Telemetry: What Good Looks Like

Designing Solutions

Safe Table Discussion Confidentiality Agreement

Welcome to the CHPSO/AQIPS Safe Table discussion.

By participating in this Safe Table, I agree to perform Patient Safety Activities, such as reviewing, analyzing, and participating in deliberations about Patient Safety Work Product within the CHPSO Patient Safety Evaluation System as CHPSO temporary volunteer Workforce. My term of service as CHPSO PSO Workforce terminates at the end of this safe table. I understand that this safe-table is conducted in a safety culture where the focus is on systems or gap analysis and not on individual provider performance. All Patient Safety Work Product is confidential and shall not be disclosed except to provide feedback for quality improvement purposes. I understand that I will be participating in confidential conversations about sensitive confidential data that are intended to improve the quality of care at my facility. If I am disclosing information from my facility, I have permission to disclose the data and have removed any PHI and identification of any specific health care provider.

I understand that Confidentiality training and other rules for participating in the Safe-table will be provided to me at the beginning of the meeting. I agree that the confidentiality protections of Patient Safety Work Product shall survive after the meeting is adjourned and I will not disclose any Patient Safety Work Product discussed at this meeting except for quality improvement purposes within the facility. As this meeting is occurring via teleconference, I understand that I am responsible for taking reasonable steps to ensure that no impermissible disclosures occur at the location that I am participating in the meeting.

I recognize that 21 C.F.R. Part 3 provides for penalties -- that I can be personally responsible for -- of up to $11,000 for each Disclosure of Patient Safety Work Product – other than to provide feedback to the facility for quality improvement purposes.

Prior to entering the safe table discussion, you will be prompted to acknowledge your acceptance of this agreement.

ADAPTIENT
ADAPTIVE, RESILIENT, HIGHLY RELIABLE

Ground Rules

You have a duty to protect confidentiality

You may not disclose Patient Safety Work Product (PSWP)

All information developed during the Safe Table is PSWP and must be marked as PSWP to show that the information is confidential and cannot be disclosed.

As a patient safety activity, these meetings occur within a Patient Safety Evaluation System (PSES).

Lee Erickson, MD

Sharon Hickman, MBA

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Disclosure of Relevant Financial Relationships

Lee Erickson, MD, LSSMBB reported no relevant financial relationships or relationships she has with ineligible companies of any amount during the past 24 months.

Sharon Hickman, MBA, CPHQ, CPPS, CPXP, LSSMBB reported no relevant financial relationships or relationships she has with ineligible companies of any amount during the past 24 months.

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OUR TEAM
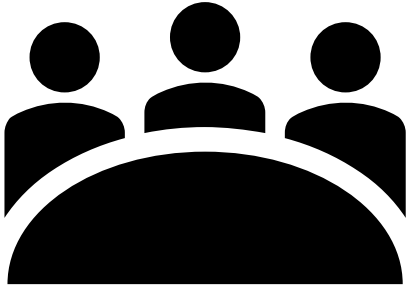
- California Hospital PSO
- Child Health PSO
- ECRI & ISMP PSO
- Louisiana Alliance for Patient Safety PSO
- 2 additional PSOs
- More than 40 Hospitals

Aimee Cloyd
Eddie Decker
Vivian Eusebio
Leslie Huezo
Melinda Jamil
Kamali Jones
Angela Lockhart
Mary C. Magee
Ashley Moody
Steven Smith
Jeraldine Stoltzfus
Emily Tooley

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THE FRAMEWORK
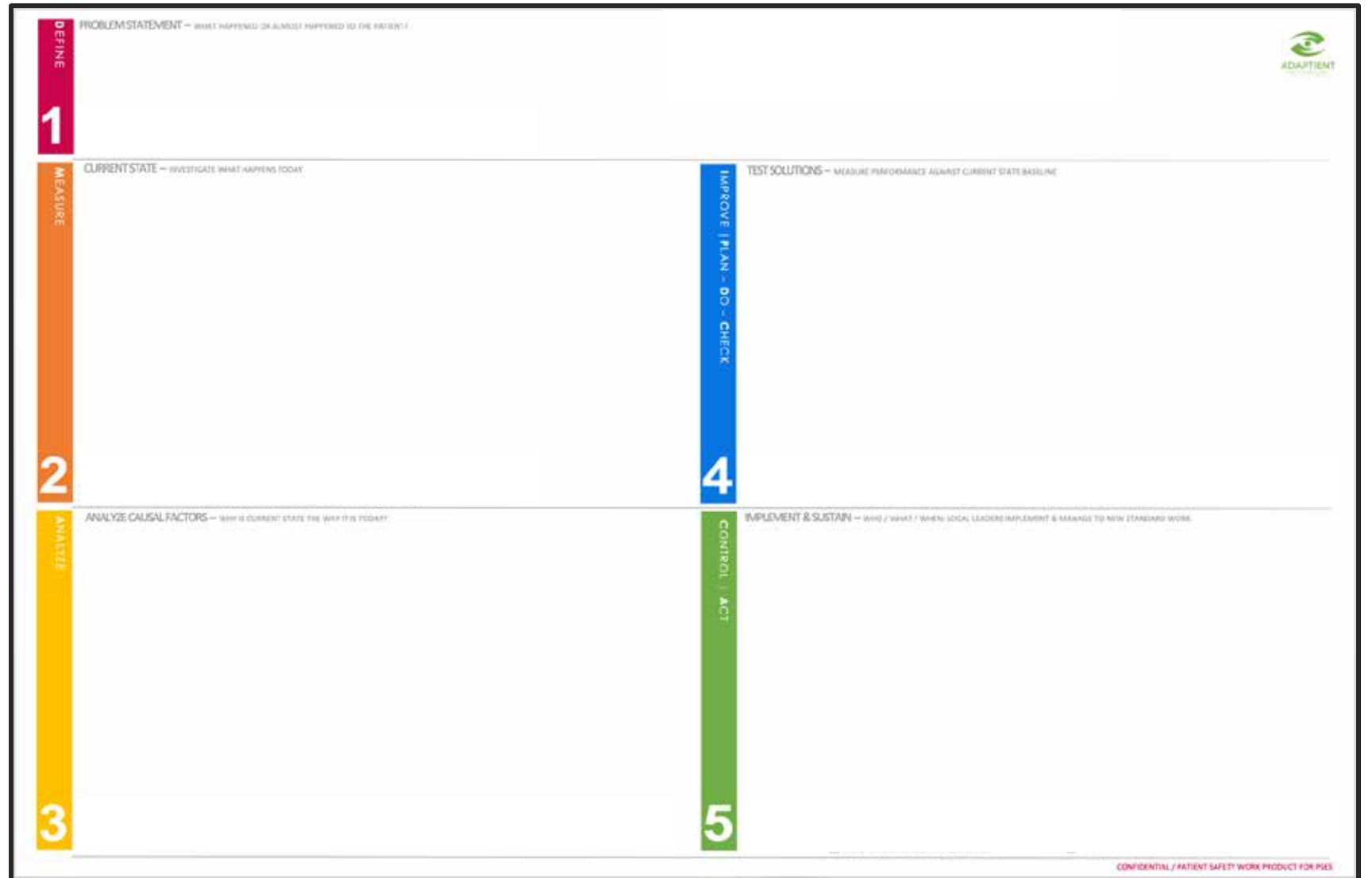
PROBLEM STATEMENT — WHAT HAPPENED OR ALMOST HAPPENED TO THE PATIENT?
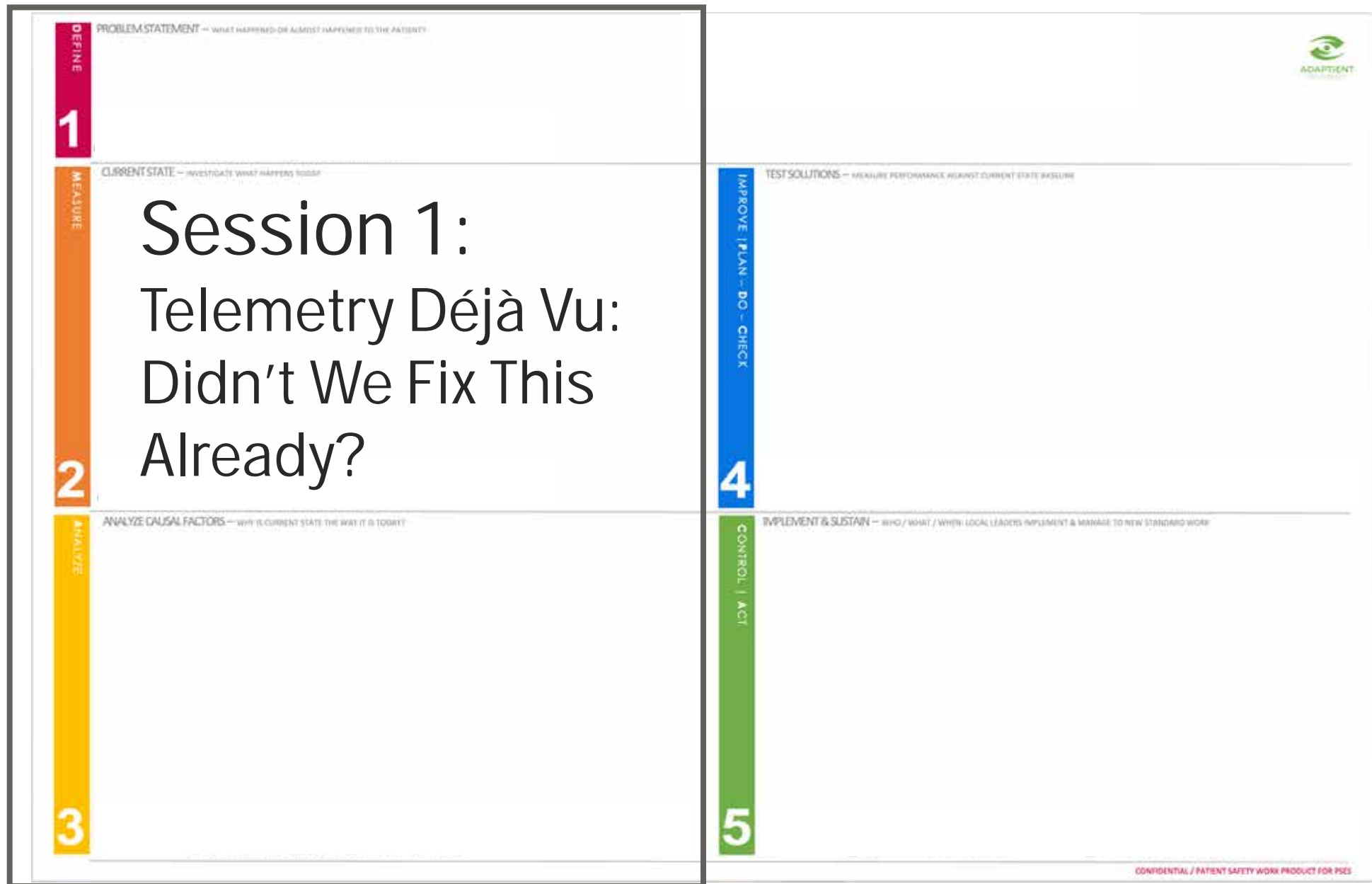
MEASURE

CURRENT STATE — INVESTIGATE WHAT HAPPENS TODAY

CURRENT STATE — INVESTIGATE WHAT HAPPENS TODAY

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

ANALYZE

3

Session 1:
Telemetry Déjà Vu: Didn't We Fix This Already?

IMPROVE | PLAN – DO – CHECK

4

Session 2:
Solutions for Highly Reliable Telemetry

CONTROL | ACT

Session 3:
Leadership's Mission - Make Improvements Stick

Thursday, October 23rd
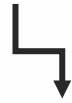3:00-4:30 PM Eastern Time

5

DEFINE

1

Despite multiple root cause analyses and improvement efforts, telemetry failures remain a persistent issue in healthcare. Why does this keep happening?
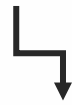
CURRENT STATE — INVESTIGATE WHAT HAPPENS TODAY

MEASURE

Telemetry = inpatient cardiac monitoring, adult & pediatric, any type of unit
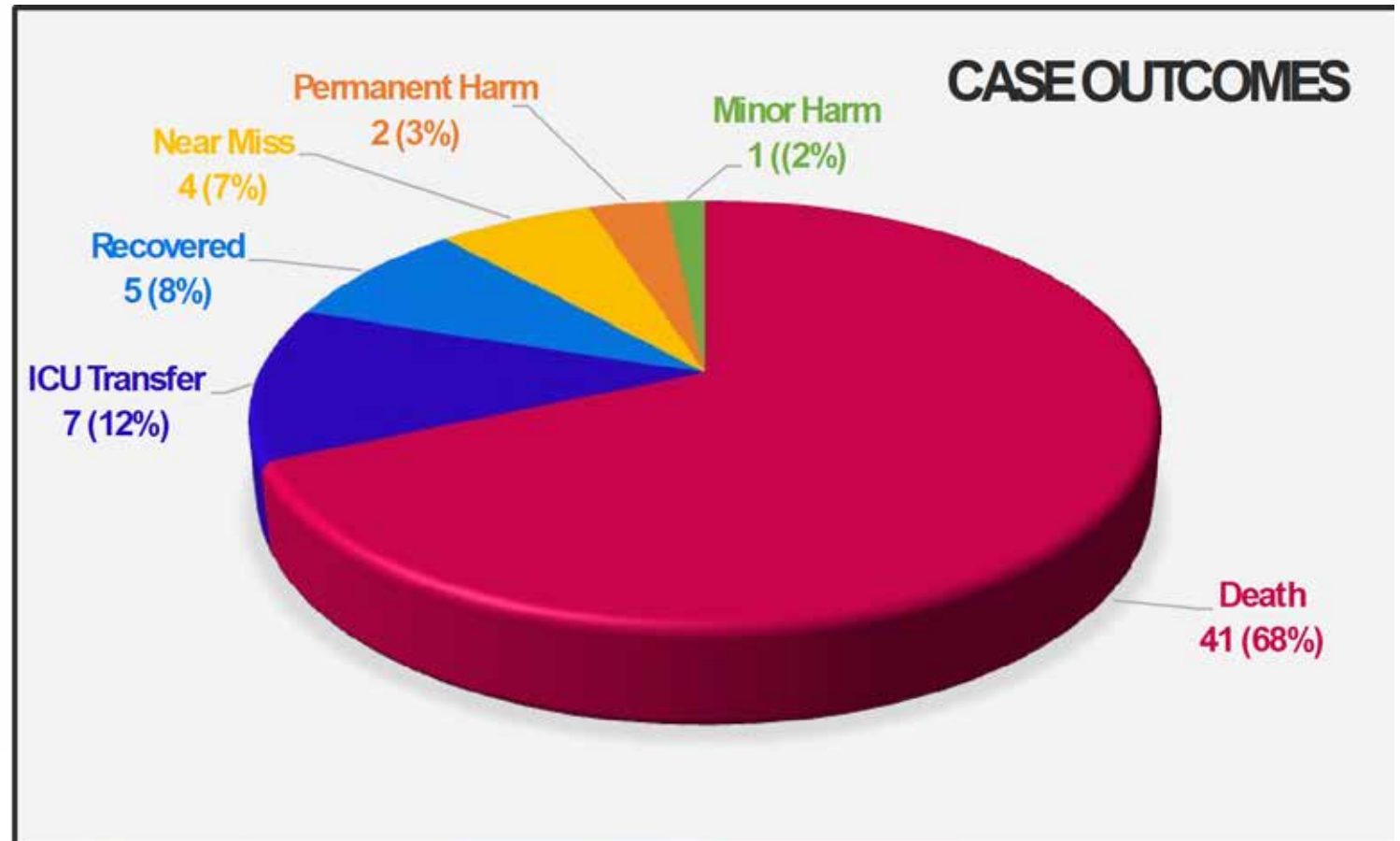
79 RCAs submitted

19 excluded as not telemetry-related

60 analyzed

68% mortality rate
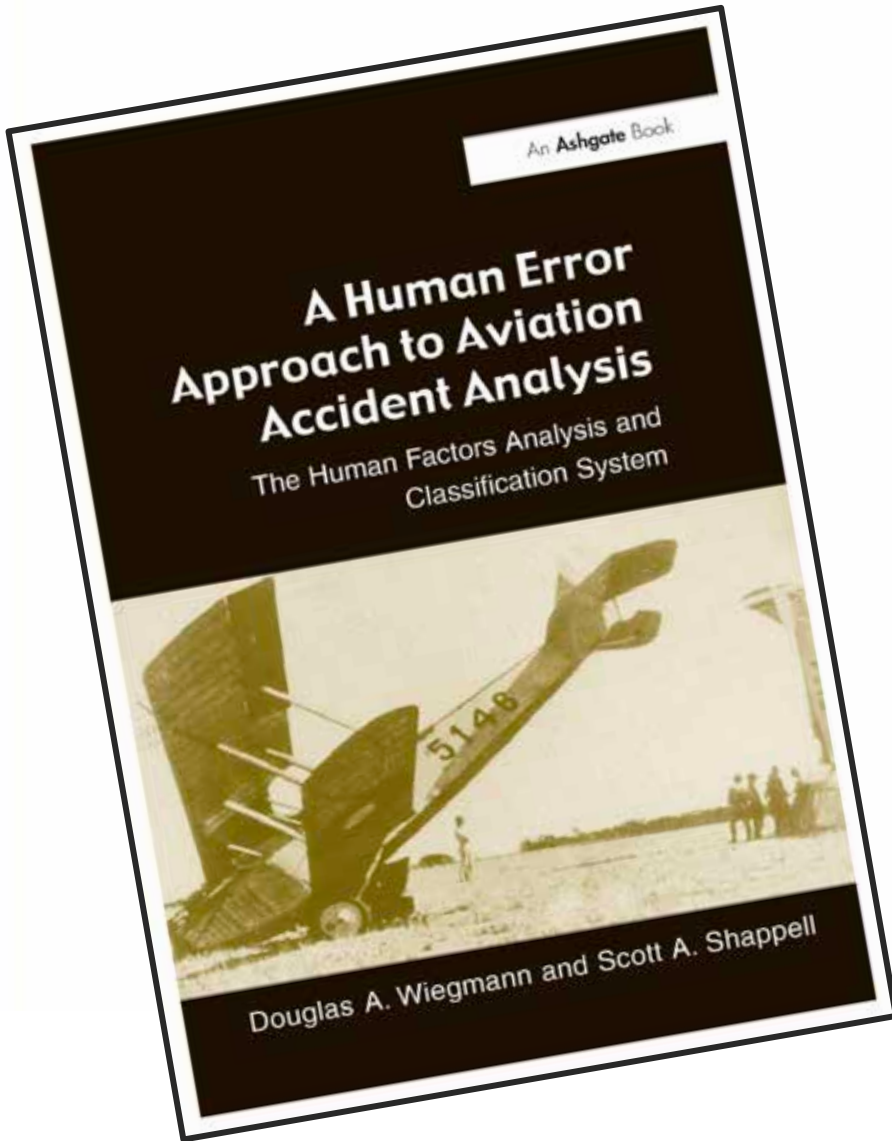
CASE OUTCOMES

Permanent Harm
2 (3%)

Minor Harm
1 ((2%)

Near Miss
4 (7%)

Recovered
5 (8%)

ICU Transfer
7 (12%)

Death
41 (68%)

An **Ashgate** Book

A Human Error Approach to Aviation Accident Analysis

The Human Factors Analysis and Classification System

5148

Douglas A. Wiegmann and Scott A. Shappell

ANALYZE

2

3

An **Ashgate** Book

A Human Error
Approach to Aviation
Accident Analysis

The Human Factors Analysis and
Classification System

5146

Douglas A. Wiegmann and Scott A.

HUMAN
ERROR

JAMES REASON
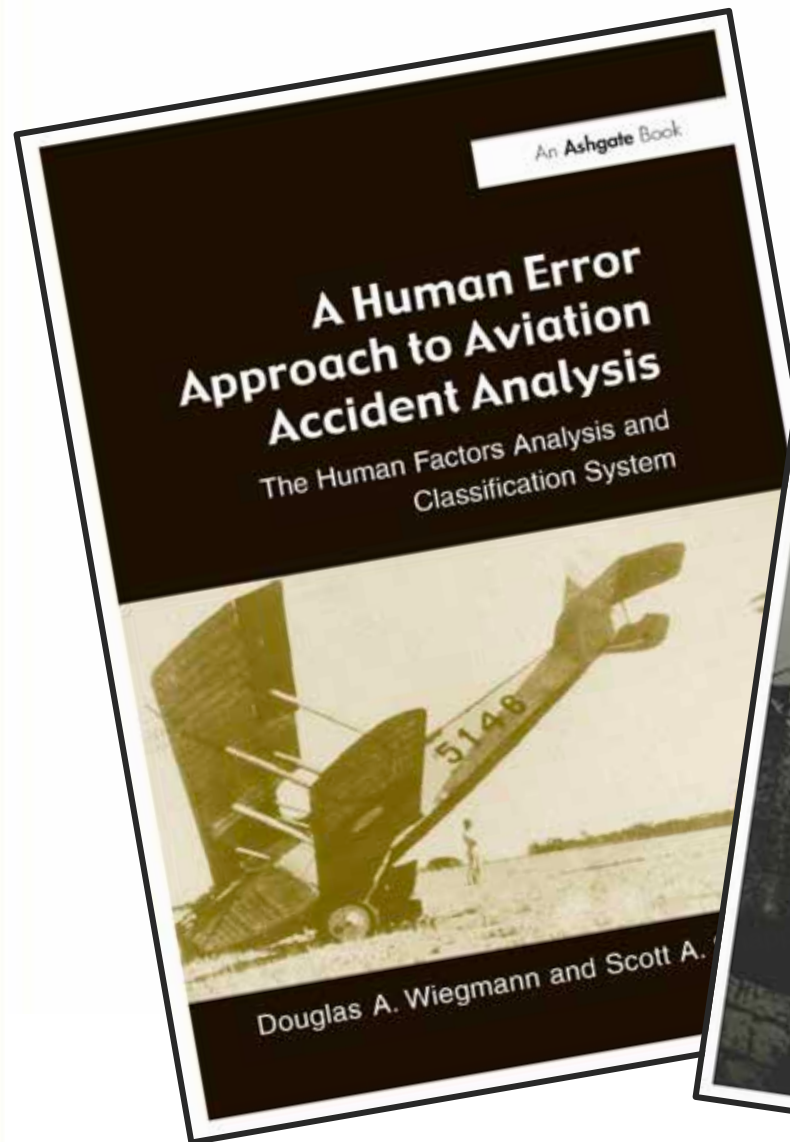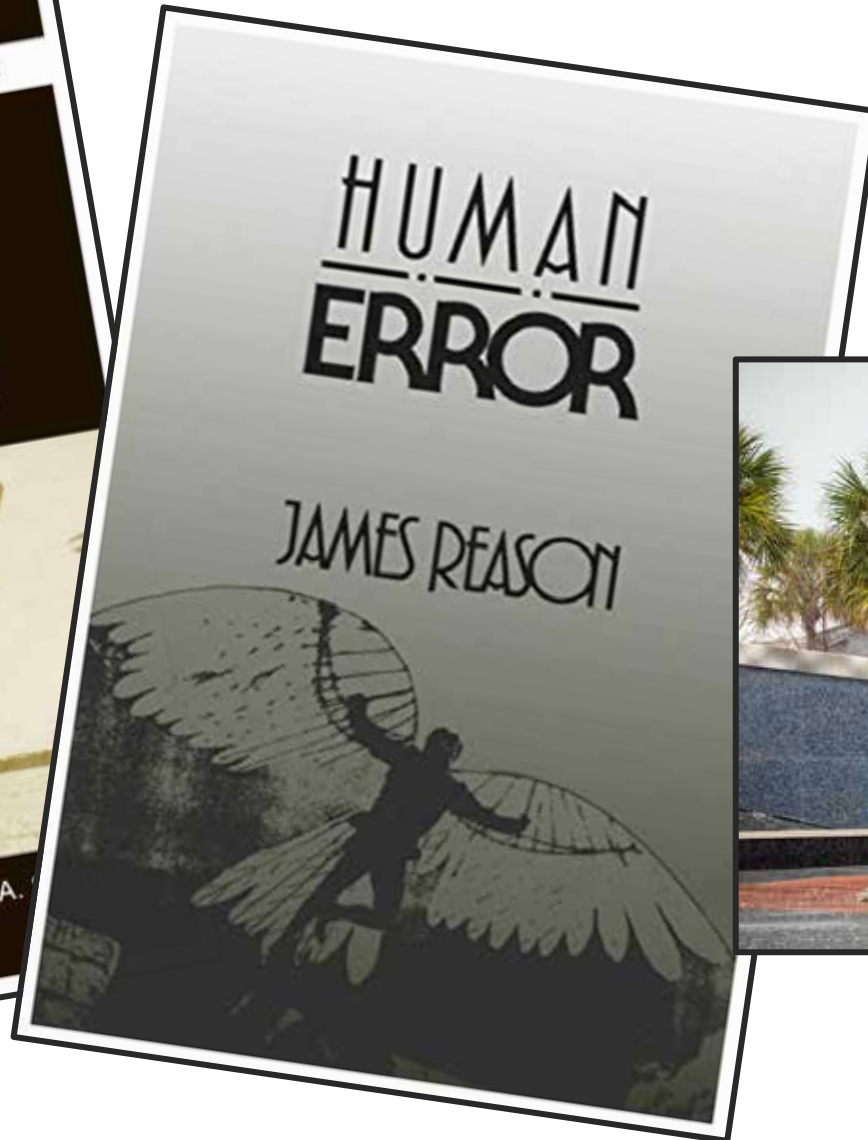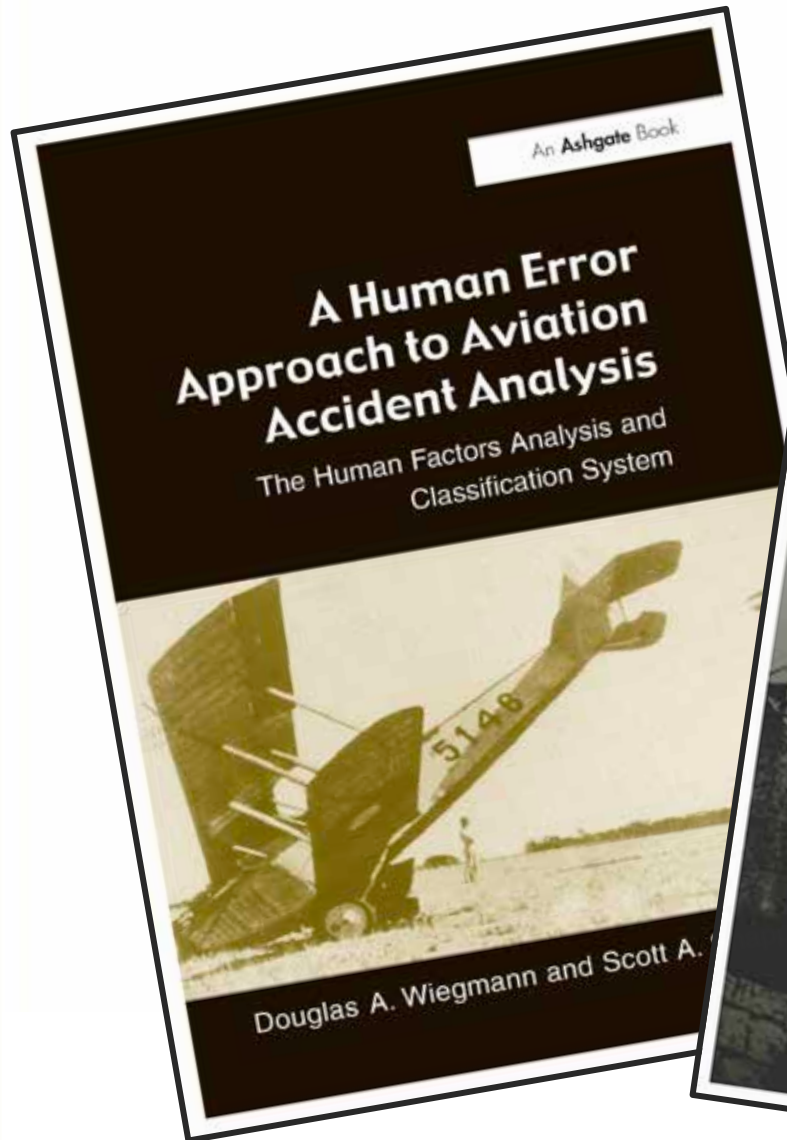
ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

POLLING QUESTION 1

When you roll out Action Items in your organization's RCAs, which HFACS level gets the most attention?

A. Frontline Acts
B. Preconditions
C. Supervision
D. Organization

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ADAPTIVE, RESILIENT, HIGHLY RELIABLE
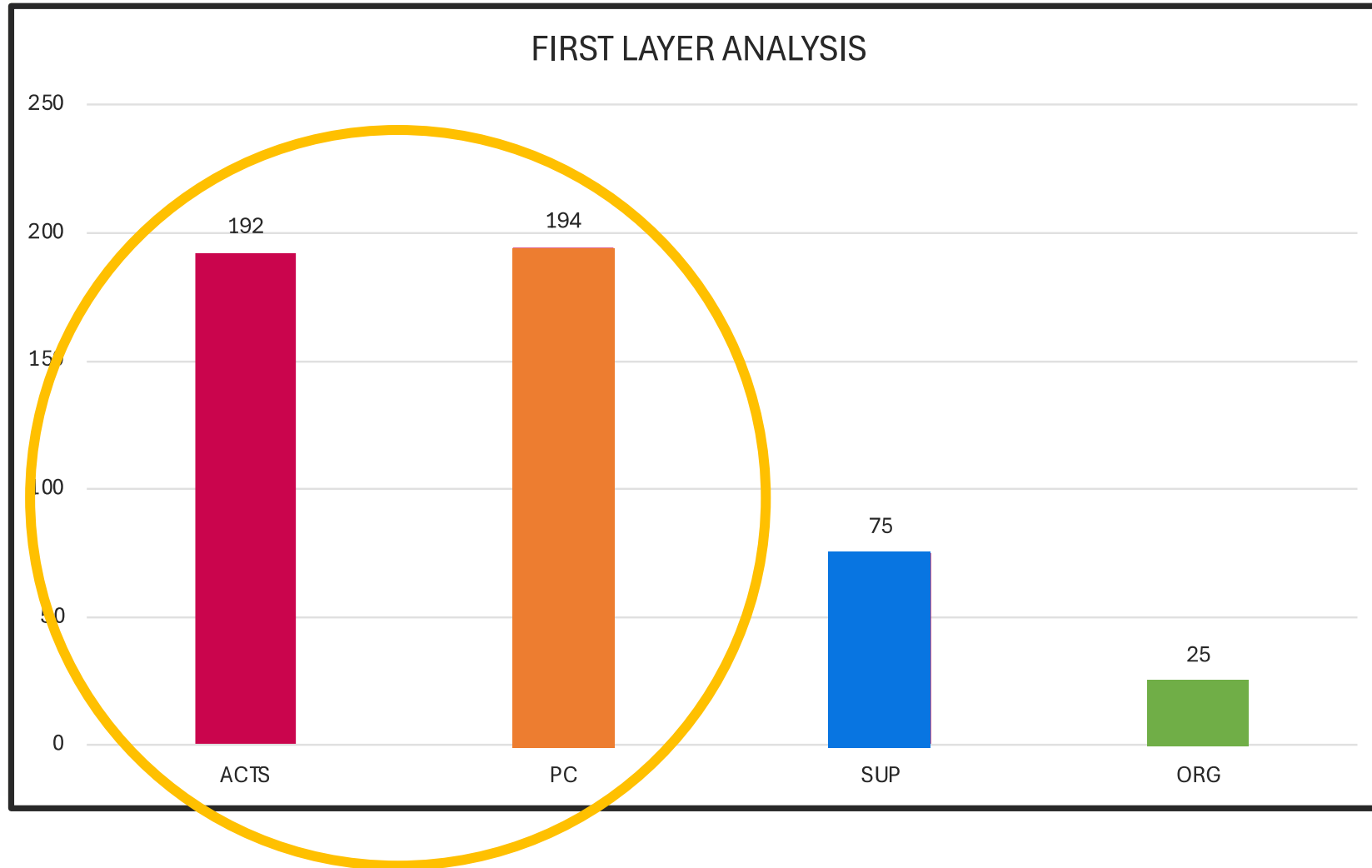
ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

FIRST LAYER ANALYSIS
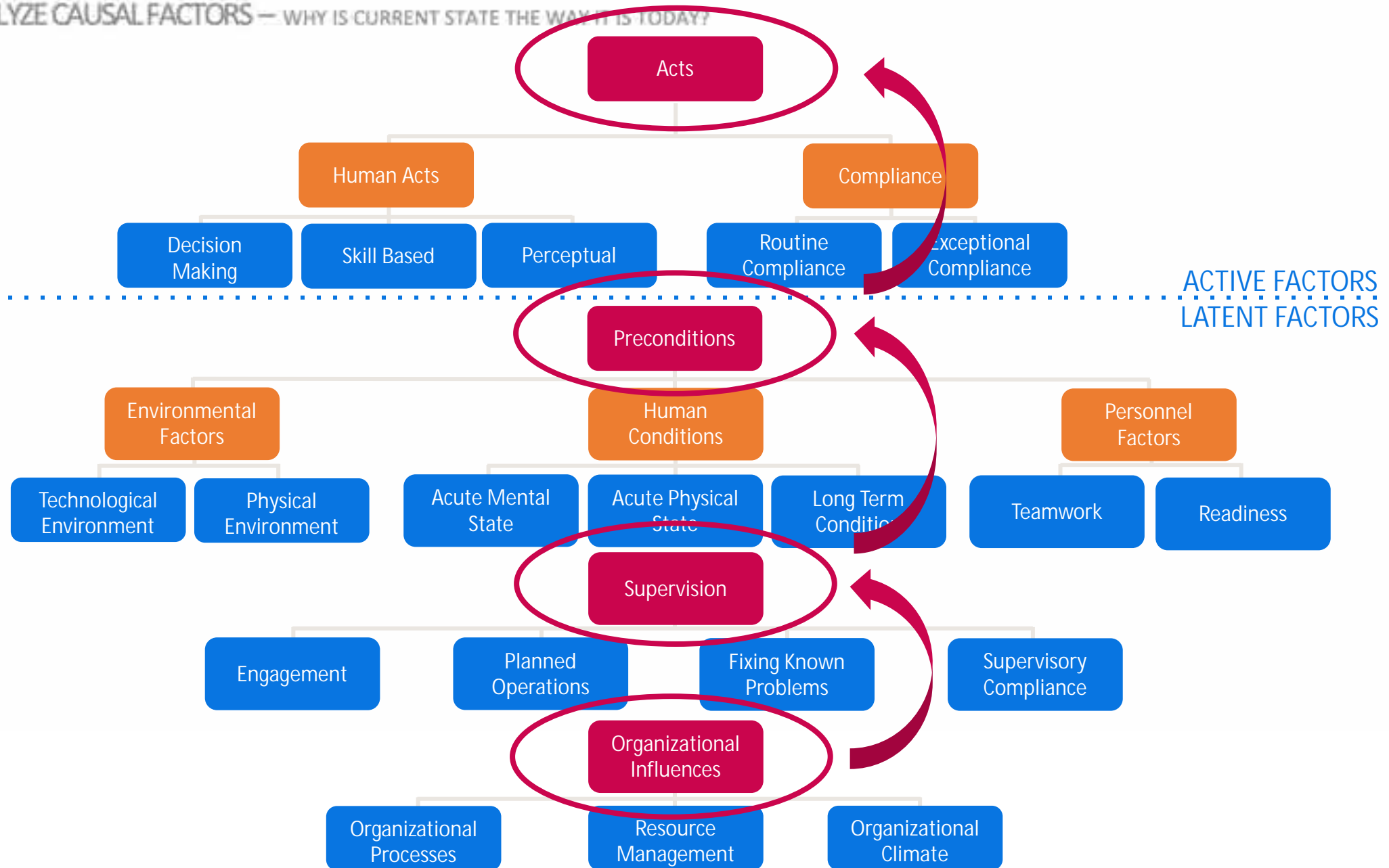
40% Acts

40% Preconditions

15% Supervision

5% Organization

IMPROVE | **PLAN** – **DO** – **CHECK**

4

40% Acts

40% Preconditions

15% Supervision

5% Organization

Backsliding

IMPROVE | PLAN – DO – CHECK

4

40% Acts

40% Preconditions

15% Supervision

5% Organization

IMPROVE | **PLAN** – **DO** – **CHECK**

4
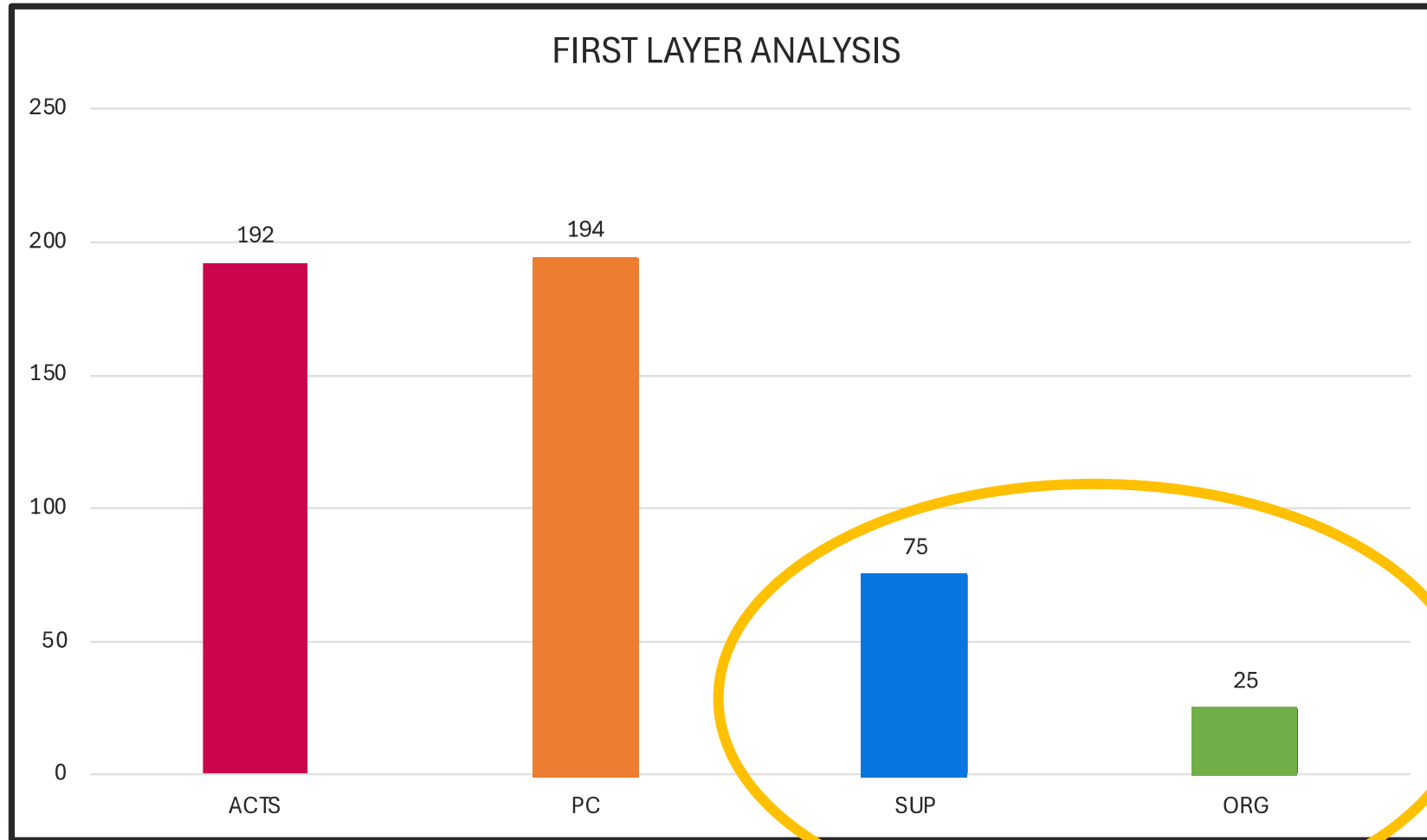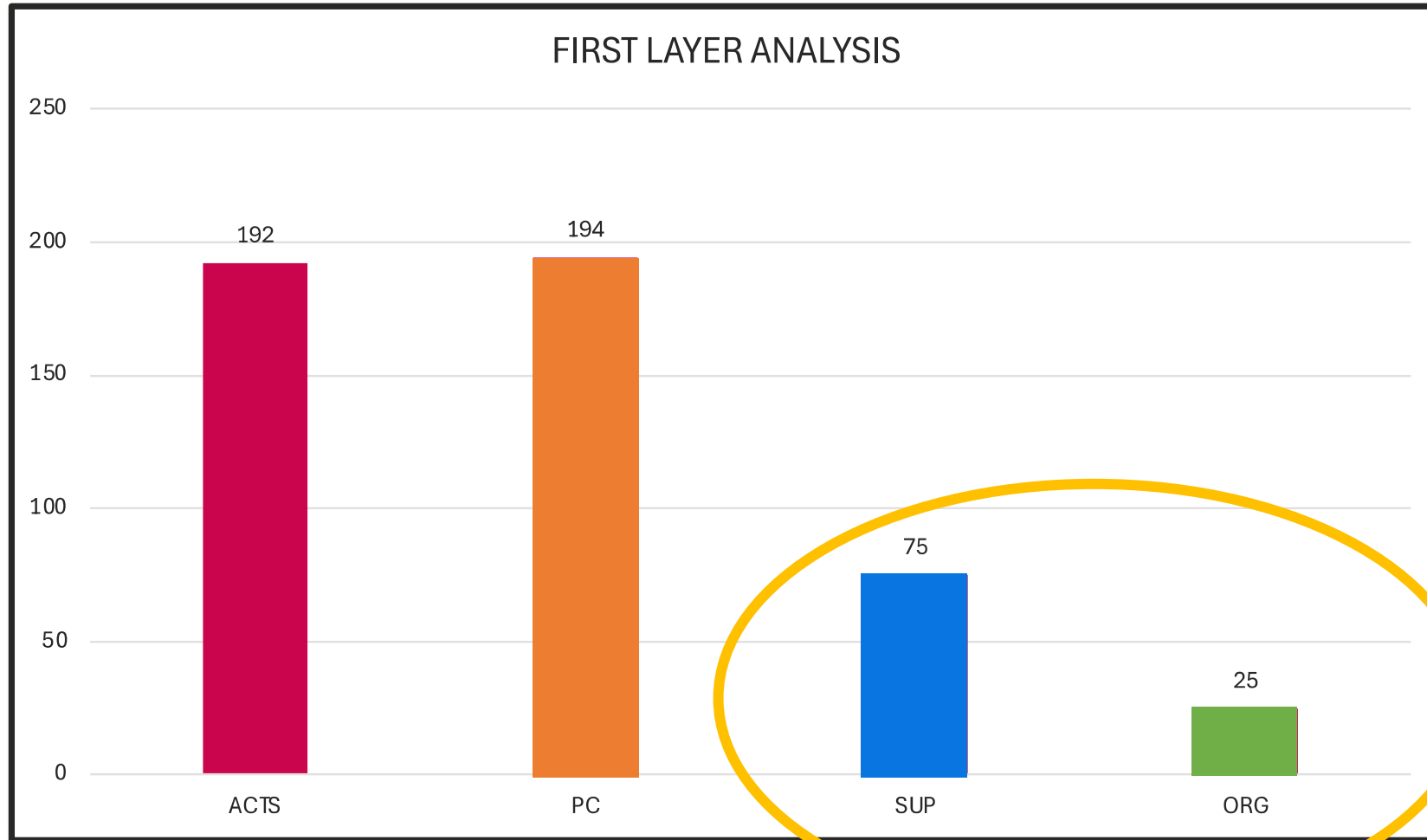
40% Acts

40% Preconditions

15% Supervision

5% Organization

HIERARCHY OF SOLUTIONS

PROTECT US FROM HUMAN ERROR

SOLUTION	Example
AUTOMATE	Pharmacy robot picks individual bar-coded pills for inpatients
FORCE FUNCTION	Tubing for oxygen connects only to oxygen nozzles
FAIL SAFE MECHANISMS	Anesthesia machine auto-adjusts gas ratios in event of sudden pressure change
STANDARDIZE EQUIPMENT	Same make and model for every defibrillator across a health system
PHYSICAL PLANT IMPROVEMENTS	Install automatic magnetic locking doors on locked memory care unit
SIMPLIFY PROCESSES	Eliminate waste & follow the Four Rules
STANDARDIZE PROCESSES	Standard communication tools like SBAR or IPASS
REDUCE DISTRACTIONS	"No Interruption" vests for nurses passing meds
CHECKLISTS / COGNITIVE AIDS	WHO surgical safety checklist
VISUAL CUES	Photos of proper endoscope reprocessing hung next to reprocessing machine
CREATE REDUNDANCIES	Two RNs *independently calculate* and double-check high-risk drips
ADD DETECTION TOOLS	Software monitors real-time census and flags need for float staff
IMPLEMENT HELP CHAINS	Secure texting platform to access intern > resident > fellow > attending > chair
DECREASE WORKLOADS	Eliminate waste
INCREASE STAFFING	Add FTEs

BETTER

GOOD

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ADAPTIVE, RESILIENT, HIGHLY RELIABLE

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BETTER

GOOD

ADAPTIVE, RESILIENT, HIGHLY RELIABLE

WEAKER SOLUTIONS
NEVER USE AS A SINGLE SOLUTION – IT WILL FAIL!

SOLUTION	Example
EDUCATION & TRAINING	All RNs complete competency training on stroke protocol
IMPLEMENT NEW POLICY	Rewrite the policy on independent double checks
DOUBLE CHECKS	First RN calculates high-risk drip and second RN checks her math
DOCUMENT	Ask surgeon to sign a form attesting that she updated the H&P prior to surgery

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

■ Acts

■ Preconditions

■ Supervision

■ Organization

■ DM - Decision Making Acts on the Frontlines

■ T - Preconditions Related to Teamwork

■ PO - Planned Operations: Supervisory Decisions

■ TE - Preconditions in Technological Environment

■ AMS - Preconditions Related to Acute Mental State of the Frontline Worker

Telemetry involves high-demand cognitive tasks

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

ANALYZE

Telemetry involves high-demand cognitive tasks

No surprise that Decision Making
and the Acute Mental State of the
worker were frequent causal
factor themes

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

IMPROVE | PLAN – DO – CHECK

4

- Choosing the right diagnosis or conclusion

- Choosing the right procedure or action

- Recognizing the level of risk

- Task prioritization

EDUCATION & TRAINING

- Monthly strip reviews
- Tele tech certifications
- Etc.

IMPROVE | PLAN – DO – CHECK

4

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- Choosing the right procedure or action

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NEVER USE AS A SINGLE SOLUTION – IT WILL FAIL!

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IMPROVE | PLAN – DO – CHECK

4

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- Task prioritization

PATIENT-SPECIFIC AI-ASSISTED DECISION SUPPORT

IMPROVE | **PLAN** – DO – CHECK

4

PATIENT-SPECIFIC AI-ASSISTED DECISION SUPPORT

Contextual aids

- Risk factors
- Medications
- Trended clinical data
- Predictive analytics
- Nuisance alarm filters

IMPROVE | PLAN – DO – CHECK

4

PATIENT-SPECIFIC AI-ASSISTED DECISION SUPPORT

GE HealthCare to Spotlight Industry-Leading AI-Enabled Portfolio and Digital Solutions at HIMSS 2024

March 7, 2024

News & Views | Open access | Published: 22 March 2025

Wearable AI to enhance patient safety and clinical decision-making

Arjun Mahajan, Kimia Heydari & Dylan Powell ✉ | Cite this article

npj Digital Medicine 8, Article number: 176 (2025)

Philips launches smart telemetry platform for cardiac monitoring that provides continuous, enterprise-wide connectivity beyond the bedside

Empowering clinical teams to respond to surges, track usage and ease workflows with user-friendly touchscreen technology for telemetry patients on the move
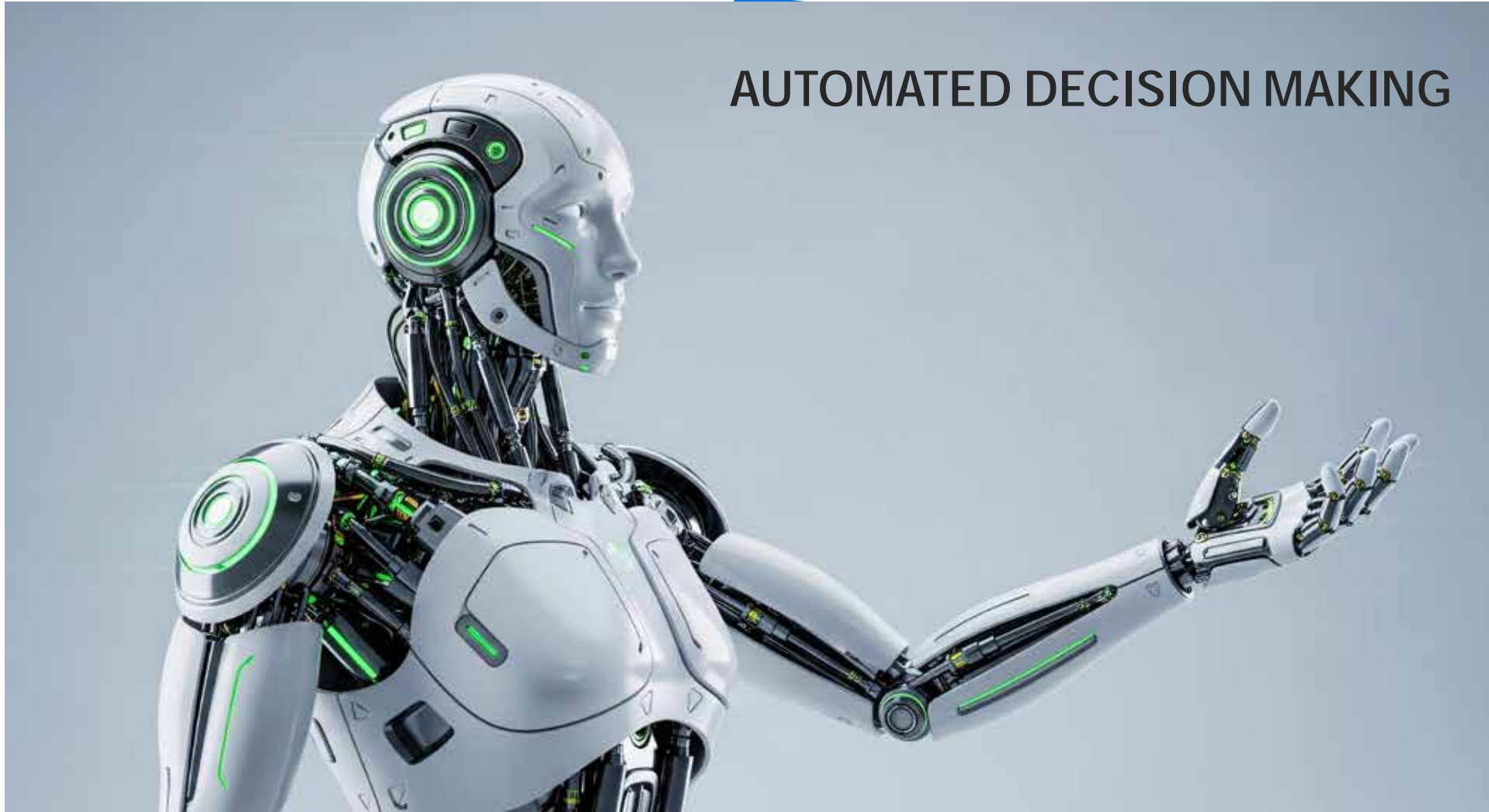
Sep 04, 2025 | 3 minute read

IMPROVE | **PLAN** – **DO** – **CHECK**

4

PATIENT-SPECIFIC AI-ASSISTED DECISION SUPPORT

AUTOMATED DECISION MAKING

POLLING QUESTION 2

How good are you at multi-tasking?

A. Superb
B. Pretty good
C. Not so great
D. I can't - it's impossible

ANALYZE

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

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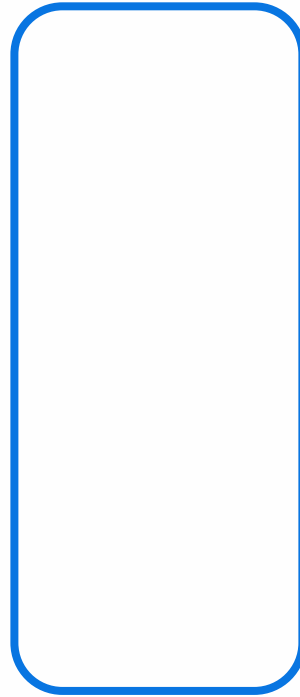
IMPROVE | PLAN – DO – CHECK

4

- Task / cognitive overload

- Attention

IMPROVE | PLAN – DO – CHECK

4

Decrease nuisance alarms

IMPROVE | PLAN – DO – CHECK

4

Control workload (24-32 patients per tech)

IMPROVE | PLAN – DO – CHECK

4

Checklists to direct decision making

IMPROVE | PLAN – DO – CHECK

4

Minimize cognitive load of finding the right clinician

IMPROVE | PLAN – DO – CHECK

4
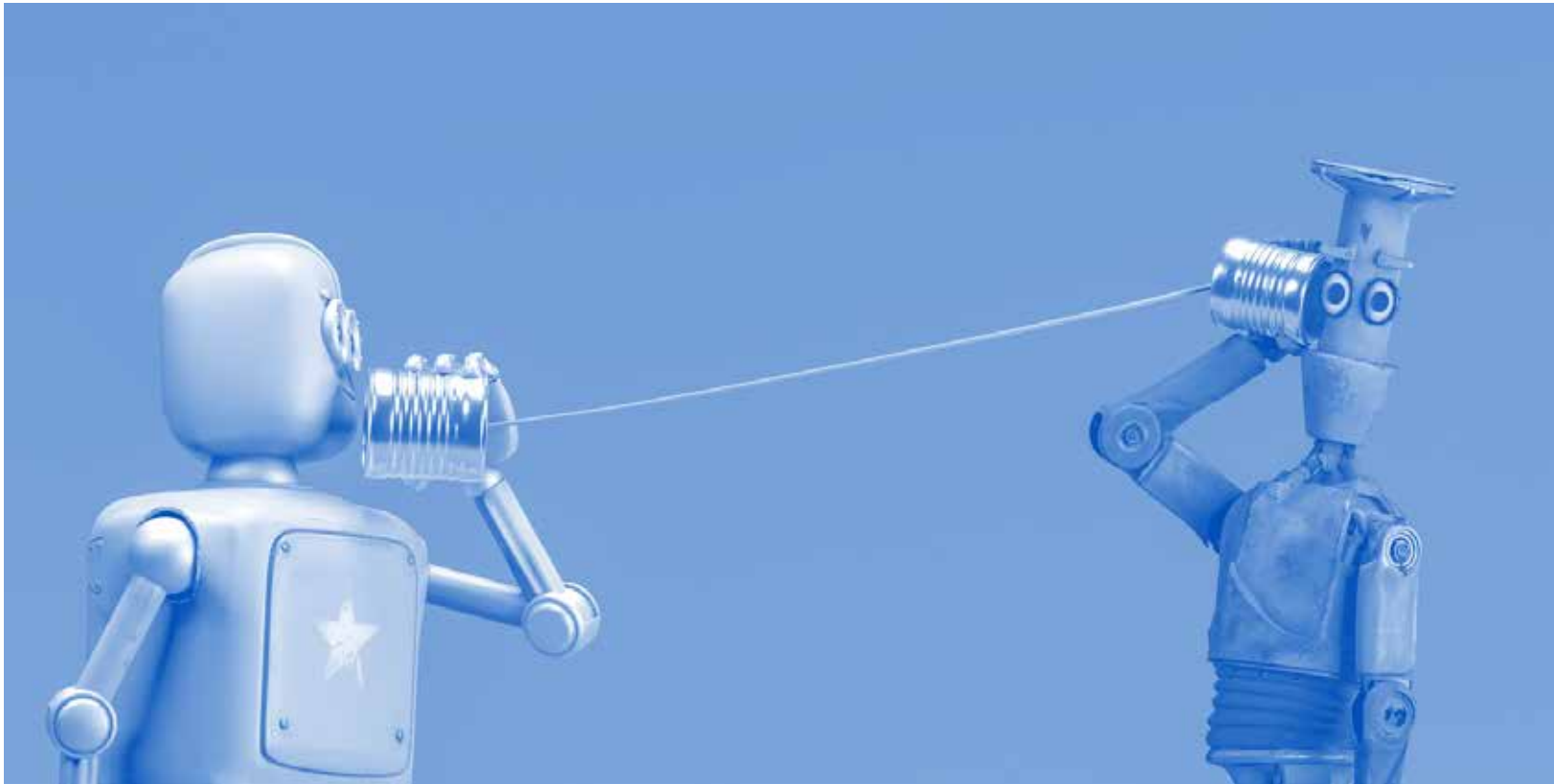
Consolidate data on single displays (eliminate screen switching)

Design displays with visual hierarchies to make critical alerts obvious

IMPROVE | PLAN – DO – CHECK

4

Use multi-modal alerts (visual, haptic, audible)

IMPROVE | PLAN – DO – CHECK

4

Enforce shift breaks and task rotation to restore attentiveness

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?
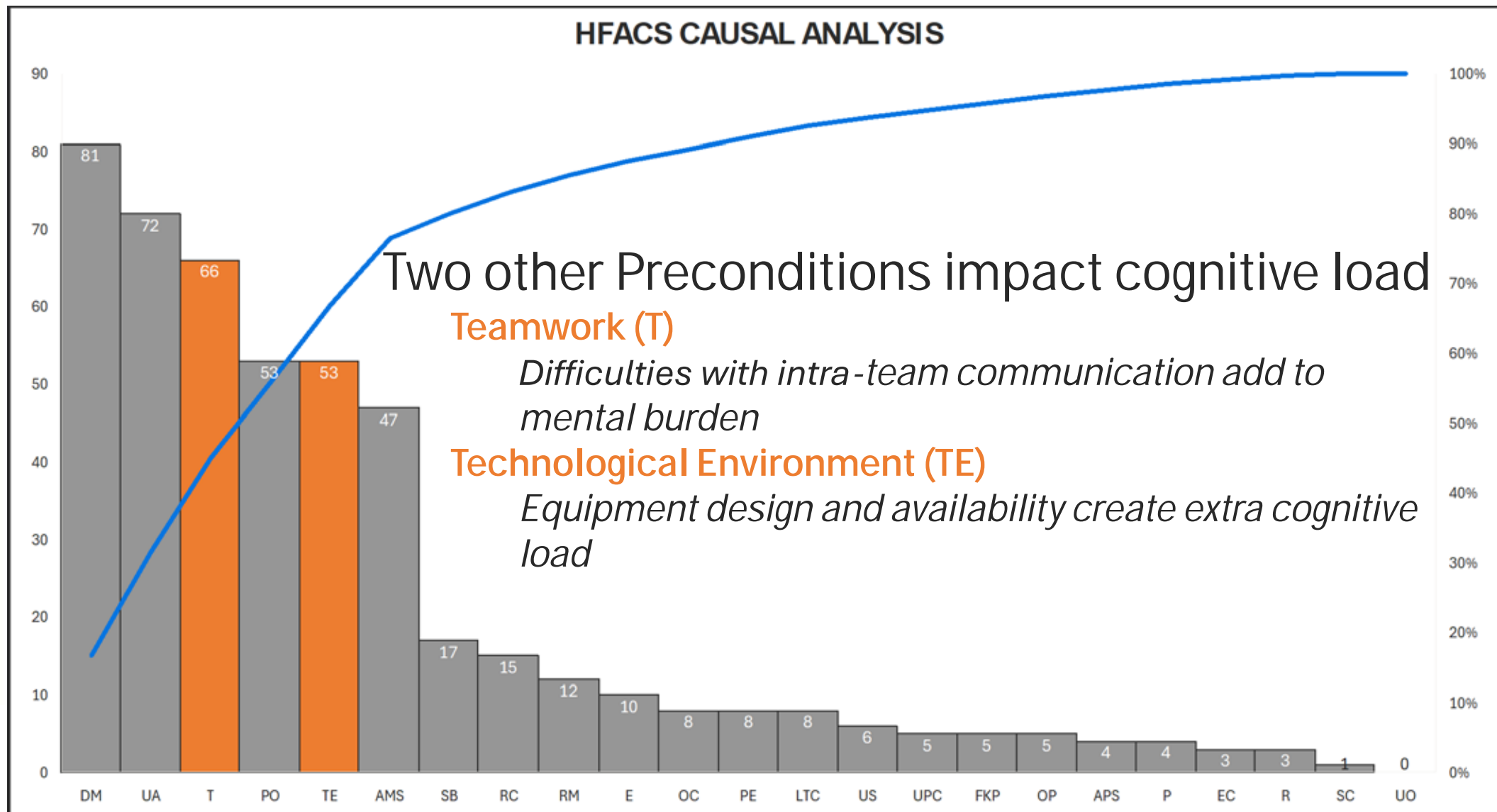
HFACS CAUSAL ANALYSIS

Two other Preconditions impact cognitive load

Teamwork (T)
Difficulties with intra-team communication add to mental burden

Technological Environment (TE)
Equipment design and availability create extra cognitive load

Chart values (left axis, bars):
DM 81, UA 72, T 66, PO 53, TE 53, AMS 47, SB 17, RC 15, RM 12, E 10, OC 8, PE 8, LTC 8, US 6, UPC 5, FKP 5, OP 5, APS 4, P 4, EC 3, R 3, SC 1, UO 0

ANALYZE

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

ANALYZE

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

IMPROVE | PLAN – DO – CHECK

4

- Communication

- Standard Work

- Role Clarity

RULES
for
RELIABILITY

RULES for RELIABILITY

STANDARD WORK
All tasks are highly specified as to content, sequence, timing, location, and expected outcome

RULES for RELIABILITY

COMMUNICATIONS

All communications are highly scripted and direct, with closed loops and 3-way repeat and readback.

RULES for RELIABILITY

PATHWAYS
All paths are pre-defined, simple and direct, with no loops or forks.

RULES for RELIABILITY

TESTING
All processes are tested first, using scientific methods, under the guidance of a coach / teacher.

COMMUNICATIONS
All communications are highly scripted and direct, with closed loops and 3-way repeat and readback.

COMMUNICATIONS

All communications are highly scripted and direct, with closed loops and 3-way repeat and readback.

No one stayed on the phone with Central Monitoring to confirm the leads were reading

The Arrhythmia Center was unable to reach the nurse

The tele tech didn't notify the nurse, since he believed she was already at the bedside

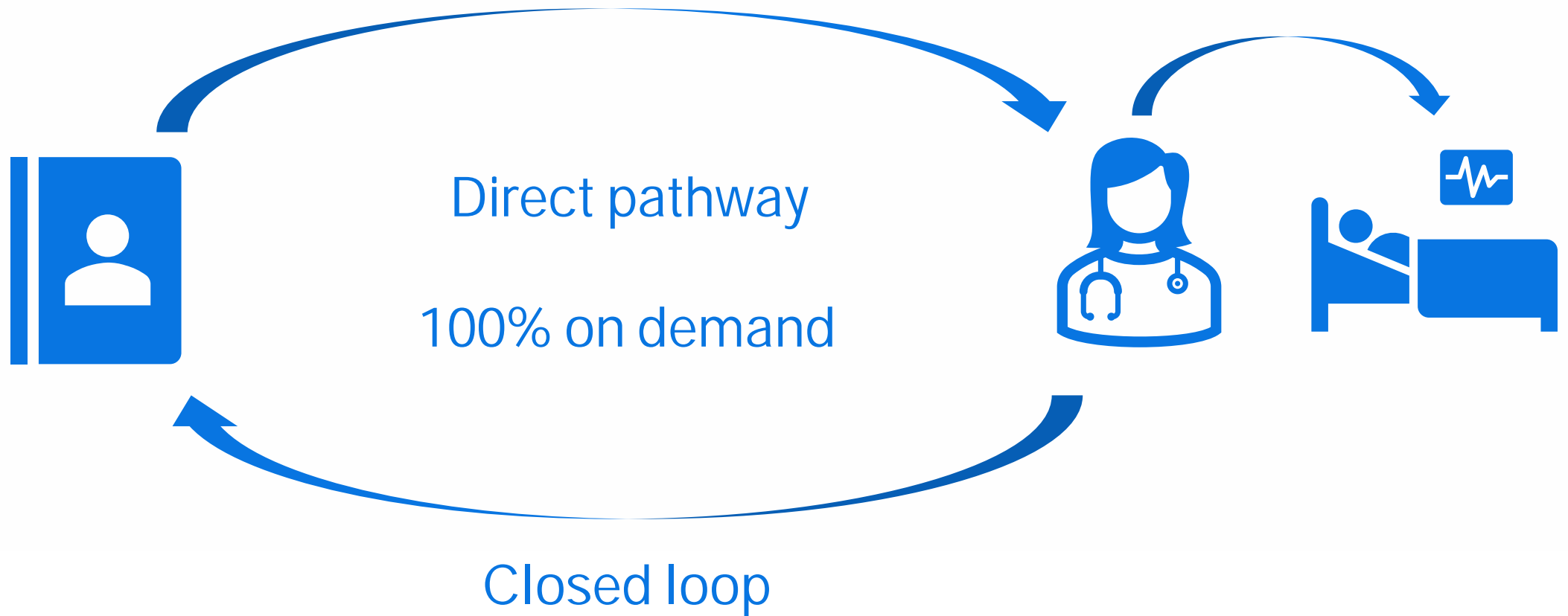The SBAR for nursing did not include the need for a telemetry order
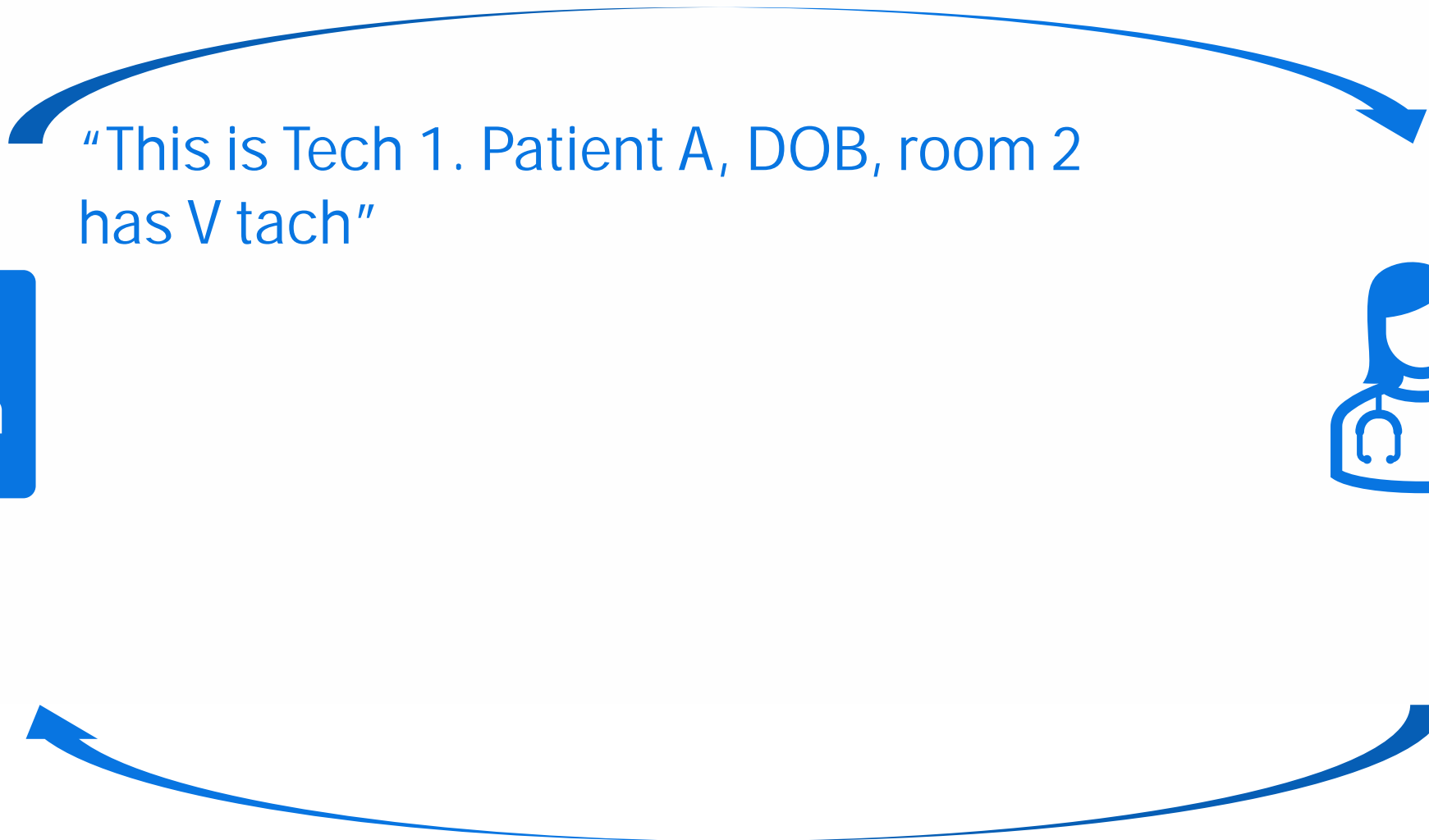
Communication Design

4

Communication Design

IMPROVE | PLAN – DO – CHECK

4

Direct pathway

IMPROVE | PLAN – DO – CHECK

4

Communication Design

Direct pathway

100% on demand

IMPROVE | PLAN – DO – CHECK

Communication Design

"This is Tech 1. Patient A, DOB, room 2 has V tach"

"This is Closest Nurse, Tech 1. Patient A, DOB, room 2 has V tach"

4

RULES for RELIABILITY

STANDARD WORK
All tasks are highly specified as to content, sequence, timing, location, and expected outcome

ACTIVITIES
All tasks are highly specified as to content, sequence, timing, location, and expected outcome

There was no protocol or decision tree for telemetry techs to escalate an alarm
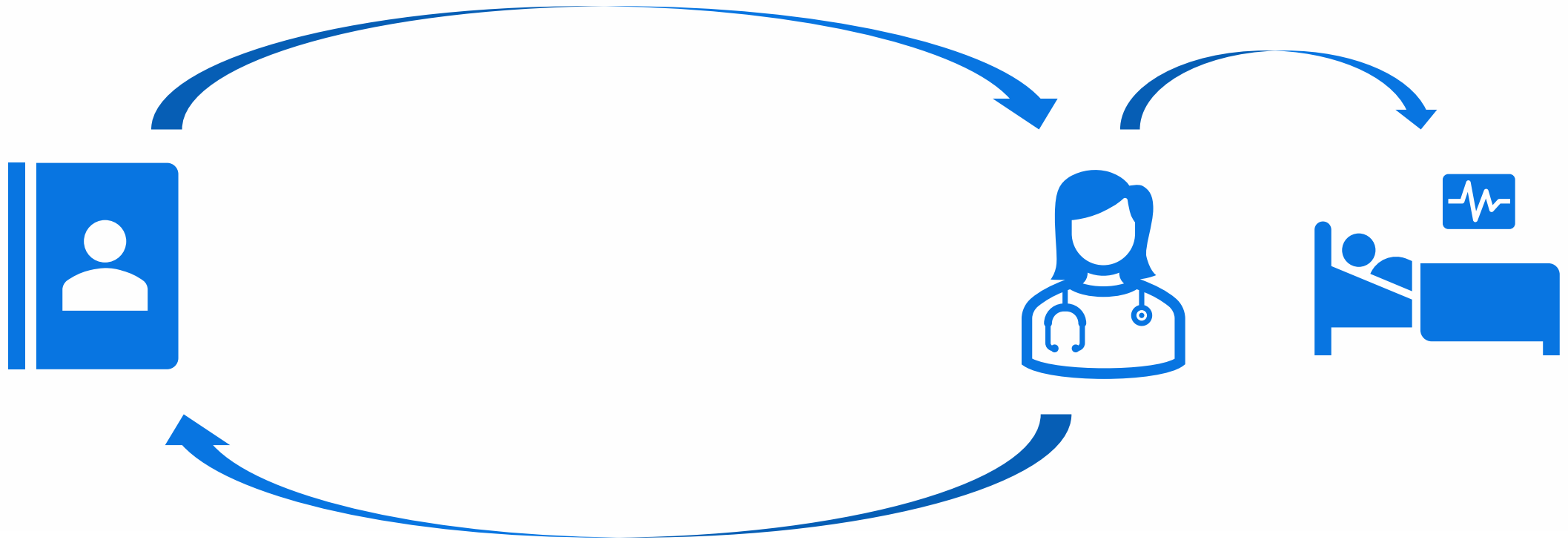
It was unclear who was responsible for putting the leads back on

The daily review of who needed telemetry was discontinued during the holidays

The Rapid Response team was not called in accordance with the escalation policy

Standard Work & Role Clarity

V TACH ALARM

Standard Work & Role Clarity

V TACH ALARM

IMPROVE | PLAN – DO – CHECK

4

WHO: Tele tech 1

WHAT: Call closest RN using smart connection

WHEN: Within 30 seconds

HOW: Scripted communication w/closed loop

WHY: RN to be at bedside within 120 seconds

Standard Work & Role Clarity

V TACH ALARM

WHO: Closest RN to patient

WHAT: Always answers tele call on smart connection

WHEN: Immediately – stop other tasks

HOW: Scripted communication w/closed loop

WHY: RN to be at bedside within 120 seconds

IMPROVE | PLAN – DO – CHECK

4

IMPROVE | **PLAN** – **DO** – **CHECK**

Standard Work & Role Clarity   OFF TELE FOR BATH

WHO: Nursing assistant

WHAT:

WHEN:

HOW:

WHY:

4

Standard Work & Role Clarity   OFF TELE FOR BATH

WHO: Nursing assistant

WHAT: Calls Tele Tech 1, always remains with patient

WHEN:

HOW:

WHY:

IMPROVE | PLAN — DO — CHECK

4

IMPROVE | PLAN – DO – CHECK

Standard Work & Role Clarity   OFF TELE FOR BATH

WHO: Nursing assistant

WHAT: Calls Tele Tech 1, always remains with patient

Calls Tele Tech 1 when done to confirm lead pickup

WHEN:

HOW:

WHY:

4

IMPROVE | PLAN — DO — CHECK

4

Standard Work & Role Clarity   OFF TELE FOR BATH

WHO: Nursing assistant

WHAT: Calls Tele Tech 1, always remains with patient
Calls Tele Tech 1 when done to confirm lead pickup

WHEN: Start, during, and end of bath

HOW:

WHY:

IMPROVE | PLAN — DO — CHECK

4

Standard Work & Role Clarity OFF TELE FOR BATH

WHO: Nursing assistant

WHAT: Calls Tele Tech 1, always remains with patient

Calls Tele Tech 1 when done to confirm lead pickup

WHEN: Start, during, and end of bath

HOW: Scripted communication w/closed loop

WHY:

IMPROVE | PLAN – DO – CHECK

Standard Work & Role Clarity   OFF TELE FOR BATH

WHO: Nursing assistant

WHAT: Calls Tele Tech 1, always remains with patient
Calls Tele Tech 1 when done to confirm lead pickup

WHEN: Start, during, and end of bath

HOW: Scripted communication w/closed loop

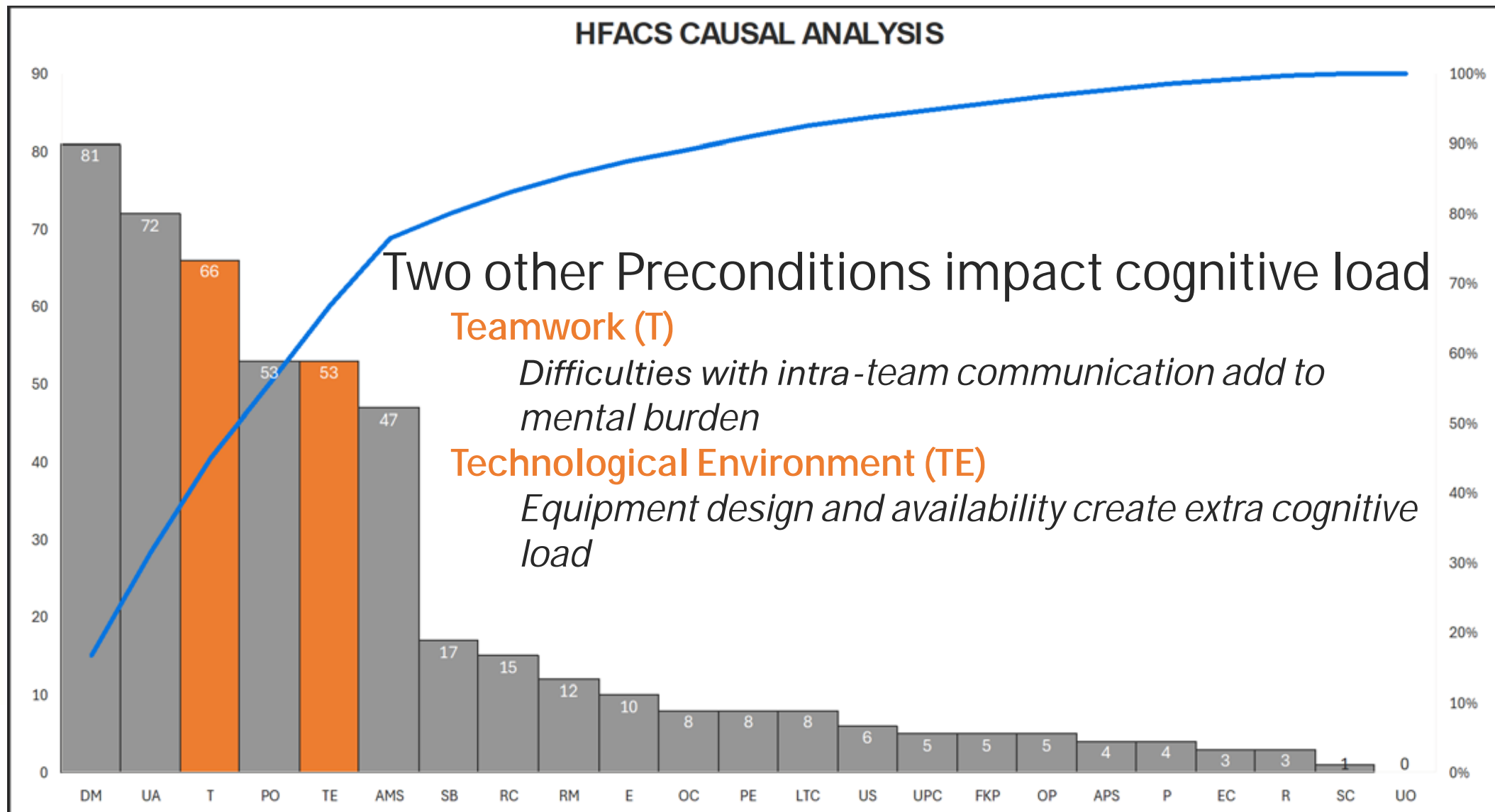**WHY:** Patient needing tele cannot be "off" and alone

4

POLLING QUESTION 3

Do the people on your patient safety team have training in this kind of work design – design for reliability?

A. Yes, we have experts
B. A little bit
C. No, this is new

ANALYZE CAUSAL FACTORS — WHY IS CURRENT STATE THE WAY IT IS TODAY?

HFACS CAUSAL ANALYSIS

Two other Preconditions impact cognitive load

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Difficulties with intra-team communication add to mental burden

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Equipment design and availability create extra cognitive load

- Inadequate supply of tele boxes
- Communication equipment does not support closed loops
- Access to sections of EHR restricted by role
- Alarm volume
- Nuisance alarms

IMPROVE | PLAN – DO – CHECK

4

- Inadequate supply of tele boxes
- Communication equipment does not support closed loops
- Access to sections of EHR restricted by role
- Alarm volume
- Nuisance alarms

IMPROVE | PLAN – DO – CHECK

4

Inadequate supply of tele boxes

Avoid overuse of telemetry:
- Order sets reinforced by supervisory audits
- 24/7/365 Tele Czar reinforced by supervisors
- Flex telemetry limits based on acuity & staffing
- AI-reinforced order sets
- Mini-monitoring for 100% inpatients

Communication Equipment Does Not Support Closed Loops

Equipment with direct, on-demand access
Dedicated role to answer tele calls 24/7/365
Co-locate techs and clinical units

IMPROVE | PLAN – DO – CHECK

4

IMPROVE | PLAN – DO – CHECK

4
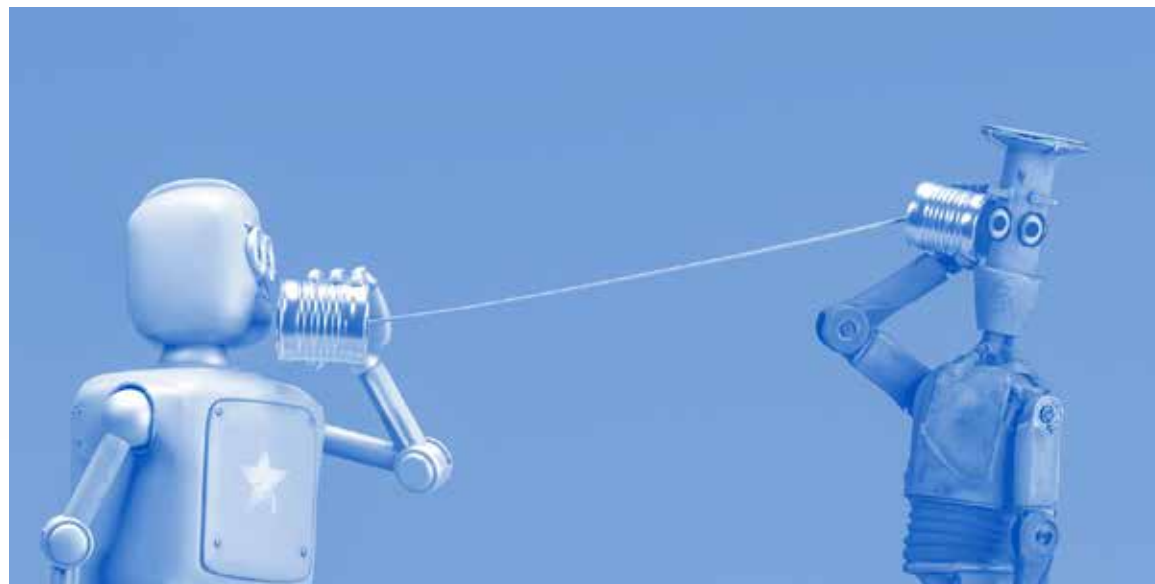
Access to EHR sections restricted by role

Get rid of role-based permissions in the EHR
Grant access for:
   Tele techs
   Transport
   Unit clerks
   Nursing assistants
   Respiratory

Alarm Volume

Use multi-modal alerts (visual, haptic, audible)

Decibel testing on units
Acoustic design on units

4

IMPROVE | PLAN – DO – CHECK
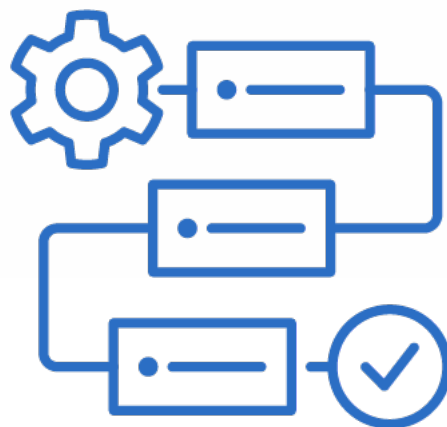
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Nuisance Alarms

AI filters to eliminate them
Individualized patient alarm parameters
Standard work for setting alarms parameters
Middleware to identify frequent alarmers
Alarm management committees

SOLUTION	TELEMETRY SOLUTION
AUTOMATE	Autonomous AI decision making
FORCE FUNCTION	*What else can we invent here?*
FAIL SAFE MECHANISMS	*What else can we invent here?*
STANDARDIZE EQUIPMENT	
PHYSICAL PLANT IMPROVEMENTS	Co-locate monitoring station & techs within the clinical unit
SIMPLIFY PROCESSES	Simplify process for monitoring tech to find nearest clinician
STANDARDIZE PROCESSES	Design workflows that meet Rules for Reliability on Communication and Standard Work
REDUCE DISTRACTIONS	AI-driven nuisance alarms filters
CHECKLISTS / COGNITIVE AIDS	AI-assisted decision support: contextual aids, risk factors, trended clinical data Checklists to direct decision-making
VISUAL CUES	Consolidate data on single display to eliminate screen switching Design displays with visual hierarchies
CREATE REDUNDANCIES	Multi-modal alerts
ADD DETECTION TOOLS	AI-driven predictive analytics
IMPLEMENT HELP CHAINS	
DECREASE WORKLOADS	Limit Tech:Patient ratio to 1:24-32 Enforce shift breaks to restore attentiveness
INCREASE STAFFING	
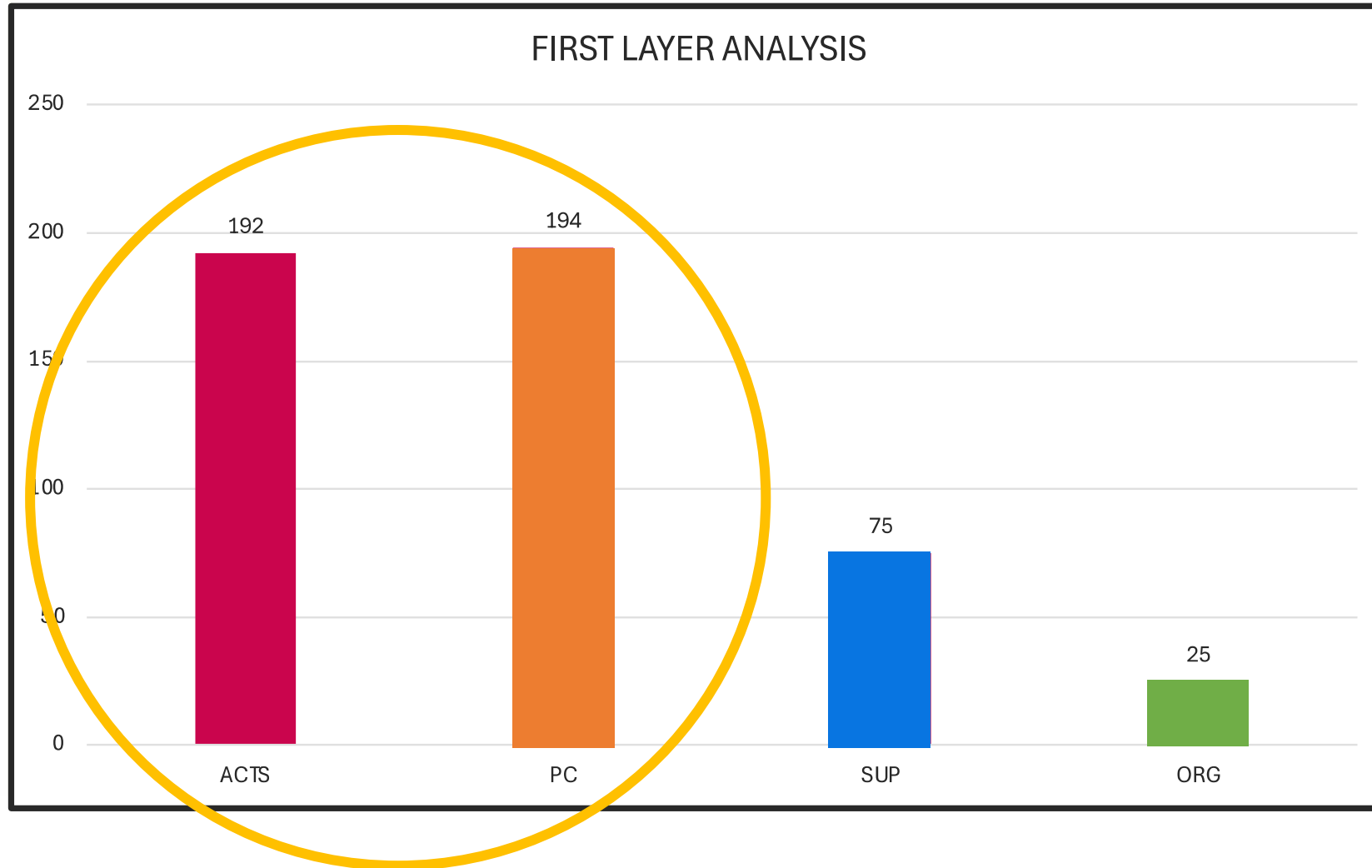
BETTER

GOOD

FIRST LAYER ANALYSIS

40% Acts

40% Preconditions

15% Supervision

5% Organization

IMPROVE | PLAN – DO – CHECK

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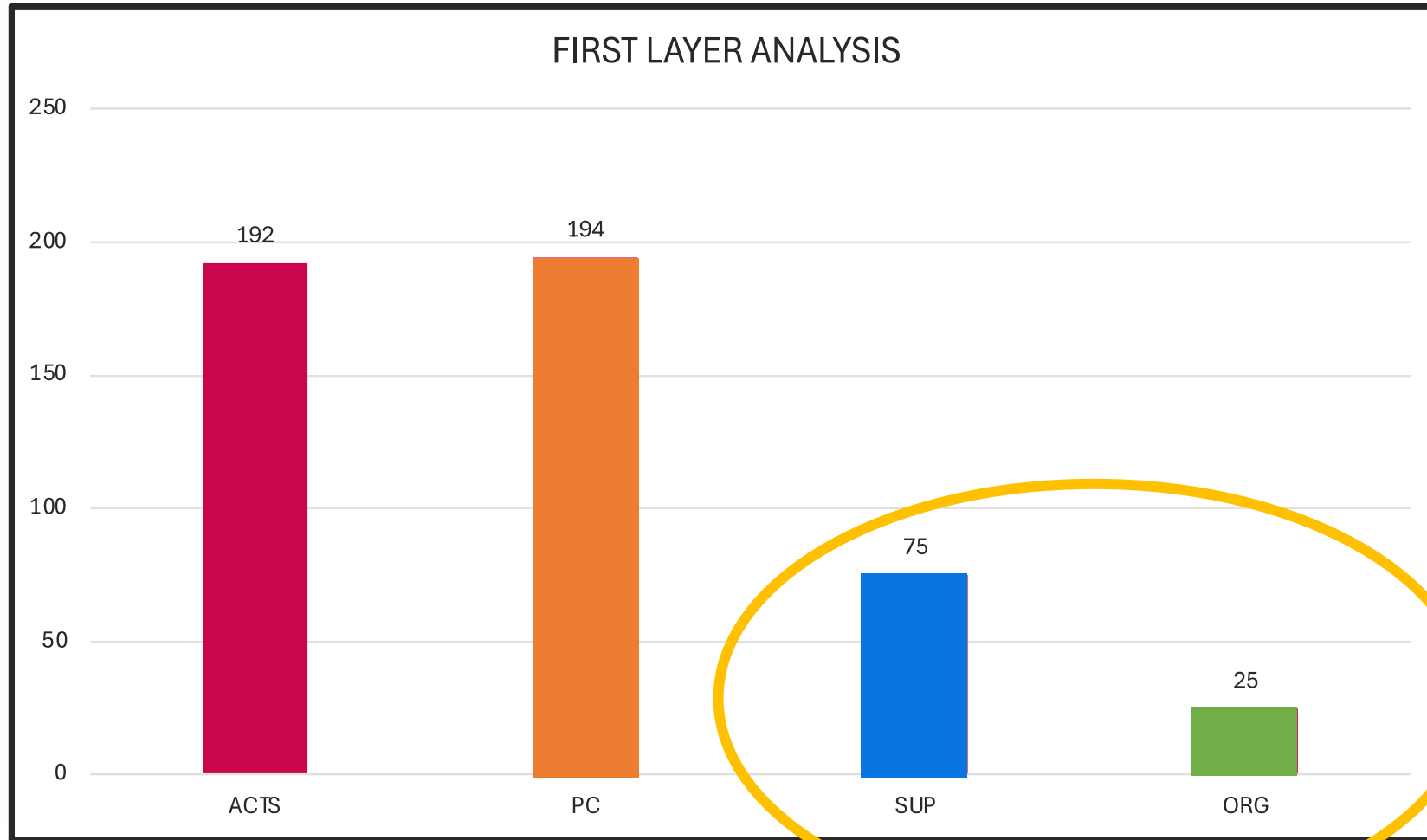
Supervisory and Organizational solutions

IMPLEMENT & SUSTAIN — WHO / WHAT / WHEN: LOCAL LEADERS IMPLEMENT & MANAGE TO NEW STANDARD WORK

5

Put an End to Telemetry Déjà Vu

Questions? Discussion?

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Thank you!