td>
</tr>
<tr>
<td></td>
<td>Reliable</td>
<td>Unrealistic</td>
</tr>
<tr>
<td>II</td>
<td>Scientific</td>
<td>Critical</td>
</tr>
<tr>
<td></td>
<td>Target-obsessed</td>
<td>Rigorous</td>
</tr>
<tr>
<td></td>
<td>Inflexible</td>
<td>Ambitious</td>
</tr>
</tbody>
</table>
Point 8

• We don’t want a RE landscape ½ deep and a mile wide
Point 9

Never express yourself more clearly than you are able to think
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