HRO IN HEALTHCARE

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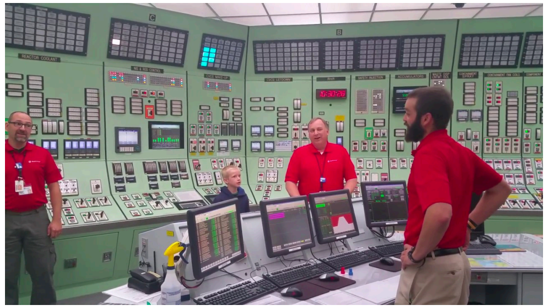
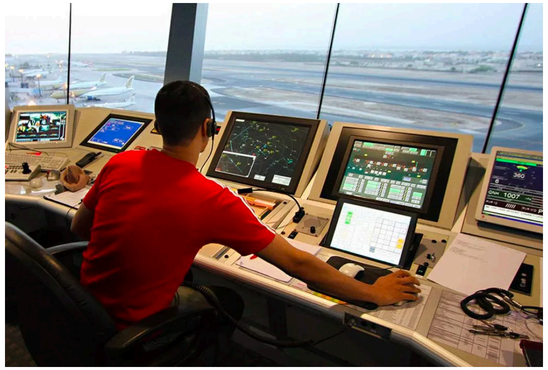
FUNDAMENTALS OF HRO



(1989[1]) The term “High Reliability Organizations” was defined by K. Roberts and D. Rousseau to define a class of industries meeting eight characteristics of operational complexity, to motivate further study by the academic community.



- Organizations within these industries typically have exceptional records of systems safety, contradictory to that postulated by Normal Accident Theory
- Advocates the rigorous examination of near misses and addition of operational redundancy
- “Hospital emergency rooms are characterized by several of the above dimensions, …., yet other dimensions are hardly relevant.” – K. Roberts and D. Rousseau (1989[1])

1. Roberts, K. and Rousseau, D. (1989) “Research in Nearly Failure-Free, High-Reliability Organizations: Having the Bubble” IEEE Transactions on Engineering Management, 36(2), 132-139

FUNDAMENTALS OF HRO

Does healthcare match the elements and characteristics of an HRO industry as defined by Roberts and Rosseau?

Element	Yes	No	Maybe
1. Stable Technical Processes			
2. Full Knowledge of the System			
3. Ability to "Stand-Down"			
Characteristic	**Yes**	**No**	**Maybe**
1. Hyper-complexity			
2. Extreme Hierarchy			
3. Redundancy (personnel)			
4. High Accountability			
5. Tight Coupling			
6. Immediate Feedback			
7. Compressed Time Factors			
8. Simultaneous Outcomes			

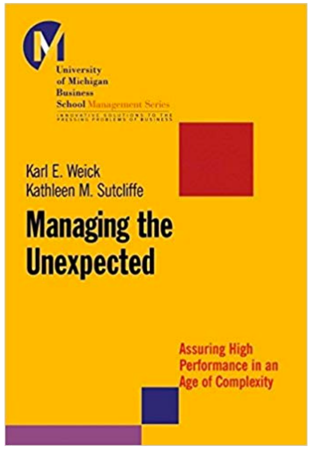
FUNDAMENTALS OF HRO

(2001[1]) K. Weick and K. Sutcliffe studied HRO organizations, and observed that those who had exceptional safety records exhibited a “collective mind”. Further, the collective mind may be developed through the promotion of operational Hallmarks in day-to-day operations

- The Hallmarks are attractive as they may be readily enacted across an organization
- They present a self-assessment tool for adherence to the Hallmarks
- “Karlene Roberts was very clear that the term High Reliability Organization was never meant to be a sticker” – K. Sutcliffe (2017[2])

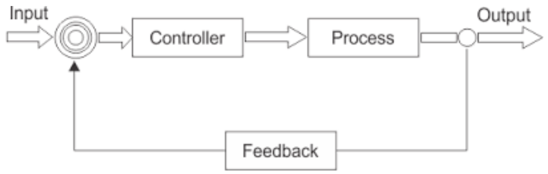
Hallmarks of an HRO

1. Preoccupation with Failure
2. Reluctance to Simplify
3. Sensitivity to Operations
4. Commitment to Resilience
5. Deference to Expertise



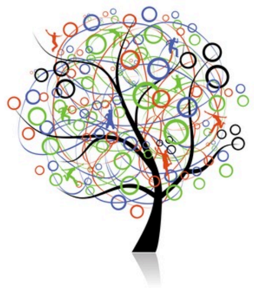
1. Weick, K. and Sutcliffe, K. (2001) *Managing the Unexpected: Assuring High Performance in the Age of Complexity*, Josey-Bass, New York
2. Sutcliffe, K. (1997) Personal Communication at the High Reliability Summit, Sept. 12, Washington D.C.

FUNDAMENTALS OF HRO



(2011[1], 2013[2]) M. Chassin, president of the Joint Commission, and J. Loeb publish papers in which they promote the HRO Hallmarks as a means to reduce medical error and increase patient safety

- There is no scientific justification given for HRO in Healthcare in these papers
- The leadership standard LD.03.01.01 was issued, and the J.C. Center for Transforming Healthcare offers the tool Oro 2.0 for HRO assessment
- “Evidence suggests that healthcare is starting to organize for higher reliability. … Regardless, high reliability remains elusive” – Sutcliffe, K., Paine, L., and Ponovost, P. (2017[3])
- “It is possible that the healthcare delivery industry’s interest in HRO is a managerial fashion that will fall as quickly as it has risen” – Martelli, P., Rivard, P., and Roberts, K. (2018[4])



1. Chassin, M. and Loeb, J. (2011) “The Ongoing Quality Improvement Journey: Next Stop, High Reliability” Health Affairs, 30(4), 559-568
2. Chassin, M. and Loeb, J. (2013) “High-Reliability Health Care: Getting There from Here” The Milbank Quarterly, 91(3), 459-490
3. Sutcliffe, K., Paine, L., and Pronovost, P. (2017) “Re-examining High Reliability: Actively Organizing for Safety”, BMJ Quality and Safety, 26, 248-251
4. Martelli, P., Rivard, P., and Roberts, K. (2018) “Caveats for High Reliability in Healthcare”, Journal of Health Organizations and Management, 32(5), 647-690

FUNDAMENTALS OF HRO

The disconnect between HRO theory and healthcare/hospital operations

- Healthcare is a Humanistic (Complex Adaptive) System – HRO grew out of Newtonian (Mechanistic) Systems
- Productivity and profitability (e.g. Lean/Six-Sigma, OR Scheduling) – True HRO is very costly
- There is little (if any) training on HRO in day-to-day medical practice – True HRO requires extensive training
- Variability in core processes (each patient is unique) – HRO industries typically have scripted procedures
- Tradeoff of risk in decision making (patient care is timely) – HRO industries can "stand-down"
- Management is by businessmen and women with no clinical background – Management in HRO industries typically have years of operational experience
- Incidents of (consequential) medical error are on the order of 10^{-1} with sentinel events on the order of 10^{-4} – The collective mind of an HRO is intended to manage (inconsequential) incidents on the order of 10^{-1} to prevent errors of 10^{-7} (or much less)
- Medical error is viewed through the person (liability) – HRO is focused on the system

RELIABILITY IN HEALTHCARE

(2008[1]) M. Mello and D. Studdert examined 1452 medical malpractice cases, in which 889 were judged to involve injury due to medical error. Of those, 96% had contributing factors related to the individual clinician, 56% had factors related to the system, and 70% had factors related to the system and patient (clinical and behavioral).

- HRO is about managing the reliability of the system, not about the individual or patient
- HRO assumes that all patients are the same, makes no allowance for variability
- Individual contributing factors are often the result of cognitive failures, which may be attributed to the system in part

Table 1. Individual, System, and Patient-Related Factors Contributing to Harmful Errors (*n*=889)

Contributing Factors	*n*	Proportion of All Error-Related Injuries
Individual factors:	854	96%
Error in judgment	625	70%
Failure of vigilance/memory	511	57%
Lack of technical competence/ knowledge	426	48%
System factors:	497	56%*
Teamwork and communication factors:	353	40%
Lack of supervision	176	20%
Handoffs	129	15%
Other communication problem	116	13%
Lack of clear lines of responsibility	87	10%
Conflict among personnel	17	2%
Other system factors:	175	20%
Workload/inadequate staffing	77	9%
Interruptions/distractions	58	7%
Technology failure	67	8%
Fatigue	18	2%
Ergonomic failure (lighting, setup, etc.)	10	1%
Patient-related factors (clinical and behavioral)	345	39%

* If patient-related factors are included, the proportion of injuries with system factors is 70%.

1. Mello, M. and Studdert, D. (2008) "Deconstructing Negligence: The Role of Individual and System Factors in Causing Medical Injuries", The Georgetown Law Journal, 96, 599-624

PATH TO HIGHER RELIABILITY IN HEALTHCARE

1. Support the cognition of care providers
2. Develop interventions that promote what was absent, rather than what was present, in cases of medical error
3. Manage localized interactions towards reducing system complexity

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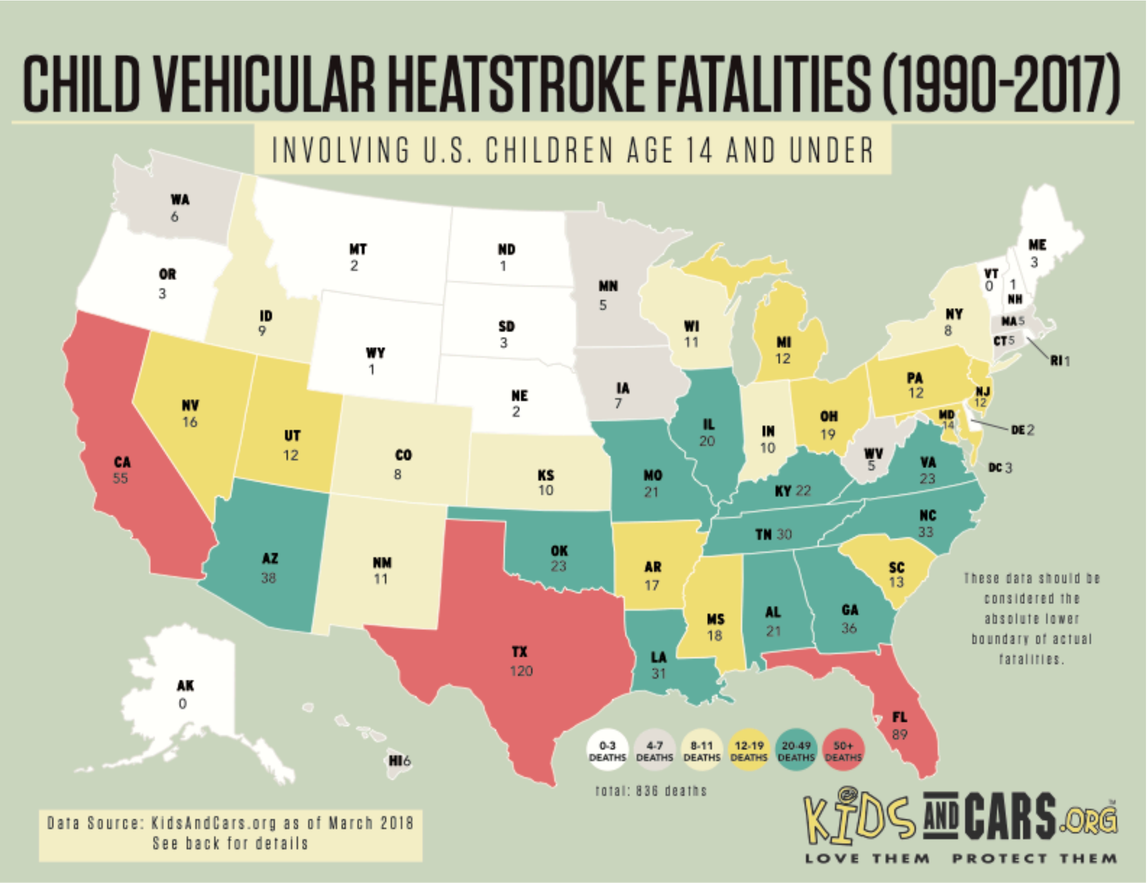
ILLUSTRATIVE EXAMPLE - CHILDREN LEFT IN CARS

[1]There are on average a little over 30 heatstroke fatalities each year of children inadvertently left in parked cars by their parents.

- In almost all cases, there was no evidence of prior abuse or neglect by the parents
- Cases tend to have common factors[2]:
  1. Change in parents routine to follow alternate, but well traveled, route
  2. Change in how parent interacted with child during trip (e.g. sleeping child)
  3. Lack of a cue (e.g. diaper bag in view)
  4. Choice point during drive (e.g. work or home)
  5. Stressful experiences before/after drive
  6. Sleep deprivation



1. http://www.kidsandcars.org/wp-content/uploads/2018/06/heatstroke-map-2018.pdf
2. Diamond, D. “Hot Car Deaths: How Can Parents Forget a Child in a Car?” The Conversation – CNN, July 25, 2106

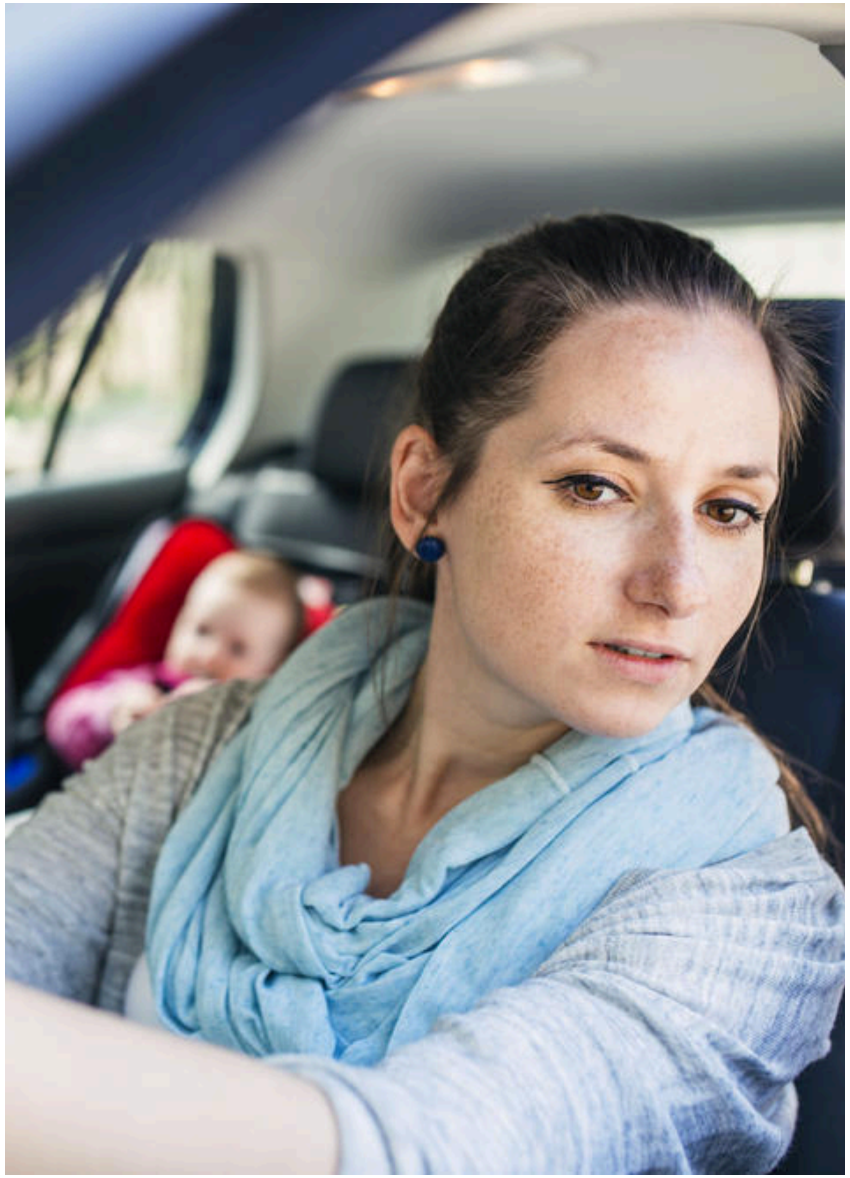
ILLUSTRATIVE EXAMPLE: CHILDREN LEFT IN CARS

In these cases, the habit memory (basal ganglia) overtook the individuals prospective memory (hippocampus and prefrontal cortex), due to cognitive biases (tunneling, availability, etc.) that were exacerbated by stress and lack of sleep.

- Should the parent be blamed for the child's death?
- Should the parent be held accountable for the child’s death?

Interventions to avoid hot car deaths should be focused on the individual and system

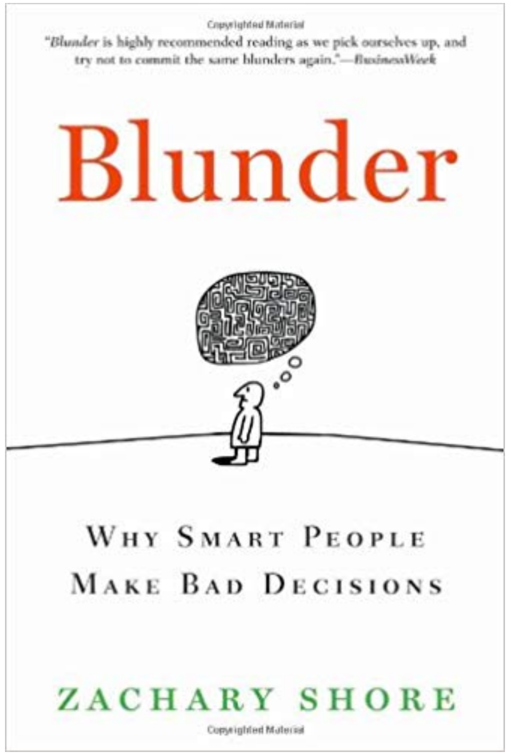
- What interventions might support a parents cognition?
- What system interventions might prevent deaths?



COGNITIVE FACTORS IN MEDICAL ERROR

A recent study found 19 common cognitive biases in a review of medical errors[1], and the insightful work of Z. Shore[2] presents 7 common cognitive traps, taken from a historical perspective, across multiple settings. There are hundreds of identified biases, yet the following are broadly found in healthcare

- Confirmation bias – Searching for what we want to find
- Exposure Anxiety – Fear of being seen as weak
- Causefusion – Focusing on one cause and ignoring others
- Cure-allism – If it worked before, it must work again



1. Saposnik, G., Redelmeier, D., Ruff, C., and Tobler, P. (2016) "Cognitive Biases Associated with Medical Decisions: A Systematic Review" BMC Medical Information Decision Making, 16 (1), doi:10.1186/s12911-016-0377-1
2. Z. Shore (2008) *Blunder* Bloomsbury, New York

THOUGHTS FOR HEALTHCARE

- We need to re-envision the role and use of technology in healthcare, to reduce the cognitive workload of care providers and to support the decision maker (instead of making decisions)
  - Humans minds create mental models of what something should look like, computers only processes information. "We started with a creative, flexible, problem-solving human and mostly dumb computer that's good at rote, repetitive tasks like monitoring. So we let the dumb computer fly and the novel-writing, scientific-theorizing, jet-flying humans sit in front of the computer like potted plants waiting for blinking lights." – Stephen Casner, research psychologist at NASA[1]

1. Duhigg, C. (2016) *Smarter, Faster, Better: The Transformative Power of Real Productivity* Random House, New York

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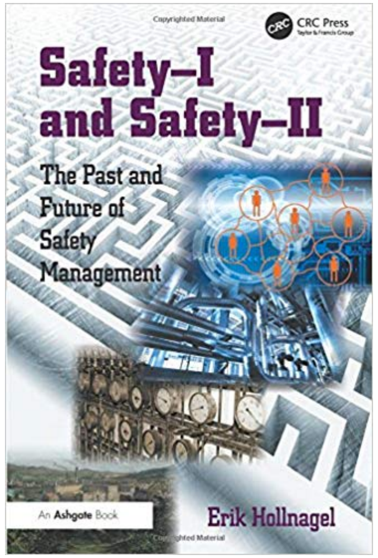
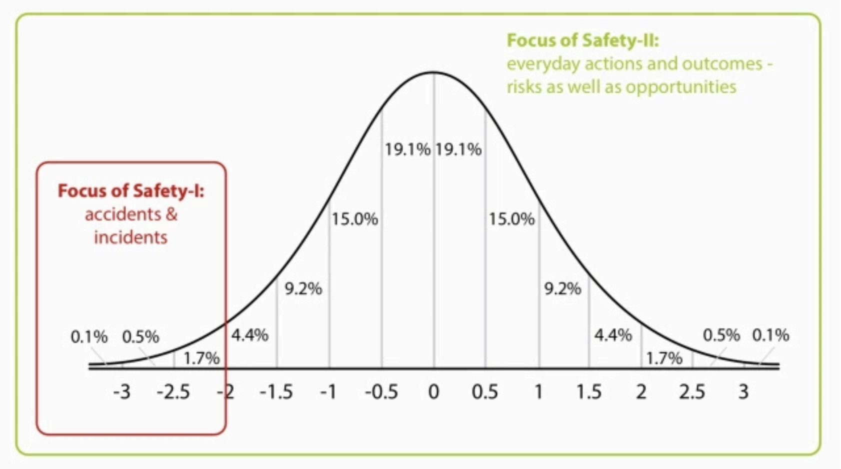
SAFETY I AND II

(2014[1]) E. Hollnagel explores an alternative way to think about the management of reliability and safety in complex-humanistic systems, including medical systems, exploring both failures (Safety I) and successes (Safety II) in determining interventions

- Safety I – When something went wrong, what were the contributing factors? (Root Cause Analysis, Causal Factor Analysis, 5 Whys, etc.)
- Safety II –What right is missing when things go wrong? (Data Analytics, Pattern Recognition, etc.)





1. Hollnagel, E. (2014) *Safety-I and Safety-II: The Past and Future of Safety Management*, Routledge, London

SAFETY I AND II IN HEALTHCARE

(2018[1]) Medical records of a large health authority who had error rates of 7% were analyzed from the viewpoint of safety I and II.

- Safety I – Ten factors were found to be common to incidents of medical error. Traditional interventions around these (campaigns, strict surveillance, "zero-tolerance") were ineffective
- Safety II – Seven factors were found to occur disproportionately more often in those cases when things went right. Safety II thinking would promote focusing on doing more of these seven things

<u>Safety I</u>

1. Workarounds
2. Shortcuts
3. Violations
4. Guidelines not followed
5. Errors and miscalculations
6. Unfindable people and medical instruments
7. Unreliable measurements
8. User-unfriendly technologies
9. Organizational frustrations
10. Supervisory shortcomings

<u>Safety II</u>

1. Diversity of opinion and possibility to voice dissent
2. Keeping a discussion of risk alive
3. Deference to expertise
4. Ability to say stop
5. Broken down barriers between hierarchies and departments
6. Not waiting for audits or inspections to improve
7. Pride of workmanship

1. Dekker, S. (2018) "Why do things go right?" www.safetydifferntly.com

THOUGHTS FOR HEALTHCARE

- Consider all the data, not just that generated by an adverse event
  - Adopt data mining practices (unstructured text, pattern recognition, etc.)
  - Create a culture of learning

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CYNEFIN *(KUN-EV-IN)* FRAMEWORK

(2007[1]) The Cynefin framework was developed by Dave Snowden, within which failures are categorized as arising from systems that are Simple, Complicated, Complex, or Chaotic

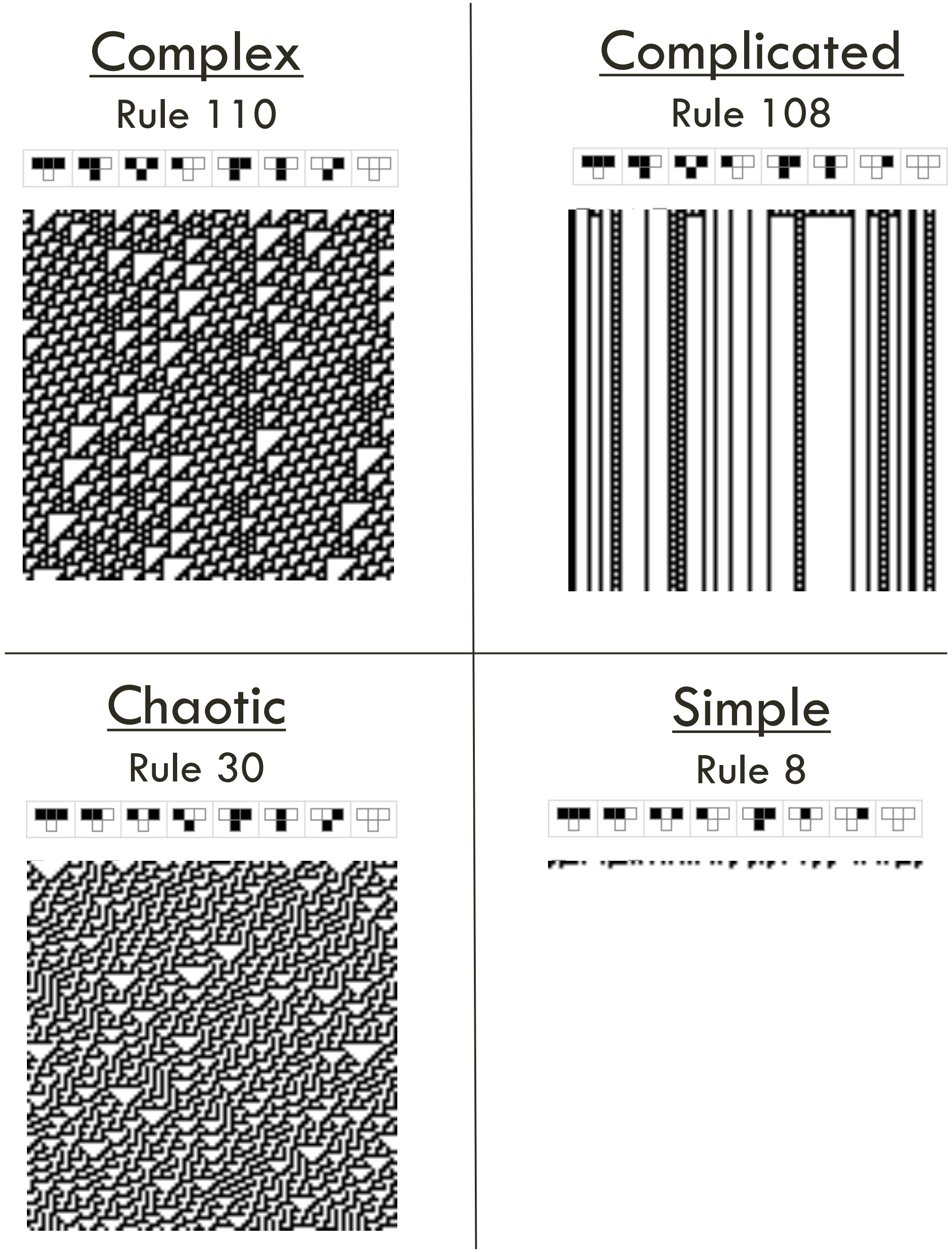
- Simple: known knowns
  - cause and effect is clear
- Complicated: known unknowns
  - cause and effect relationships require analysis and expertise
- Complex: unknown unknowns
  - cause and effect can only be deduced in retrospect
- Chaotic: unknowable

1. Snowden, D. and Boone, M. (2007) "A Leader's Framework for Decision Making" Harvard Business Review, 69-76

VISUALIZING THE CYNEFIN FRAMEWORK

The Cynefin framework may be visualized through repeating simple patterns of local rules using agent-based modeling[1].

- Complexity may emerge from a simple pattern of local behaviors
- Very few patterns lead to complexity
- Disrupting local patterns may lead to complex, complicated, chaotic, or obvious system behavior



1. S. Wolfram (2002) *A New Kind of Science*, Wolfram Media

CAUSES OF MEDICAL ERROR

- The causes of <u>minor</u> medical error are often predictable, albeit complicated
- The causes of <u>major</u> medical errors/sentinel events are often unpredictable, and emerge from complexity

MANAGING COMPLEX SYSTEMS

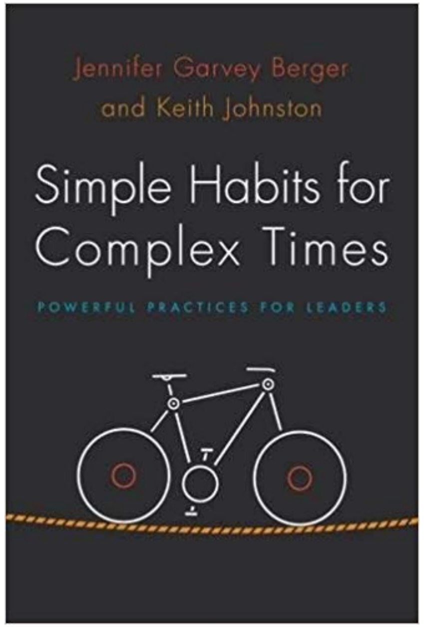
Managing a complex system is about learning to influence (not control) the dynamics of an ever shifting organization to drive it to a desired state

1. Shape the vision (not a goal or target)
2. Draw boundaries on localized behaviors
3. Understand the system dynamics
4. Strengthen (or weaken) attractors
5. Create ongoing Safe-to-Fail experimentation

SAFE-TO-FAIL EXPERIMENTATION

The purpose is to create an environment for positive attractors to grow and negative ones to diminish[1]

1. Experiments are short-term, cheap, and finely-grained
2. Some experiments should be at the edges
3. Diversity of thought is needed in forming experiments
4. Many experiments in parallel, some that are contradictory
5. Some experiments should fail (safely), or learning is not achieved



1. J. Berger and K. Johnson (2015) *Simple Habits for Complex Times, Stanford Business Books, Redwood City, Ca*

THOUGHTS FOR HEALTHCARE

- Healthcare should move away from long term process improvement methodologies (6-sigma, kaizen events, etc.) and focus on short term safe-to-fail experimentation, both in the realm of patient safety and care delivery
- Leadership in healthcare needs to be re-envisioned

CONCLUSION

- Healthcare is a humanistic system and efforts to reduce medical error should recognize this.
- Adopting safety practices from other industries (e.g. HRO) might not be the best strategy for healthcare
- Technology should support the cognition of care providers, not attempt to replace or inflict cognitive workload
- Learning about medical error should come from more than just incidents of medical error
- Managing complexity is the key to reducing sentinel events