Advancing Patient Safety through Increasing Resiliency & Adaptive Capacity

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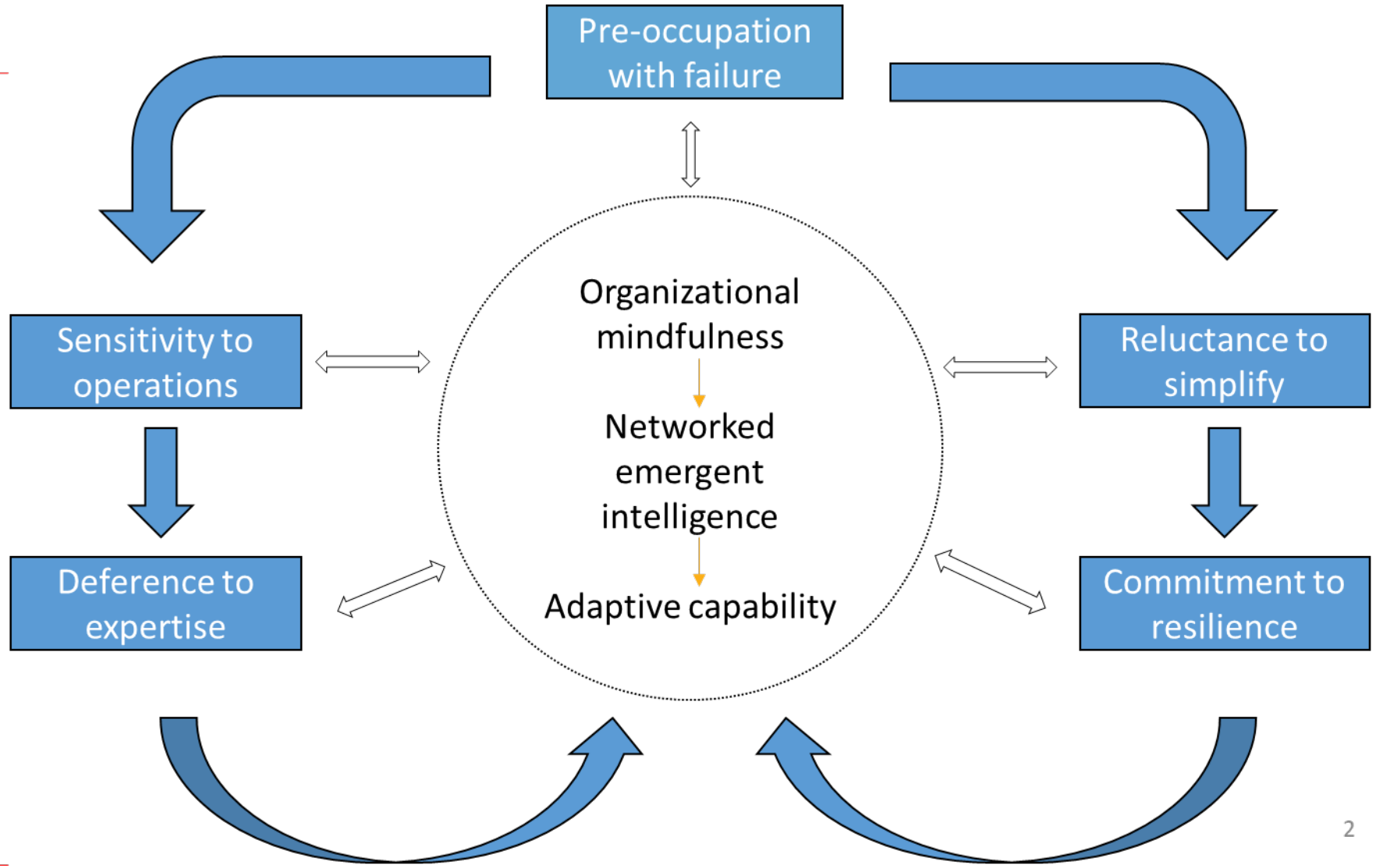
High-reliability organization → Organizing

Resiliency Adaptive Capability



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High-reliability organization → Resiliency engineering

- High reliability is not a destination, it's an ongoing journey to increase ***adaptive capability and resiliency.***
- Resiliency is the answer in complex systems that need to manage uncertainty.
  - Situational awareness…focus on small signals and mindfulness.
  - Avoidance of complacency…continuously need to organize.
  - Need to adapt, improvise and be agile.
  - Connective intelligence…property of the system, not of its parts.

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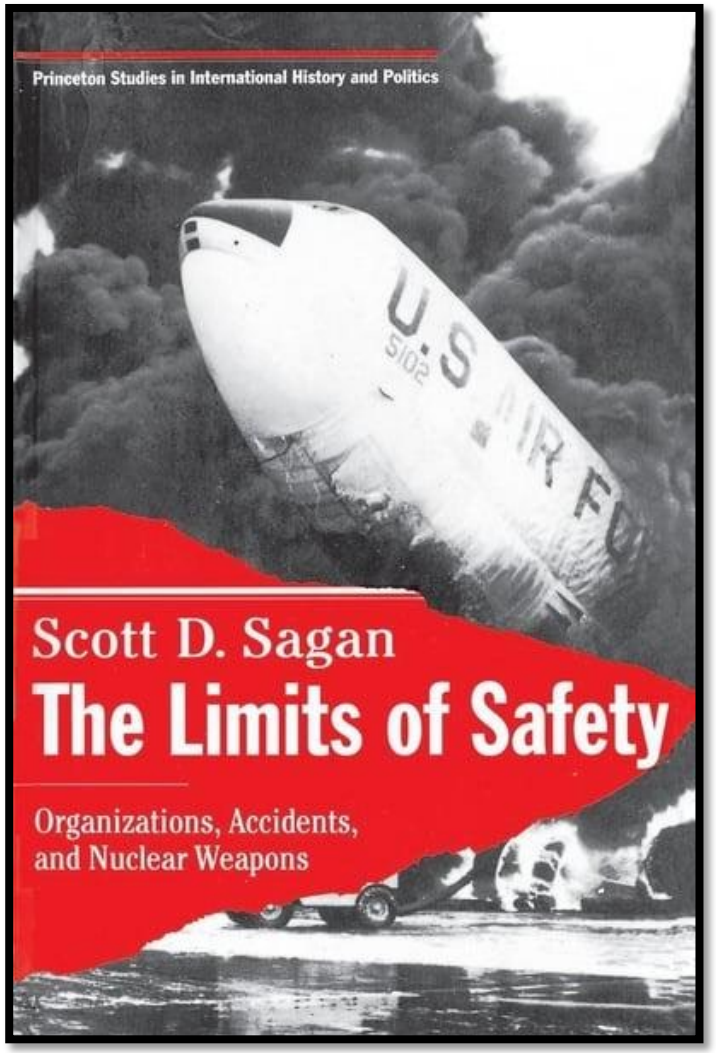
Evolution of patient safety thinking

Things that never happened before, happen all the time."

- Scott D. Sagan "The Limits of Safety"

Because things that never happened before, happen all the time," *system reliability has limits…and so focusing only on system reliability will fail to create system safety.*



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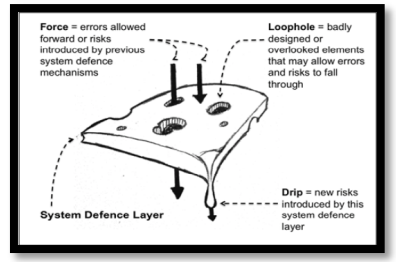
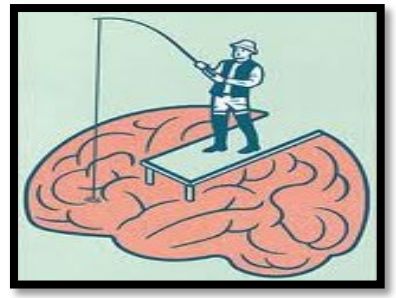
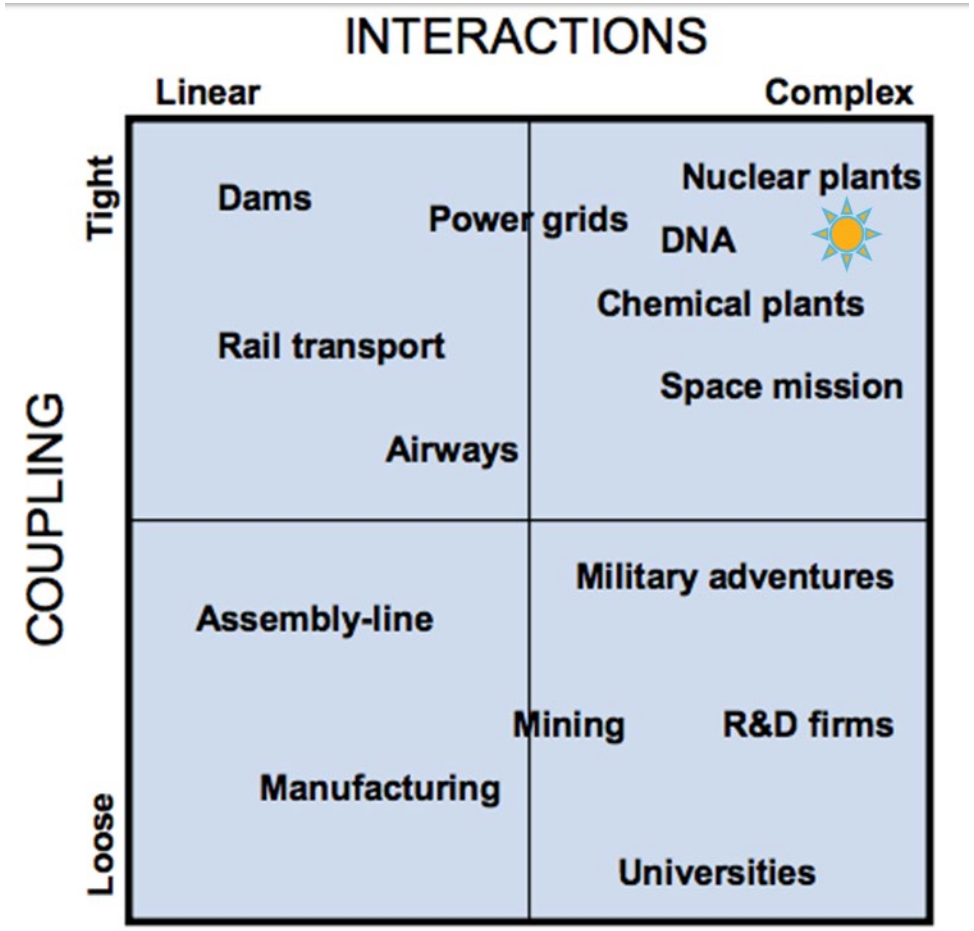
Healthcare has irreducible complexity

- **System complexity:**
  - Pieces of the system interacting in unanticipated ways.
  - Dependency of different parts of the system on each other.
  - Coupling: one part of the system can't act without another, inter-dependence.
  - Resonance: risks are additive in a non-linear way.
  - Emergence: risks appear with scarcity.
  - Drip: safeguards themselves can be risks.
  - Human limitations in capability and capacity to do work.
  - Humans naturally drift or make micro-adjustments to account for failing systems (Safety 3, Anti-fragility).





Why reliability alone won't work in HC delivery



- ✓ Human behavior: Non-linear, variable, interdependent, performance dampening
- ✓ Information: Hidden, siloed, inferred, complex, indirectly accessed
- ✓ Rules & context: Fluctuating parts, changing conditions and unforeseen connectivity
- ✓ Resources: Limitations, time constraints

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Resilience Engineering: New directions for measuring and maintaining safety in complex systems
Final Report December 2008 Sidney Dekker, Erik Hollnagel, David Woods and Richard Cook

Resiliency, not just reliability

"In complex environments (i.e. where WAD is not WAI), resilience often spells success, while even the most brilliantly engineered fixed solutions are often insufficient or counterproductive."

- Gen. Stanley McChrystal
Team of Teams, 2015

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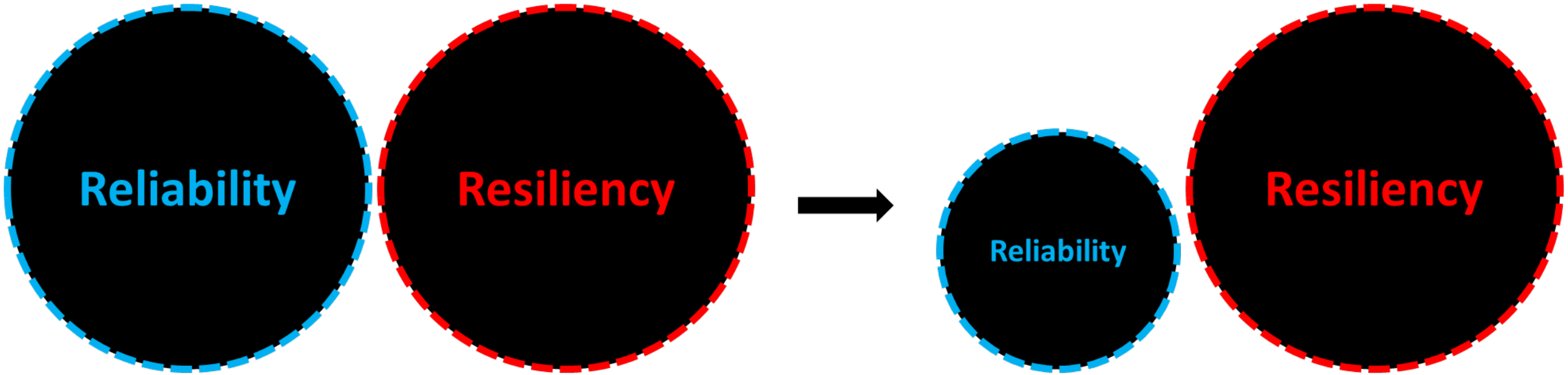
Managing system complexity requires increasing our adaptive capacity to respond and increasing system resiliency



More focus going forward

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Three types of resiliency

Human resiliency

Process resiliency

Training resiliency

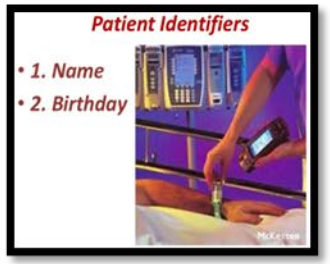
Resiliency engineering in training

System reliability

Error avoidance

Redundancy

Forced functions



Constraints

Prevent errors

System resiliency

Error management

Rescue

Restrict

Reverse

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Resiliency is about rescue

Resiliency

- Same complication rates
- Different surgical outcomes
- Attributed to the ability to ***rescue*** pts from complications

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

Variation in Hospital Mortality Associated with Inpatient Surgery

Amir A. Ghaferi, M.D., John D. Birkmeyer, M.D., and Justin B. Dimick, M.D., M.P.H.

From the Michigan Surgical Collaborative for Outcomes Research and Evaluation, the Department of Surgery, University of Michigan, Ann Arbor. Address reprint requests to Dr. Ghaferi at Michigan Surgical Collaborative for Outcomes Research and Evaluation, 211 N. Fourth Ave., Suite 201, Ann Arbor, MI 48104, or at aghaferi@umich.edu.

N Engl J Med 2009;361:1368-75.

ABSTRACT

BACKGROUND

Hospital mortality that is associated with inpatient surgery varies widely. Reducing rates of postoperative complications, the current focus of payers and regulators, may be one approach to reducing mortality. However, effective management of complications once they have occurred may be equally important.

METHODS

We studied 84,730 patients who had undergone inpatient general and vascular surgery from 2005 through 2007, using data from the American College of Surgeons National Surgical Quality Improvement Program. We first ranked hospitals according to their risk-adjusted overall rate of death and divided them into five groups. For hospitals in each overall mortality quintile, we then assessed the incidence of overall and major complications and the rate of death among patients with major complications.

RESULTS

Rates of death varied widely across hospital quintiles, from 3.5% in very-low-mortality hospitals to 6.9% in very-high-mortality hospitals. Hospitals with either very high mortality or very low mortality had similar rates of overall complications (24.6% and 26.9%, respectively) and of major complications (18.2% and 16.2%, respectively). Rates of individual complications did not vary significantly across hospital mortality quintiles. In contrast, mortality in patients with major complications was almost twice as high in hospitals with very high overall mortality as in those with very low overall mortality (21.4% vs. 12.5%, P<0.001). Differences in rates of death among patients with major complications were also the primary determinant of variation in overall mortality with individual operations.

CONCLUSIONS

In addition to efforts aimed at avoiding complications in the first place, reducing mortality associated with inpatient surgery will require greater attention to the timely recognition and management of complications once they occur.

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Rescue errors from becoming failures

- The ability to recover, “bounce back” and sustain required operations under both expected and unexpected conditions.
- Property of the *relationships among components* rather than in the components themselves.
- Something a system *does* rather than something a system *has*.
- Very much a result of human expertise, not experience, in recognizing error, rescuing error from turning into failure and containing the effects of failure.

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Resilience Engineering: New directions for measuring and maintaining safety in complex systems
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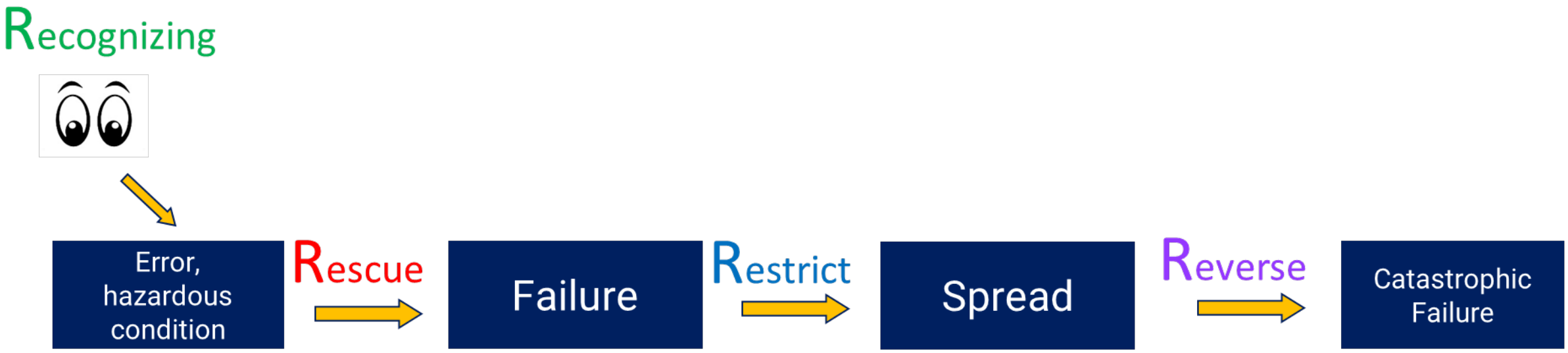
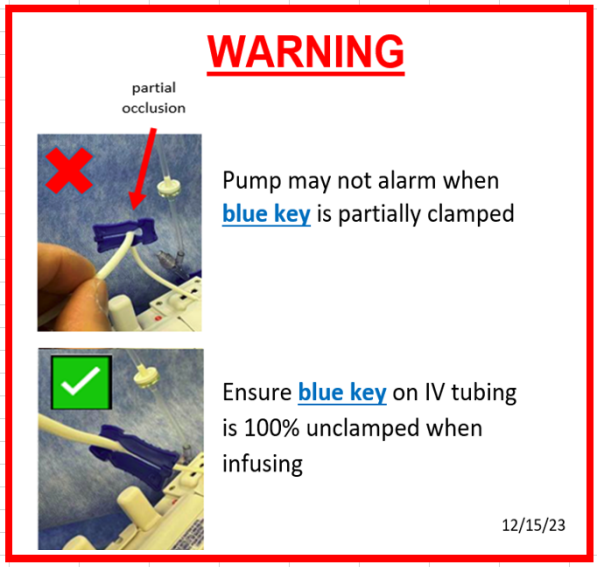
Resiliency engineering and 4 Rs

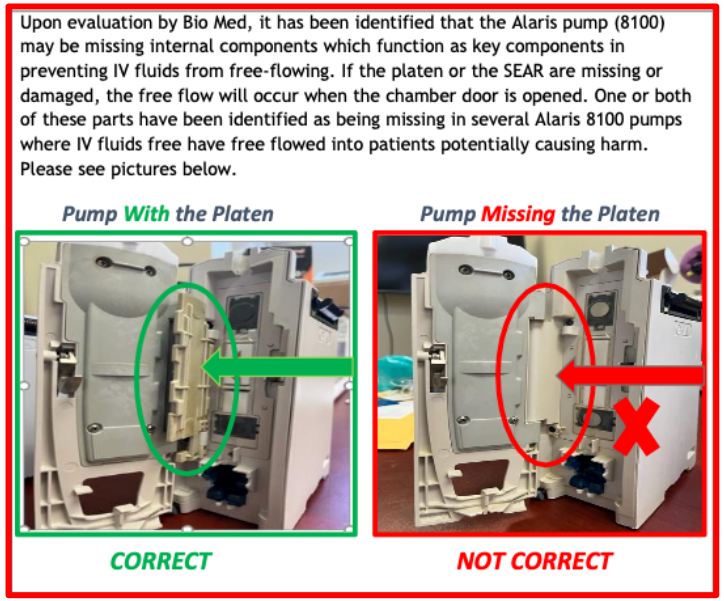


Early Recognition and Rescue are the key to advancing safety in complex systems

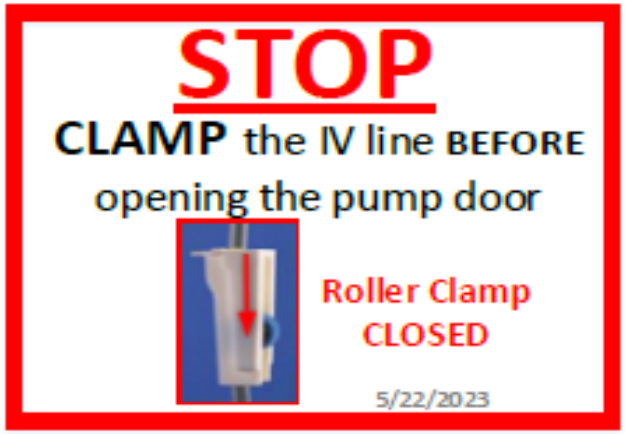
Resiliency in communication

Describe how to Recognize error





Describe how to Rescue from failure



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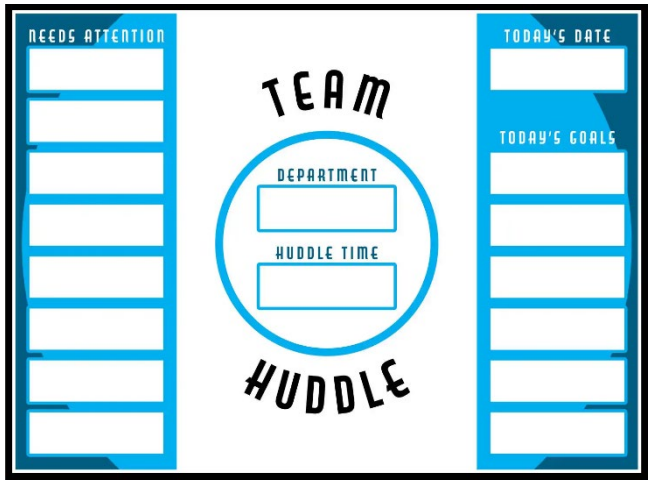
PM safety sweep

Individual room sweep

- What are the biggest risks to mitigate (meds, falls)?

Team huddle before PM shift change

- What did not happen on the day shift (omission errors) that needs to be reassigned (i.e. CHG Bath, femoral line removal, Foley out)?



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Clinical risk mitigation teams

- Proactive teams that round to reduce clinical risk
- Units with higher risk
- Support for staff
- CLABSI: Support a CHG Bath
- CAUTI: Remove a Foley
- FALLS: Toilet a patient
- HAPI: Turn a patient

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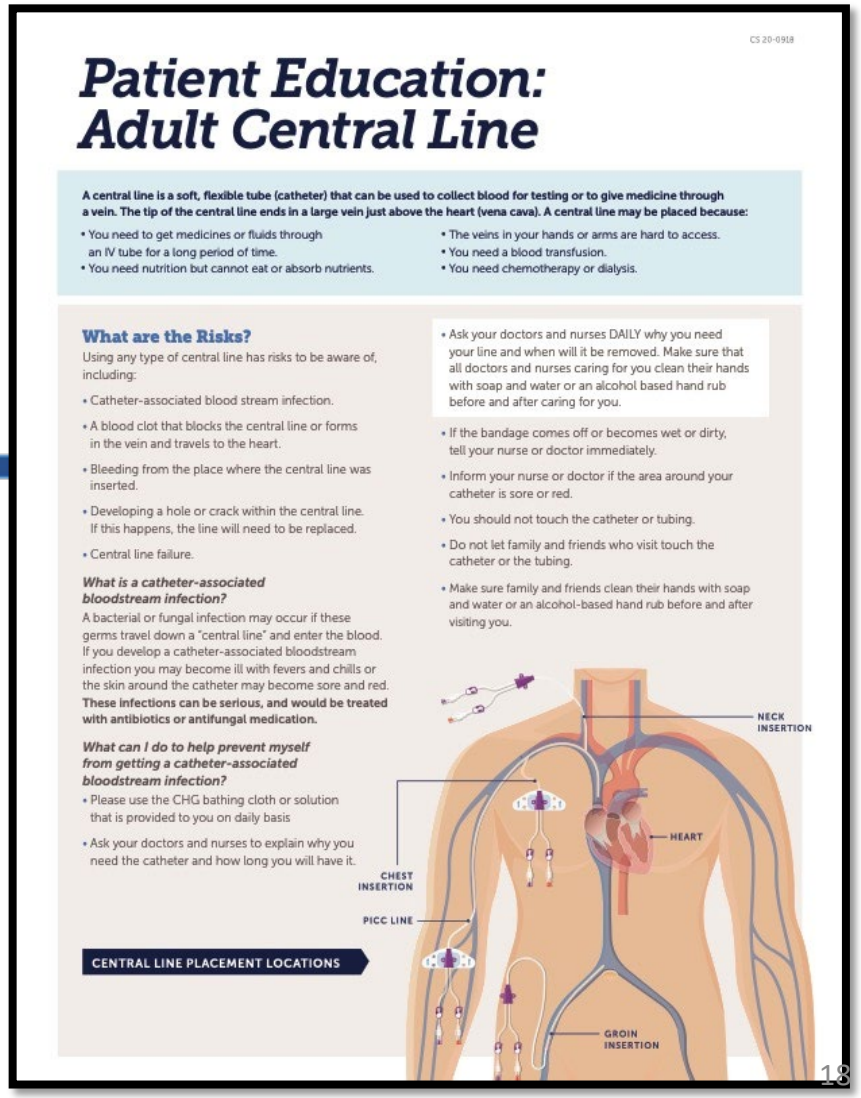
Create a safe night

- Evidence-based system to identify risk overnight
  - One study: The observed/ expected mortality ratio fell from 1.04 to 0.76.
- At sign out, pts are determined to be watchers in the EMR
- At midnight, a clinical team reviews in person all watcher pts
- Mitigate clinical risk in real time

https://patientsafety.pa.gov/psj/Pages/2020-3-5.aspx

Leverage pts and families in rescue

- Ask your doctors and nurses DAILY why you need your line and when will it be removed. Make sure that all doctors and nurses caring for you clean their hands with soap and water or an alcohol based hand rub before and after caring for you.



CS 20-0918

Patient Education: Adult Central Line

A central line is a soft, flexible tube (catheter) that can be used to collect blood for testing or to give medicine through a vein. The tip of the central line ends in a large vein just above the heart (vena cava). A central line may be placed because:

- You need to get medicines or fluids through an IV tube for a long period of time.
- You need nutrition but cannot eat or absorb nutrients.
- The veins in your hands or arms are hard to access.
- You need a blood transfusion.
- You need chemotherapy or dialysis.

What are the Risks?

Using any type of central line has risks to be aware of, including:

- Catheter-associated blood stream infection.
- A blood clot that blocks the central line or forms in the vein and travels to the heart.
- Bleeding from the place where the central line was inserted.
- Developing a hole or crack within the central line. If this happens, the line will need to be replaced.
- Central line failure.

What is a catheter-associated bloodstream infection?

A bacterial or fungal infection may occur if these germs travel down a "central line" and enter the blood. If you develop a catheter-associated bloodstream infection you may become ill with fevers and chills or the skin around the catheter may become sore and red. **These infections can be serious, and would be treated with antibiotics or antifungal medication.**

What can I do to help prevent myself from getting a catheter-associated bloodstream infection?

- Please use the CHG bathing cloth or solution that is provided to you on daily basis
- Ask your doctors and nurses to explain why you need the catheter and how long you will have it.
- Ask your doctors and nurses DAILY why you need your line and when will it be removed. Make sure that all doctors and nurses caring for you clean their hands with soap and water or an alcohol based hand rub before and after caring for you.
- If the bandage comes off or becomes wet or dirty, tell your nurse or doctor immediately.
- Inform your nurse or doctor if the area around your catheter is sore or red.
- You should not touch the catheter or tubing.
- Do not let family and friends who visit touch the catheter or the tubing.
- Make sure family and friends clean their hands with soap and water or an alcohol-based hand rub before and after visiting you.

CENTRAL LINE PLACEMENT LOCATIONS

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Three types of resiliency

Human resiliency

Process resiliency

Training resiliency

Error management training

- A learning strategy where the learner focuses on correct actions and does not pay much attention to error recognition.
- Examples of this are sequential, step-by-step instructions or conventional tutorials.
- This approach aims to eliminate errors before they occur by placing barriers (forced functions, two-step verification, redundancy of critical resources, checklists) between steps that contribute to an error.
- In this model, errors are dealt with mostly after they have occurred, where recovery may or may not be discussed at all, and if so, is only focused on in relation to cataclysmic errors.
- Weaknesses:
  - Learners receive little training on how to recognize they are getting close to making errors or actual errors.
  - Learners receive little support in rescuing from failure and/or containing error.

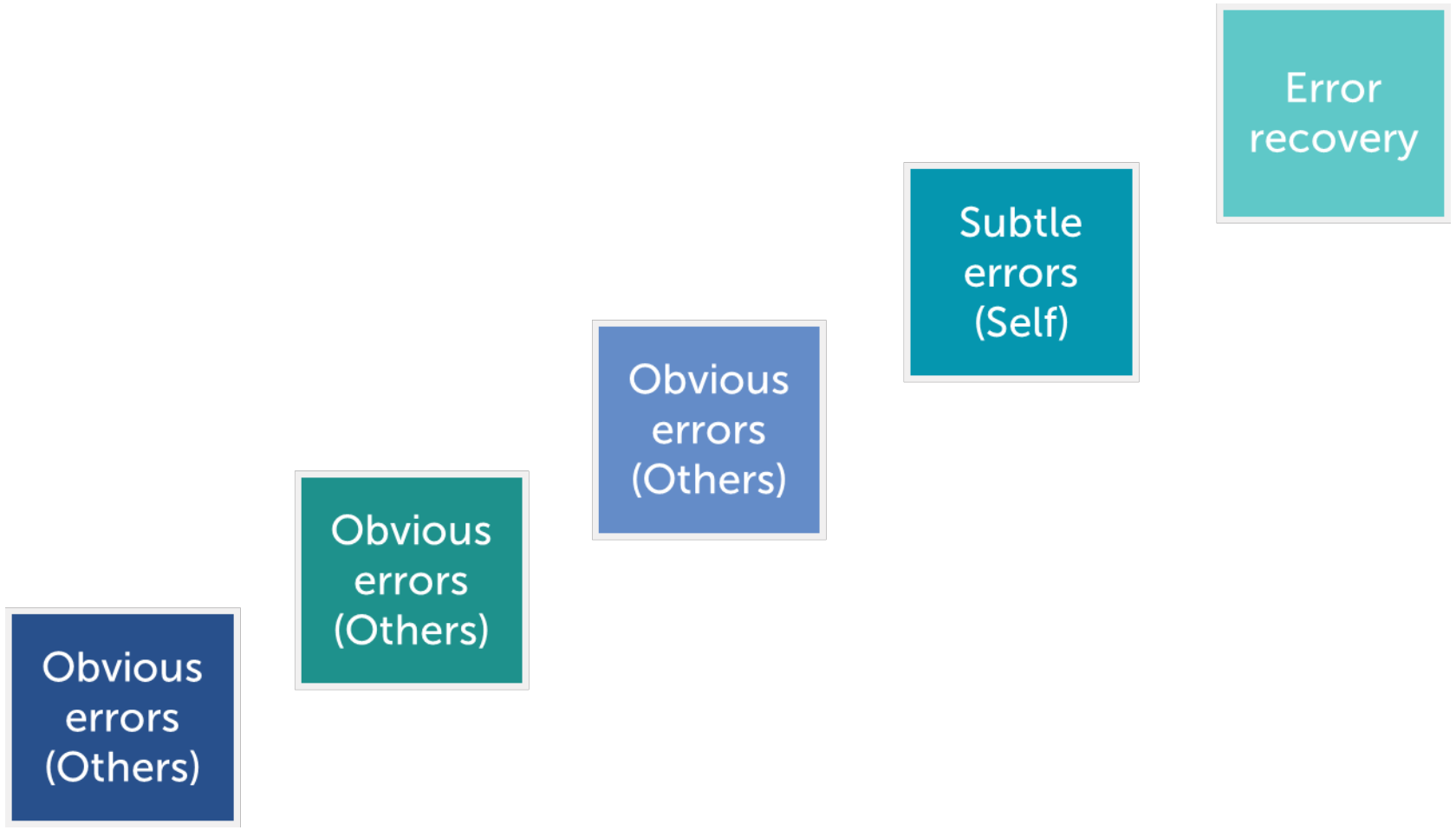
Error management theory

- EMT is a brain-based learning strategy that utilizes active exploration and explicit encouragement of learners to make errors during training as an approach to more successful and resilient long-term learning.
- It sensitizes learners to what leads to error and what error looks like in its various forms so it can be recognized earlier, faster and more efficiently.
- Enables a framework to rescue error → failure and how to contain failure.
- This theory exploits the fact that learners are motivated to understand and learn from their mistakes.

Error management theory cont'd

- Learning strategy that promises to improve long-term retention, emotional resiliency and contextualization of learning.
- Rather than avoid errors, learners are asked to embrace errors as part of the initial events of learning.
- Learners are asked to understand what "wrong" is or identify errors, ***error recognition***, and how best to manage the error, or ***error recovery.***
- *Increases Level 3 Situational Awareness (Projection, Anticipation)*

Error management learning paradigm



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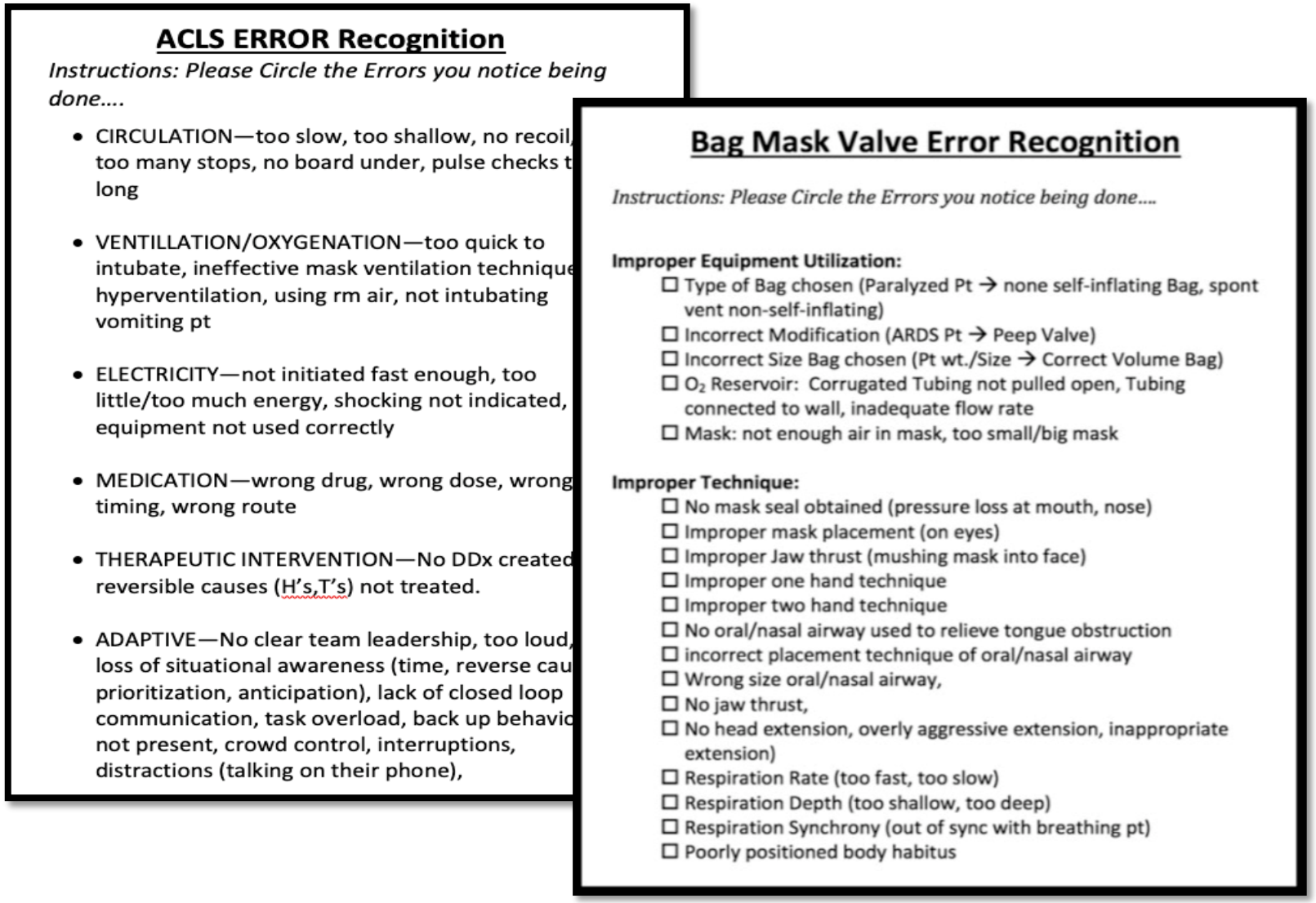
Dror I. Medical Teacher, 2011, 33:1, 34-38

EMT: Practical approach

- Just-in-time videos
- Simulation
- EMT checklist
  - obvious errors
  - subtle errors
- Recognition and rescue
- Contain



ACLS ERROR Recognition

Instructions: Please Circle the Errors you notice being done….

- CIRCULATION—too slow, too shallow, no recoil, too many stops, no board under, pulse checks t long
- VENTILLATION/OXYGENATION—too quick to intubate, ineffective mask ventilation technique hyperventilation, using rm air, not intubating vomiting pt
- ELECTRICITY—not initiated fast enough, too little/too much energy, shocking not indicated, equipment not used correctly
- MEDICATION—wrong drug, wrong dose, wrong timing, wrong route
- THERAPEUTIC INTERVENTION—No DDx created reversible causes (H's,T's) not treated.
- ADAPTIVE—No clear team leadership, too loud, loss of situational awareness (time, reverse cau prioritization, anticipation), lack of closed loop communication, task overload, back up behavio not present, crowd control, interruptions, distractions (talking on their phone),

Bag Mask Valve Error Recognition

Instructions: Please Circle the Errors you notice being done….

Improper Equipment Utilization:

- ☐ Type of Bag chosen (Paralyzed Pt → none self-inflating Bag, spont vent non-self-inflating)
- ☐ Incorrect Modification (ARDS Pt → Peep Valve)
- ☐ Incorrect Size Bag chosen (Pt wt./Size → Correct Volume Bag)
- ☐ O_2 Reservoir: Corrugated Tubing not pulled open, Tubing connected to wall, inadequate flow rate
- ☐ Mask: not enough air in mask, too small/big mask

Improper Technique:

- ☐ No mask seal obtained (pressure loss at mouth, nose)
- ☐ Improper mask placement (on eyes)
- ☐ Improper Jaw thrust (mushing mask into face)
- ☐ Improper one hand technique
- ☐ Improper two hand technique
- ☐ No oral/nasal airway used to relieve tongue obstruction
- ☐ incorrect placement technique of oral/nasal airway
- ☐ Wrong size oral/nasal airway,
- ☐ No jaw thrust,
- ☐ No head extension, overly aggressive extension, inappropriate extension)
- ☐ Respiration Rate (too fast, too slow)
- ☐ Respiration Depth (too shallow, too deep)
- ☐ Respiration Synchrony (out of sync with breathing pt)
- ☐ Poorly positioned body habitus

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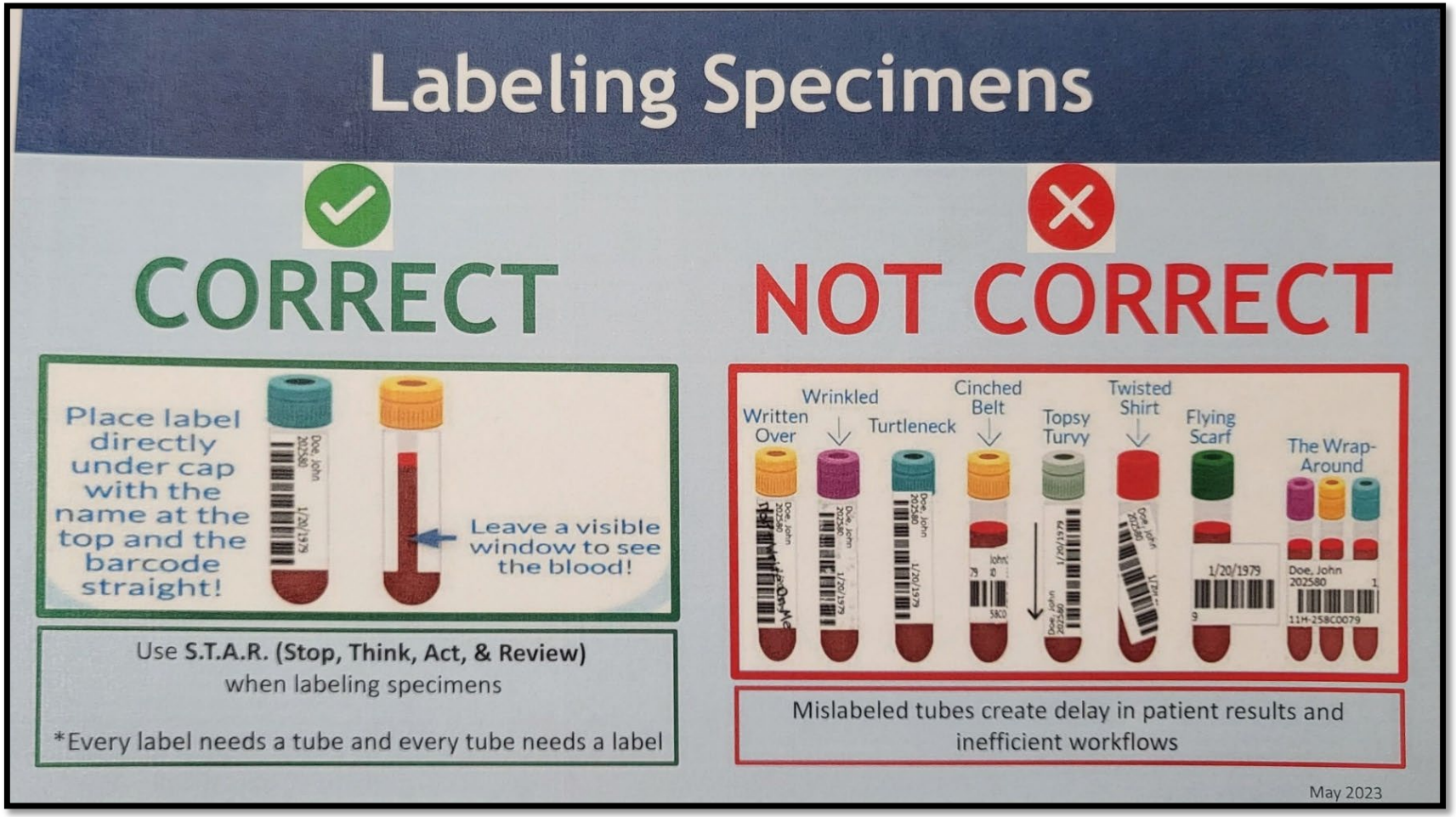
EMT: Practical approach



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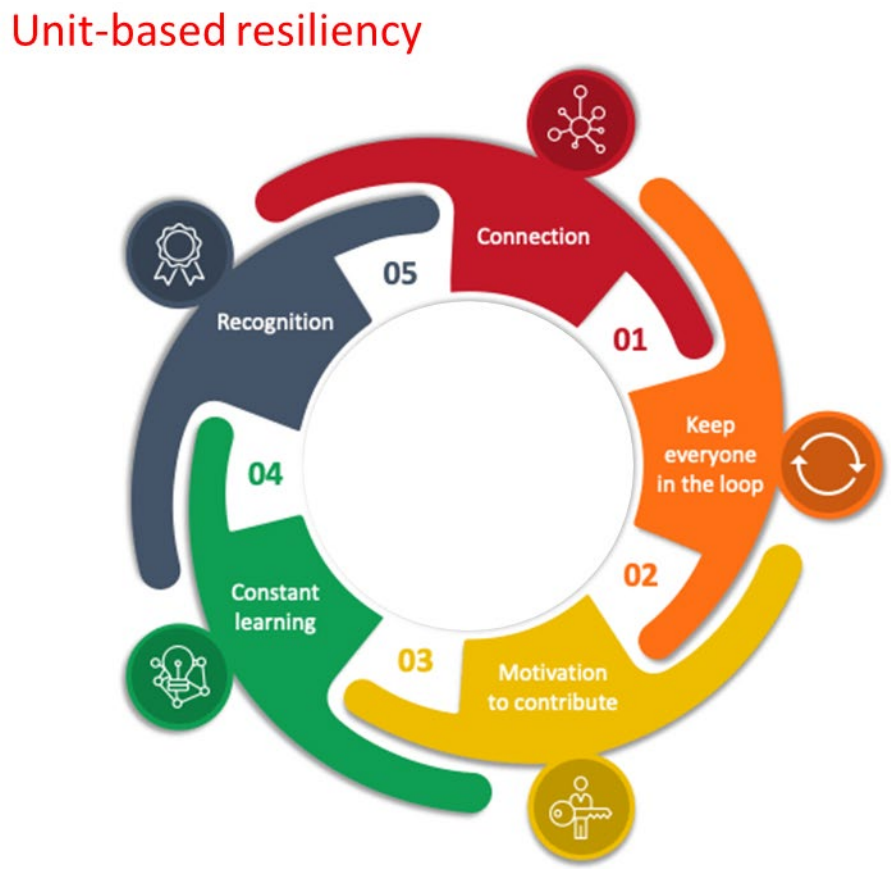
Unit-based practices to advance resiliency



- Buddy systems
- Cross-unit rounding
- Geographic modeling
- Unit group chat

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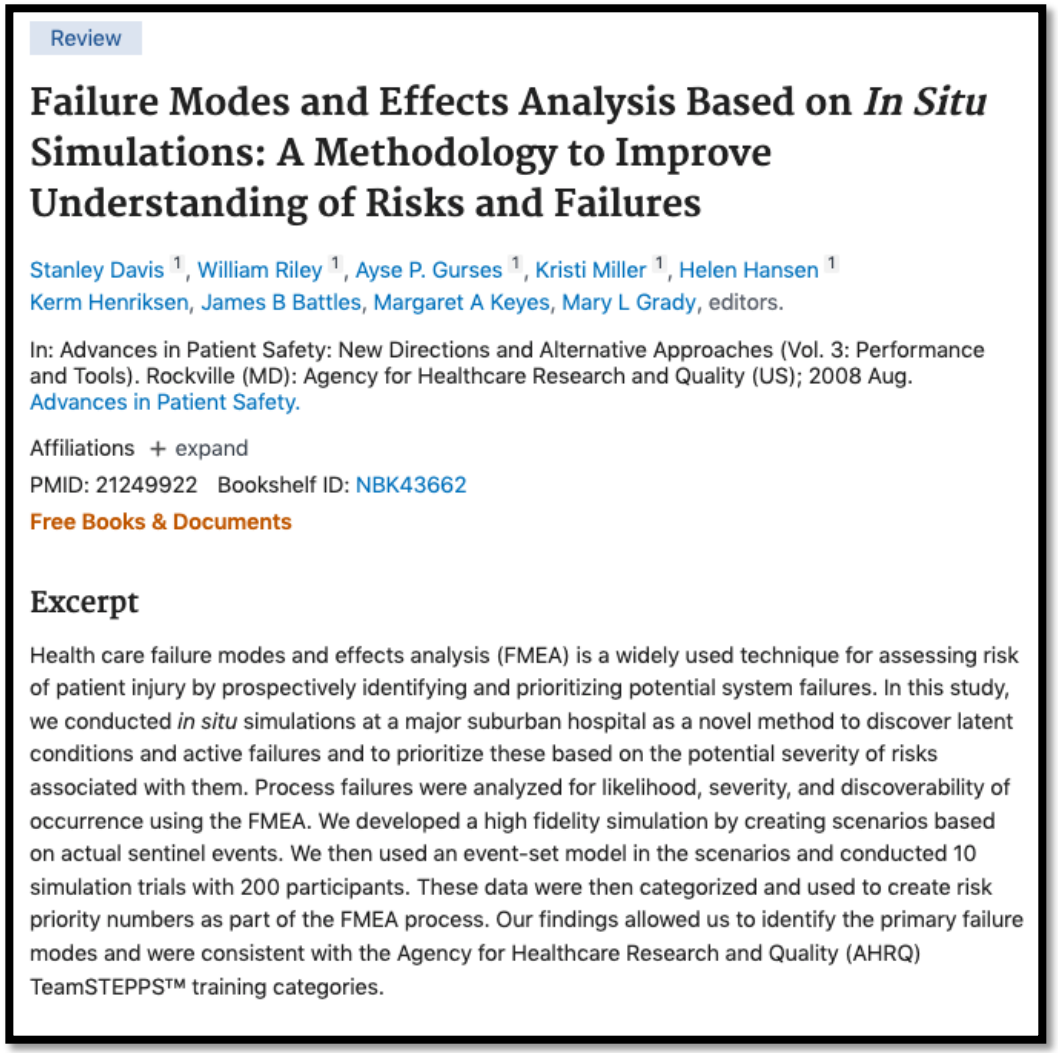
In-situ simulation FMEA

- Pre-occupation with failure by challenging assumptions (WAI vs WAD).
- Deference to expertise by utilizing front-line staff as opposed to midlevel or senior leadership.
- Sensitivity to operations (run in the actual environment of care, unearthing more subtle LSTS).
- Reluctance to simplify (captures system complexity like emergence and resonance).
- Commitment to resiliency by building in rescue mechanisms.



Review

Failure Modes and Effects Analysis Based on *In Situ* Simulations: A Methodology to Improve Understanding of Risks and Failures

Stanley Davis [1], William Riley [1], Ayse P. Gurses [1], Kristi Miller [1], Helen Hansen [1]
Kerm Henriksen, James B Battles, Margaret A Keyes, Mary L Grady, editors.

In: Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools). Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Aug.
Advances in Patient Safety.

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Excerpt

Health care failure modes and effects analysis (FMEA) is a widely used technique for assessing risk of patient injury by prospectively identifying and prioritizing potential system failures. In this study, we conducted *in situ* simulations at a major suburban hospital as a novel method to discover latent conditions and active failures and to prioritize these based on the potential severity of risks associated with them. Process failures were analyzed for likelihood, severity, and discoverability of occurrence using the FMEA. We developed a high fidelity simulation by creating scenarios based on actual sentinel events. We then used an event-set model in the scenarios and conducted 10 simulation trials with 200 participants. These data were then categorized and used to create risk priority numbers as part of the FMEA process. Our findings allowed us to identify the primary failure modes and were consistent with the Agency for Healthcare Research and Quality (AHRQ) TeamSTEPPS™ training categories.

Facilitator questions

- What is the downtime procedure for this step? (Actually get out the downtime material and do the step. Note your questions along the way.)
- What is the next step or steps that happen in parallel? (Be granular.)
  - Is there a difference between what we think we will do vs. what we actually will do?
- What are the hazardous or "at-risk" conditions, and current workarounds in place that could quickly fail during downtime and become "fault" conditions?
- At each process step, ask:
  - How could this downtime step fail?
  - How would we know if this step is failing?
  - What would we do to recover if this step failed?
  - Could we contain failure if necessary?
  - If it is a critical task; is there redundancy built in?

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Three types of resiliency

Human resiliency

Process resiliency

Training resiliency

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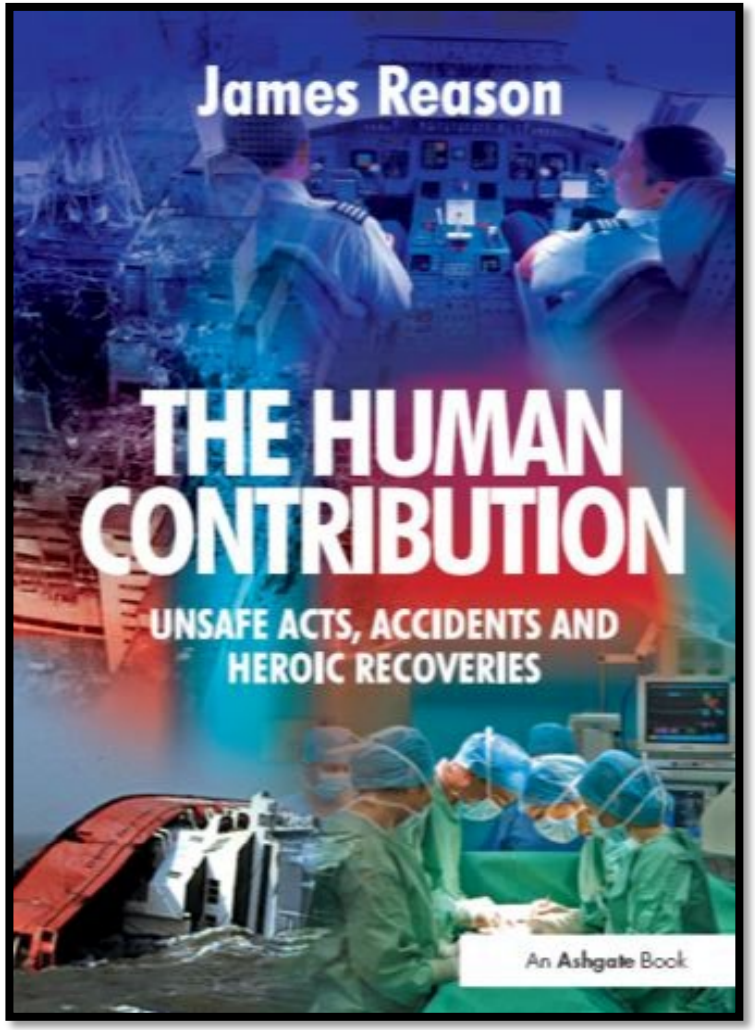
Humans are a source of system resilience

Humans are a part of the S-T System that is healthcare.

Their ability to recognize errors, adapt and compensate from errors turning into failure, to rescue and adjust is key to ***System Resiliency***, which enables the system to reach its outcomes.



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Make your staff more resilient: Adopt the Missouri Model for 2nd Victim Support

Susan Scott, PhD, RN, CPPS, FAAN
Adjunct, Associate Professor of Nursing at Sinclair School of Nursing University of Missouri Health System

- Psychological First Aid
- Resiliency In Stress Events (RISE) Team
- Proactive Reach Out of team trained for front-line clinicians involved in safety events (Missouri Model)
- Enabled referral of colleagues to Psychological First Aid Trained Staff through our event reporting platform
- 300% increase in two years in utilization of these resources

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Gamification: Fun at work increases resiliency!

Recognize and reward

Wheel of names: https://wheelofnames.com/

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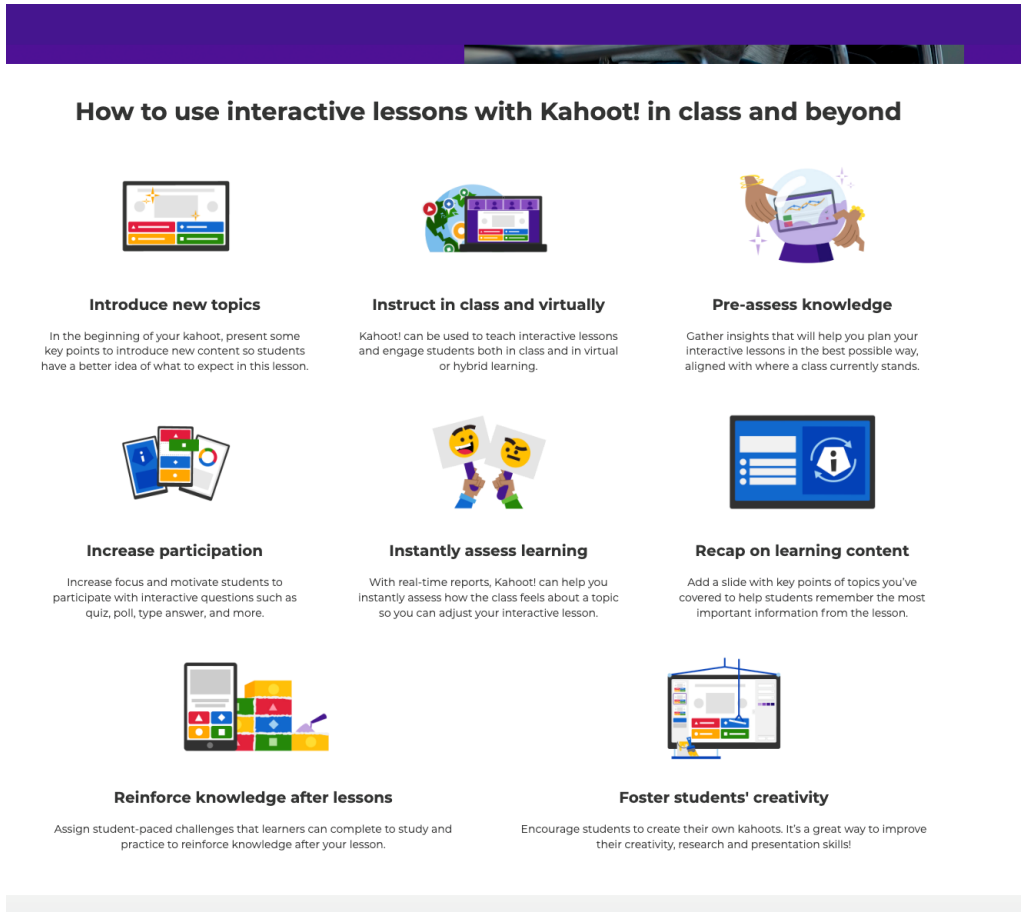
Gamification



- Focus on context to reduce rule-based errors
- Leverage competition
- Kahoot

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How do we measure resiliency?

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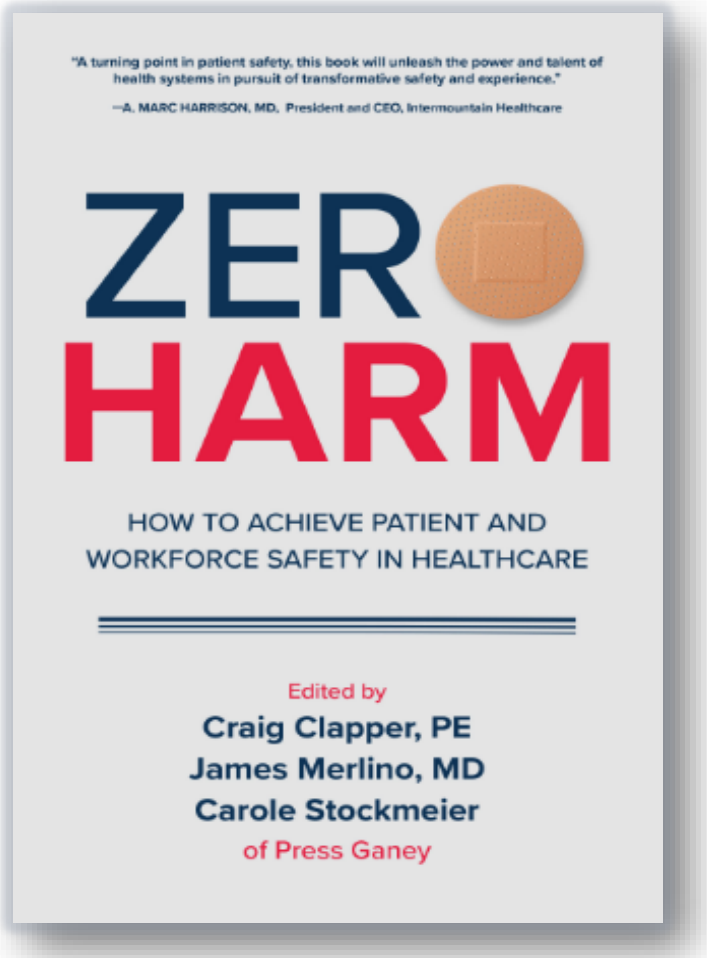
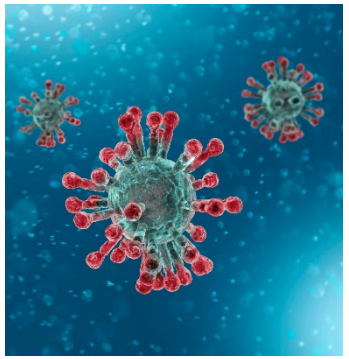
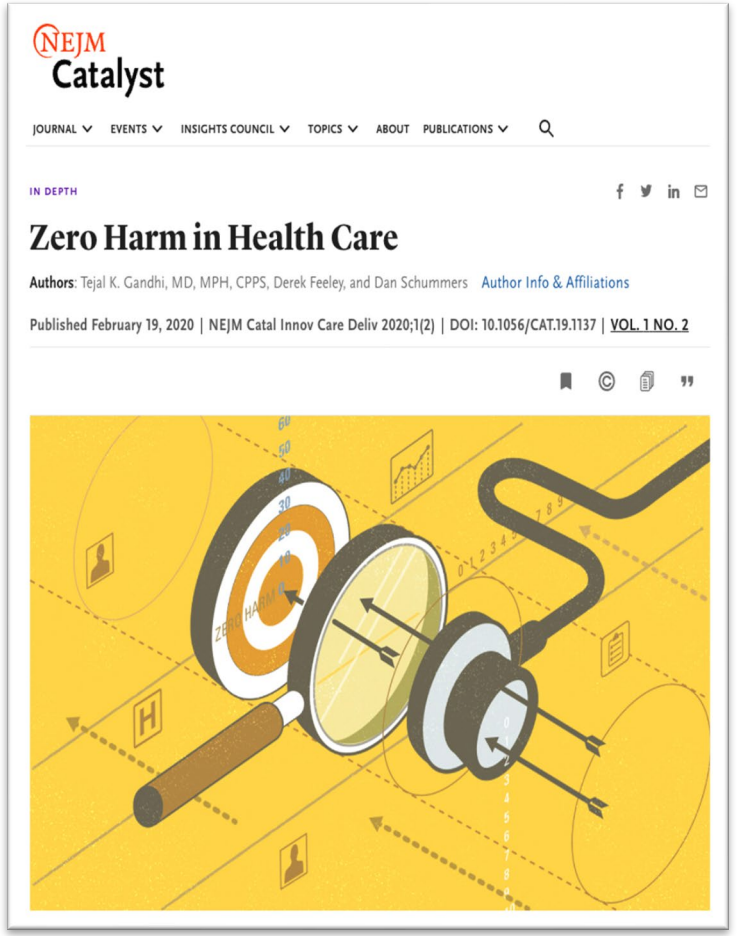
Time to rethink zero…







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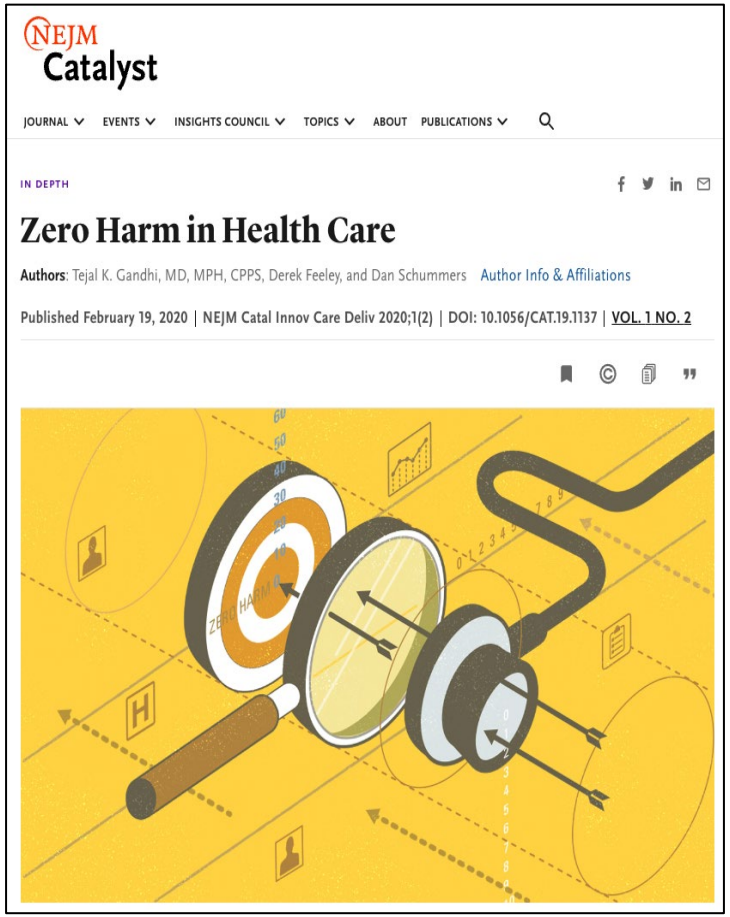
Counting for resiliency…



- Preventative Harm, Not Zero Harm
- Metrics:
  - Days with rescue
  - Utilization metrics
  - Time for system issue resolution
  - # Rescue moments (reassignments)
  - # System fixes
  - Great catches (S-T failures)
  - Great saves (Vigilance & Saves)
  - % GC/Total event reporting
  - Grading of action items

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Questions

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