EON AI Ventures

The Healthcare Situation Room — White Paper

Training clinicians on the device use-errors that reach patients — safely, and unforgettably

Executive summary

Healthcare is absorbing a generation of new nurses and clinicians into a bedside crowded with more devices, more screens, and more alarms than any human was designed to track — in a domain where being wrong is not an inconvenience but a patient. The devices are not the villains; the mismatch between a device and the person operating it is. Regulators and standards bodies have a name for that mismatch — *use error* — and a whole engineering discipline (IEC 62366 usability engineering; the FDA's human-factors program) built to prevent it. Yet the training that reaches the bedside is the forgettable annual slide deck. **The Healthcare Situation Room replaces the deck with a cinematic, rigorously-sourced catalog of the real device use-errors and failures that have reached patients** — each card cited to a public authority, each one wired into EON's composable Healthcare Living Library so a story becomes a component becomes a 3D twin becomes a live, playable procedure. This paper sets out the problem, the design, and the evidence behind a pilot library of 30 fully-sourced cases. It is not medical advice and it is not a certified training device — and those limits are the reason a serious clinical buyer can trust it.

1. The problem: a competence crisis meets a device explosion

Three forces meet at the bedside.

The workforce is turning over into complexity. A single critical-care bed now surrounds a new nurse with infusion pumps, a ventilator, a multiparameter monitor, telemetry, and a dozen alarm sources — each with its own screen, its own units, its own defaults. The tacit judgment for *which* alarm matters and *how this particular pump behaves* used to live in the experienced nurse standing beside the novice. As that generation turns over, the judgment walks out with them, and the replacement inherits the machines without the "why."

The error hides inside a compliant machine. This is the defining, treacherous property of device use-error: **the device does exactly what it was told, and the display confirms it.** A rate keyed into the wrong field, a decimal slipped, a drug-library limit in "basic mode," an alarm paused and never un-paused — the screen shows the number that was entered, looks normal, and the harm surfaces late, as an occlusion alarm, an empty bag, or a change in the patient's condition. Because the clinician sees confirmation rather than contradiction, the feedback loop that builds judgment never closes. The only way to close it is to let them learn from an error that already happened to someone else.

The same task is not the same on the next device. Float a nurse between units and the "same" infusion is programmed on a different pump — different units, different button labels, different safety limits — so identical keystrokes produce different doses. The interface itself becomes the hazard. The FDA's own review of infusion pumps names user-interface and device-design issues among the most common problem categories, which is precisely why the same order is dangerous across different pumps.

Standards bodies know all of this. IEC 62366 (usability engineering for medical devices) and the FDA's human-factors guidance exist specifically to design *against* use-error; the Joint Commission and ECRI issue recurring alerts about it. The obligation to train against it is real; the delivery is weak. **That gap is the market.**

2. The design: five principles that make it stick

2.1 Use-error first — the human, not the mechanism

The heart of every card is the *use-error mechanism* — the human-factors reason the device and the clinician diverged: wrong units, a silenced alarm, a default left unchanged, a mode the operator didn't believe, a connector that fit where it never should. This is deliberate framing, and it follows the standards: IEC 62366-1 defines use error as an act or omission producing a result different from what was intended — a property of the *design-plus-user system*, not a synonym for blame. Biomedical and reprocessing faults exist in the catalog, but they sit on one clearly-secondary shelf. The front door is the bedside decision, because that is who we are training: **nurses and clinicians at the point of care**, with patient-safety officers and clinical engineers as the second audience.

2.2 Grounded in the source — and honest where the source is thin

Every case is sourced to a public authority and carries a source-tier chip and confidence flag. The hierarchy is explicit, strongest first:

- **Established, investigated cases** — Therac-25, the teletherapy overdose investigations — rendered as strong.
- **ECRI** Top 10 Health Technology Hazards; **Joint Commission** Sentinel Event Alerts; **ISMP** medication-safety alerts; **FDA** white papers, recalls, and safety communications — rendered as authority-grade.
- **FDA MAUDE** (Manufacturer and User Facility Device Experience) reports — rendered **amber**, with the literal caveat that this is a *user-submitted device report, not an adjudicated finding.* MAUDE is passive, voluntary surveillance; it cannot establish causation, and a MAUDE-only card can never carry a green "verified" statistic.

Where a number is not quantified in public sources, the card says *"not quantified in public sources"* rather than inventing one. This honesty is not decoration; it is the product's credibility, and the compiler that builds the catalog enforces it — a card carrying an uncited number, a broken source link, or a manufacturer named where no public authority named them cannot ship.

2.3 "Same task, different device" — the signature no competitor has

The catalog's signature lens is the one thing single-device training can never show: not one broken machine, but **the inconsistency between machines doing the same task.** A dedicated card type and a dedicated top shelf carry it. The flagship example programs one identical medication order across three infusion pumps stocked in the same hospital — Pump A in mL/h with the drug library on and hard limits; Pump B in mg/kg/h with soft limits; Pump C free-text with no limit at all — so one input yields three different delivered doses, and only one is right. The pilot signature cards use **generic, unbranded** devices ("Pump A / B / C," "Defib A / B") so the teaching point lands without naming a manufacturer. ECRI and AAMI have repeatedly urged hospitals to standardize their pump fleets and drug libraries for exactly this reason; the Situation Room makes the hazard visible.

2.4 The library spine

Where a device is at fault, the card links into EON's **Healthcare Living Library — 50 equipment classes across 10 device families**, each class carrying its own competence record and, in time, a playable procedure. The infusion wrong-rate card opens onto the *Volumetric Infusion Pump (INF-01)* class sheet; a ventilation card opens onto the airway family. A story becomes a component becomes a twin. Cross-device and environmental cases — a surgical fire (electrosurgery + supplemental oxygen + alcohol prep), an MRI ferromagnetic-projectile event (the magnet + a ferrous object) — carry an environment reference and a device array instead of a single class. The library is *conceptually* built on the GMDN/UMDNS device-nomenclature standard (ISO 15225) but publishes EON's own class codes today; the card's `gmdn` field is present but honestly empty until those codes are sourced. We do not invent them.

2.5 The taxonomy clinicians already speak

The catalog is organized on the shelves a bedside clinician recognizes — Infusion & Medication; Airway & Ventilation; Monitoring & Alarms; Cardiac & Resuscitation; Tubing, Lines & Connections; Energy & the OR; Imaging & Radiation — plus the signature *Same Task, Different Device* row up top, an ECRI-anchored *Most Frequent* row, a *Landmark Cases* row, and a low, clearly-labeled *Behind the Bedside* shelf for biomedical and reprocessing failures. Cross-cutting every card are ten **human-factors tags — a healthcare "Dirty Dozen"** authored for this product and credited to the IEC 62366 and FDA human-factors tradition (mirroring how aviation's original Dirty Dozen is credited to Gordon Dupont / Transport Canada, 1993): *alarm fatigue · mode confusion · wrong units · look-alike controls · default-value error · interruption · workaround / safeguard defeat · misconnection · automation surprise (the display lies) · handoff gap.* Clinicians navigate by device; educators filter by human factor; the same card serves both.

3. The method: a layer in the Work Intelligence flywheel

The Situation Room is not a point solution. It is one layer of the EON Work Intelligence stack, and its power comes from the others:

- **Genesis** shows known procedures, four ways.
- **EON Universal** builds the smart twin and *understands* the device — it reasons about faults and runs conditional procedures a scripted trainer cannot.
- **EON Live** makes flow, pressure, dose, and alarm state behave as live state, so a use-error propagates realistically instead of being narrated.
- **The Situation Room** carries the tacit "what happens when it goes wrong" that the retiring bedside expert held — enacted against real device geometry.
- **FieldIQ** takes it to the real ward: recognize the device on sight, overlay the intelligence, guide the clinician, capture what actually happened.

Because EON models *devices* rather than hospitals — composition, not enumeration — one infusion-pump model spans the ICU card, the med-surg card, and the future playable mission. That is why a first playable mission is already in view: the **infusion wrong-rate procedure** — program, confirm, *the display lies*, catch-it-or-not — a use-error made playable, which is decision-one turned into an interaction. The Situation Room card is its front door; the EON Live engine makes it playable.

4. Evidence: the pilot corpus

The pilot is a curated set of **30 cases — ten frequent, ten landmark, ten human-factors — including two "Same task, different device" signature cards.** Its verified anchors already carry the weight:

- **Therac-25** — the canonical medical-device software catastrophe: at least six massive radiotherapy overdose accidents between 1985 and 1987, at least three patients dead, doses reaching roughly a hundred times the intended amount, documented in Leveson & Turner, *An Investigation of the Therac-25 Accidents* (IEEE Computer, 1993).
- **Infusion pumps** — from 2005 to 2009 the FDA received roughly **56,000 adverse-event reports** tied to infusion pumps, prompting **87 recalls, 14 of them Class I** (able to cause serious harm or death), with the agency attributing many events to device-design and user-interface issues (FDA *Infusion Pump Improvement Initiative* white paper, 2010). Infusion hazards remain on **ECRI's Top 10 Health Technology Hazards for 2025** — poorly managed infusion lines and incomplete investigation of infusion incidents both appear on the current list.
- **Alarm fatigue** — of 98 alarm-related events reported to the Joint Commission's sentinel-event database between January 2009 and June 2012, **80 resulted in death**, 13 in permanent loss of function, and 5 in additional or extended care (Joint Commission *Sentinel Event Alert #50: Medical Device Alarm Safety*, 2013). ECRI's 2025 list separately flags dangerously low default alarm limits on anesthesia units.
- **Tubing misconnections** — the persistent, potentially fatal hazard of a connector that fits where it never should (an epidural bag joined to an IV line, a feeding tube to a tracheostomy), addressed by the **ISO 80369** small-bore connector standards and the Joint Commission's *Sentinel Event Alert #53* (August 20, 2014).
- **Radiation and the OR** — teletherapy and CT overdose investigations, and the perennial surgical-fire hazard (supplemental oxygen + an ignition source), the latter ranked #5 on ECRI's 2025 list — each carried at the confidence its public source supports, and never with a number we have not sourced.

Scope is disciplined by a single law: **device use-error and device failure only.** The product assumes the patient's diagnosis and the clinician's intent were correct and teaches the human-device interface where care actually breaks. And a hard rule governs every image, below.

5. Positioning and honesty

The Healthcare Situation Room is a rigorous, cited human-factors resource. **It is not medical advice and it is not a certified training device;** every card renders the badge *"Not medical advice · not certified · a representative task, not a device instruction-for-use,"* and EON makes no regulatory or continuing-education

credit claims pending a certification partnership. Three guardrails are absolute and built into the schema, not left to editorial goodwill:

- **The consequence is the device, never the patient.** Allowed: the pump display lying, the silenced alarm panel, a flatline trace on a monitor, an empty and freshly-stripped bed, an unattended corridor. Forbidden, without exception: any patient — whole, partial, silhouette, or implied — any blood or wound, any protected health information, and any real manufacturer logo or model name on generated imagery. A Safety-QA gate rejects any asset that violates this, in addition to normal aesthetic review, and no asset ships without passing both.
- **Manufacturers are named only where a public authority already named them,** facts stated without editorializing, and every named-manufacturer card is flagged for human review before publish. The signature cards use generic devices by default.
- **MAUDE facts are flagged unverified,** with the literal caveat, and can never anchor a "verified" claim.

These are not constraints on the product; they are the reasons a hospital, a nursing school, or a health ministry can trust it in a room full of clinicians.

6. Roadmap — from Situation Room to Field IQ

The Situation Room is deliberately the emotional front door. It is the first visible layer of a longer arc — Field IQ — that ends at the point of care, where a clinician actually touches a machine that can cause harm.
Learn the danger — the Situation Room. The cited catalog of how real devices have failed real people, made cinematic and unforgettable, so clinicians want to build the competence rather than being made to.
Live it — EON Live and Genesis Universal. Step into the room and rehearse the error in a simulation where the consequence is real but the patient is not: program the pump, read the alarm, catch it before it reaches anyone.
Field IQ — the destination. In the field, a clinician points a phone — and eventually a body-worn camera — at a device. The system recognizes the machine, knows exactly what it is, and runs an intelligent visual checklist: not a paper form, but a living checklist that sees what the clinician sees, guides each step, and asks the control questions at the right moment. It advises, because it knows how that device typically fails. And it documents every step — the body-cam-for-competence — so the work can never be questioned.
This is the difference between a training product and a category: recognize, checklist, coach, and document, at the moment of care. The Situation Room is how that journey begins — by making people care.

7. The offer

For a hospital's nursing and patient-safety leadership, a clinical-engineering department, a nursing school, or a national health authority, the Healthcare Situation Room is the un-boring version of a patient-safety line item they already own — and the visible front end of a composable intelligence platform that carries a clinician's competence from the classroom to the bedside to the field. It convinces a boardroom in one sitting and trains a cohort at scale, on content that is true, cited, human-free, and owned.

Real device errors. Real reports. Caught before they reach a patient.

EON AI Ventures. Work Intelligence for the industries that cannot afford to be wrong. Device use-error framing follows IEC 62366 usability engineering and FDA Human Factors guidance. Case and hazard figures are attributed to their public sources: Leveson & Turner (IEEE Computer, 1993) for Therac-25; the FDA Infusion Pump Improvement Initiative white paper (2010); ECRI's Top 10 Health Technology Hazards for 2025; and Joint Commission Sentinel Event Alerts #50 (2013) and #53 (2014). FDA MAUDE reports are user-submitted and unverified. This document is not medical advice and describes a resource that is not a certified training device. No patient imagery, no protected health information, and no manufacturer is named where a public authority has not.