constructive error: the error berg

M Gaetani & C Parshuram  ICU Clinicians · Trainee & Faculty
disclosures

Gaetani:
none relevant to this presentation

Parshuram:
named inventor Bedside Paediatric Early Warning System
shares in Bedside Clinical Systems
a clinical decision support company in part owned by SickKids
penicillin

intention  Experimentation with influenza virus

error  staph. *aureus* on unwashed petri dishes

observation  after vacation new ‘mould’ inhibited bacteria.
### pacemaker

**intention**  build a heart rhythm recording device

**error**  faulty resistor emitted electric pulses

**observation**  pulses paced the heart.
safety glass

intention  chemist studying plastic
error       knocked over cellulose nitrate
observation broken glass stayed in place.
saccharin

**intention**  coal tar analysis.

**error**  didn’t wash hands after work in the lab.

**observation**  everything touched at dinner was sweet.
sildenafil

intention  hypertension and angina
error      no effect seen on angina
observation improved / sustained erection.
a moment of reflection

intention   good
error       happened

observation unexpected benefit (>lack of harm).
unplanned extubation

loss of control in the controlled environment

medical error executing the plan for a controlled airway

measure of safety / quality of care

focus of safety activities. ...... OK.
458 unplanned extubation events

263 (57%) PPV <24 hours
a lot of bad clinical events

52 (11%) bradycardia
63 (14%) stridor
9 (2.0%) cardiac arrest
1 (0.2%) aspiration

& prevention efforts ++
✓ fewer events, lower rates

195 (43%) no PPV at 24 hours.
& we wondered...

...did this ‘safety event’ provide benefit?

...was the error in planning to keep the child intubated?

...could we learn - by identifying low risk extubations?
medical error

action different than ideal or intended

& leading to......

patient injury & death

the second victim

the quest for zero error as patient safety gaol
Heinrich industrial accident ratios

“600-30-10-1” ratios

Theory articulated in 1931

Empiric data in 1941

1.7 million ‘accidents’
pyramids consistent across..
297 companies / 3 billion worker-hours

a triangle ‘pyramid’

>> accident elimination prevents death <<

a stitch in time saves nine / an ounce of prevention is better than a pound of cure / ...two-wrongs don’t make a right
error pyramid

- Harmful
- Theoretical harm
- Potential
- Near miss
The Swiss cheese model of how defences, barriers, and safeguards may be penetrated by an accident trajectory.
error: misconstrued

action different than ideal or intended

1 ‘perfect intent’ can be wrong

2 controlled environments in ICU & OR
   predicated on adherence to intent rather than absolute knowledge of “ideal” (perfect evidence).

3 error is routinely conflated with patient harm
   ‘An expert panel from the Institute of Medicine, part of the National Academy of Sciences, found that medical errors kill from 44000 to 98000 Americans each year’ (BMJ 1999)

4 error reducing technologies may not improve outcomes
   CPOE, CDSS, bar coding, electronic health-records (they reduce apparent errors).
zero error/harm

‘a goal’ ... increasingly challenged.

resilience / rescue / error mitigation-correction.

zero ICU mortality... and zero seeking statistical models.

“The safety I approach focuses on successes and adaptation in addition to examining failures”

(aka quality & safety)...
planning & execution errors

Planning error are errors in what to do (& may be occult)
Execution error is not following the plan
These errors may coincide.

<table>
<thead>
<tr>
<th>Execution error</th>
<th>Planning error</th>
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<tr>
<td>No</td>
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The Error-berg

Reconceptualizing Medical Error as a Tool for Quality and Safety
Melany Gaetani, M.B.B.Ch., B.A.O., Christopher Parshuram, M.B.Ch.B., D.Phil.

explicitly acknowledges potential risk of benefit & harm from medical error.

based on theoretical and empiric observations.
1 Software development: error seeding.
Learning from multiple errors intentionally placed in software code during development.

2 Public Projects: Hirschman’s ‘Hiding Hand’ principle.
‘Impossible’ public projects are started (planning error) and the major obstacles are overcome (due to committed project leaders). Thus society benefits from completion of the impossible.

3 Drug Regulation: “Precautionary principle”
Mandated drug product regulation constrains acquisition of helpful knowledge. Thus the ‘error’ of ‘mandated’ (a planning error) is not followed (an execution error) the result may be beneficial.
## potential application

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<th>Due to planning errors in...</th>
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<tr>
<td>Unplanned extubation</td>
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<td>Patient safety and medical errors</td>
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<td>Medication precision in children</td>
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<td>Trainee transition to independence</td>
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> Learning about planning errors (‘best’ practice becomes better)

ie. good outcomes may result from execution ‘errors’ based on (unappreciated) planning error.
summary

1 Models of medical error are incomplete and problematic.
2 Zero error goals may paradoxically limit learning.
3 Embracing errors has led to improvement in healthcare.
4 Potential applications to learn from beneficial errors.
5 The Error-Berg is a new conceptual model
   ...that explains the persistence of error in healthcare &
   ...how medical error can improve quality of care.
thank you
M Gaetani & C Parshuram