

National Academies

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Safety-I vs Safety-II

(from Erik Hollnagel)

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background

general agreement that we are not making progress on safety as fast as we would like

we have not been 'Protestant enough'

more rigour (*eg*, EBM)

greater accountability

background

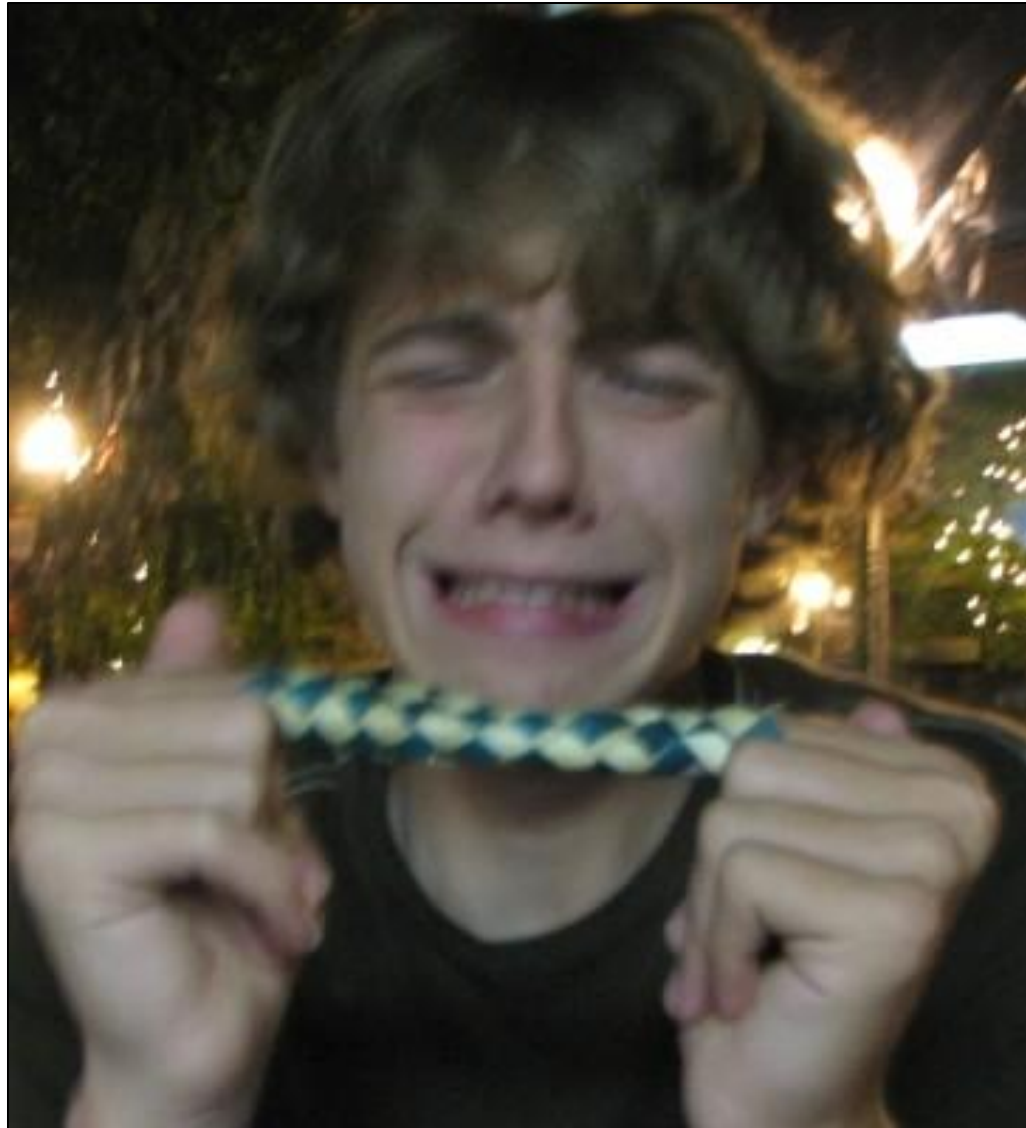
general agreement that we are not making progress on
safety as fast as we would like

wrong mental model of safety
utopian scientism

“... enduring Enlightenment projects

“... rationality can create a better, more controllable world

*“... taken for granted by safety researchers b/ it appears so
ordinary, self-evident and commonsensical.”**



patient safety orthodoxy

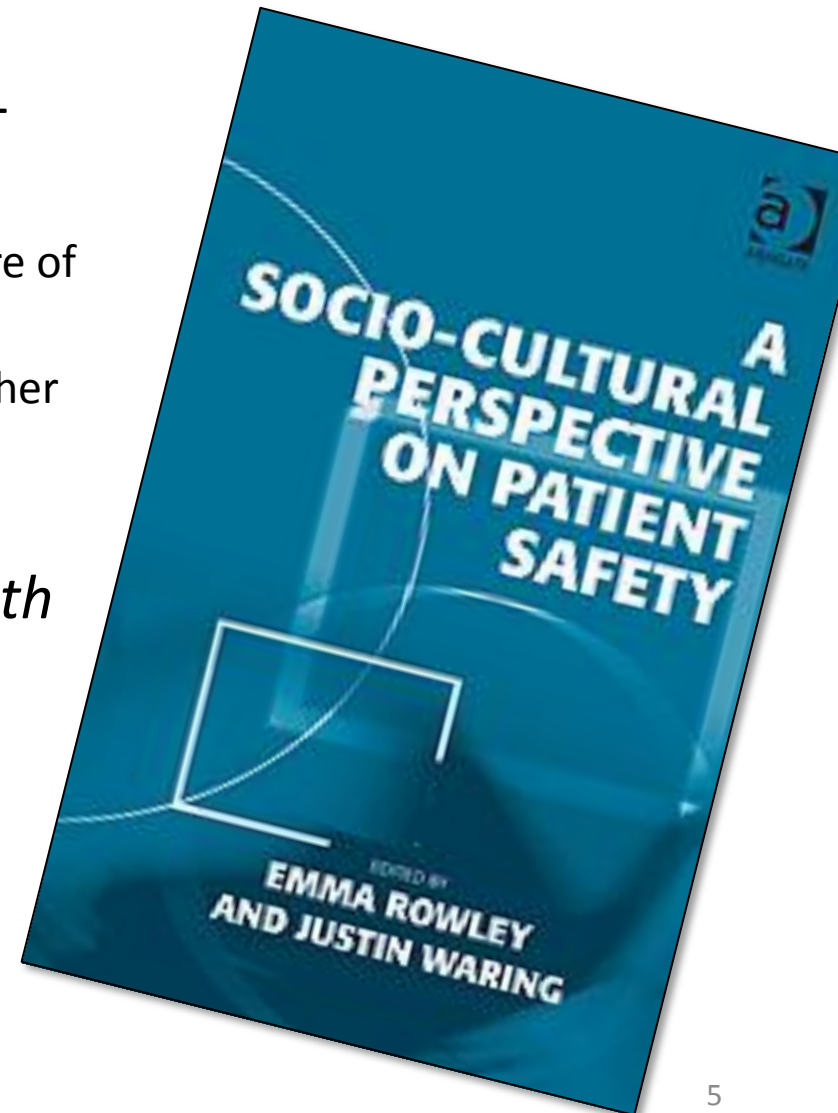
technocratic, instrumental, 'measure-and-manage' approach

myopic – failing to question underlying nature of problems

overly simplistic – transferring sol'ns from other sectors

negligent of knock-on effects of change

“glosses over the complexities of health care organisation and delivery”



view from safety-I

accidents come from erratic acts by people
(variability, mistakes, errors, violations)

study, count accidents to understand safety
(tend to look backwards)

focus on components

safety is acquired by constraining workers *via*:
standardisation, guidelines, procedures, rules, interlocks,
checklists, barriers

Taylor, Deming, Shewhart

Toyota


assumptions in safety-I

our systems are well-designed and well-understood
procedures correct and complete
systems are basically safe, well-protected
reliability = predictable, invariant
variation is the enemy
safety is an attribute
(something a system *has*)
conditions are well-anticipated, well-specified

so what's the problem?

“The real trouble with this world of ours is not that it is an unreasonable world, nor even that it is a reasonable one. The commonest kind of trouble is that it is nearly reasonable, but not quite. Life is not an illogicality; yet it is a trap for logicians. It looks just a little more mathematical and regular than it is; its exactitude is obvious, but its inexactitude is hidden; its wildness lies in wait.”

G K Chesterton, 1909

A paved road curves through a lush, green, wooded area. On the grassy shoulder to the right of the road, several alligators are resting. A wooden signpost with two posts holds a brown sign with white text. The sign reads: "HIKERS and BIKERS Move to the side of the road when a vehicle approaches". The background is filled with dense green foliage and trees.

HIKERS and BIKERS
Move to the side of
the road when a
vehicle approaches

view from safety-II

accidents are prevented by people adapting to conditions

study normal work to understand safety

(tends to look forward)

focus on inter-relations

aim is to manage, not eliminate, the unexpected

safety is enacted by enabling workers *via*:

making hazards, constraints, goal conflicts visible

enhancing repertoire of responses

Rasmussen, Woods, Hollnagel

Three Mile Island, Tenerife

assumptions in safety-II

our designs are incomplete, procedures out-dated &

systems poorly understood

systems are basically unsafe

reliability = responsiveness

variation is necessary

safety is an activity

(something a system *does*)

possible failure modes have not been anticipated

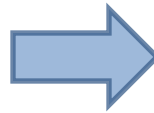
‘continuing expectation of surprise’

things that never happened before happen all the time

safety-II

healthcare STS intractable,
underspecified, variable demands

resources (time, people, material,
information) limited, uncertain



workers adjust to meet conditions
creating variability

adjustments always approximate (b/
resources limited)



*“Knowledge and error flow from
the same mental source; only
success can tell one from another.”*

Ernst Mach, 1905

approximate adjustments usually
reach goals, make things go safely

approximate adjustments sometimes
fail, or make things go wrong

safety-I vs safety-II summary

defined by its opposite - failure
well designed & maintained,
procedures correct & complete
people (ought to) behave as
expected & trained

accidents

come from variability in above

therefore

safety comes from limiting &
constraining operators via
standardization, procedures, rules,
interlocks, barriers

critical inquiry

defined by its goal - success
poorly understood, incomplete,
underspecified
people (ought to) adjust behaviour &
interpret procedures

accidents

come from incomplete adaptation

therefore

safety comes from supporting
operators via
making boundaries, hazards, goal
conflicts visible, enhancing
repertoire of responses

appreciative inquiry

philosophical bases

safety-I

linear, proportional, tractable
behaviour explained by reduction
positivist, Taylorist
cause-effect simple, oneway
controllable
'the one best way'
values declarative, technical knowledge
complicated problems
techne, episteme

safety-II

non-linear, non-proportional, intractable
behaviour explained by emergence
constructivist, interpretivist
cause-effect multiple, reciprocal
influence-able
equifinality, multifinality
values practice, tacit wisdom
'wicked problems'
mētis, phronesis

why safety-II?

highlights 'externalities'

'margin for maneuver', buffers, tradeoffs
all "hidden in the interstices of complex work"

focus on how ordinary work goes right less likely to
inadvertently damage these hidden resources

empirical support

direct observations of CV
surgery

surgeons w/ best results

had just as many untoward
events as those w/ worst

but they had

better means of detection
greater repertoire of
responses

The Journal of THORACIC AND CARDIOVASCULAR SURGERY

HUMAN FACTORS AND CARDIAC SURGERY: A MULTICENTER STUDY

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All United Kingdom pediatric cardiac
centers

Objective: To study the role of human factors on surgical outcomes, with a series of 243 arterial switch operations performed by 21 surgeons taken from 11 centers.

Methods: The following data were collected: patient-specific and procedure-specific variables, self-assessment questionnaires, and a written report from a human factors researcher who observed the operation. The relationship of patient-specific variables to outcomes (death and death and/or near miss) was used to develop a multivariable baseline model to analyze the role of human factors after adjustment for these variables.

Results: The overall mortality was 6.6% with 24.3% of cases resulting in death and death and/or near misses. The self-assessment questionnaires were found to be unhelpful. Major and minor human failures were extracted from the written report. Major negative events were potentially life-threatening failures, whereas minor events were failures that, in isolation, were not expected to have serious consequences. Major events were closely related to death ($P < .001$) and death and/or near misses ($P < .001$). Appropriate compensation, however, sharply reduced the risk of death ($P = .003$). The total number of minor events was also closely related to both death and death and/or near misses ($P < .001$).

Conclusion: The study highlights the role of human factors in negative surgical outcomes. Even in the most eventful circumstances, however, appropriate human factors defense mechanisms can lead to a successful outcome. (*J Thorac Cardiovasc Surg* 2000;119:661-72)

holy gospel according to st donald

"At present, prevailing strategies rely largely on outmoded theories of control and standardization of work."

"... while healthcare was discovering Taylorism, other industries were moving beyond it, into more effective terrain.

"... the key principles of this new approach are in many ways the exact opposite of what Taylor and his disciples taught.

"... if we want to understand how the workplace needs to be changed, we must understand and call into question many of the principles of Taylorism."

what makes safety-I persist?

not despite the fact that it's wrong, but precisely because it is wrong, wrong in particularly useful ways*

simple explanations

illusion of control, ontological security

removes managers, organisations from line of fire

fits positivist, biomedical model

'the nurse failed to notice ...'

failure comes from aberrant people / devices, so remove, control them

refitting, reorganising expensive, so re-train instead

Enlightenment 'program of technical rationality'

*Cook & Nemeth
2010



SOILED
LINEN