

BACKGROUND

At University Medical Center of Southern Nevada, a 541-bed academic medical center with dual Magnet and Pathway to Excellence designation, a four-person infection preventionist team performs surgical site infection (SSI) surveillance across ten targeted surgical procedure categories. An Epic electronic health record algorithmic report is being calibrated for operational reliability to replace exhaustive manual chart review. Hospitals routinely deploy such tools without verifying integrity, assuming vendor-defined logic is functional. The result is a phenomenon defined here as *beige box* opacity: when a knowable digital tool goes unexamined because no one ever learned to look. Black box opacity in machine learning is due to innate model complexity, whereas beige box opacity is a definitive literacy gap rooted in an imbalance in sociotechnical development.

PURPOSE

This ongoing quality improvement aims to examine what interrogating one institution's SSI surveillance algorithm reveals about readiness to govern clinical technologies already in use, and to derive a nurse-led portable framework for examining opaque digital tools.

METHODS

A four-year retrospective dataset (2022-2025) of 7,622 inpatient procedures and 204 confirmed SSIs was locked as an immutable reference standard reflecting complete manual review. Successive configurations of the algorithm's eight indicators were interrogated against that standard one setting at a time and iteratively evaluated using a two-by-two confusion matrix, with SSI capture treated as a fixed constraint. Unflagged SSIs were rigorously investigated by chart review, and anomalous results were read as signals of configuration error rather than true performance.

“EHR algorithms have become part of patient care.

And someone has to govern them.”



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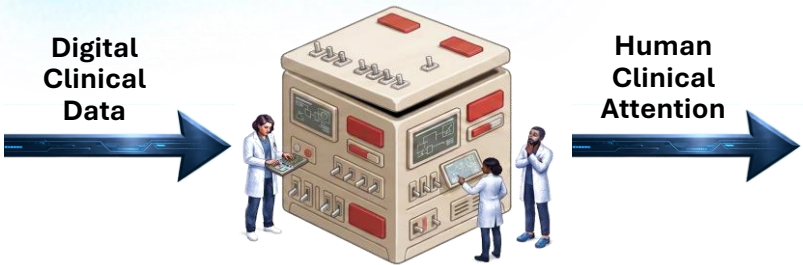


Image 1. Beige Box Opacity. [Generative AI image]. Knowable configuration standing between digital clinical data (input) and human clinical attention (output). Created from generative AI multi-turn prompt dialogue “Beige Box Opacity Isometric 3D Illustration”. Vyro AI. <https://chattyai.app>

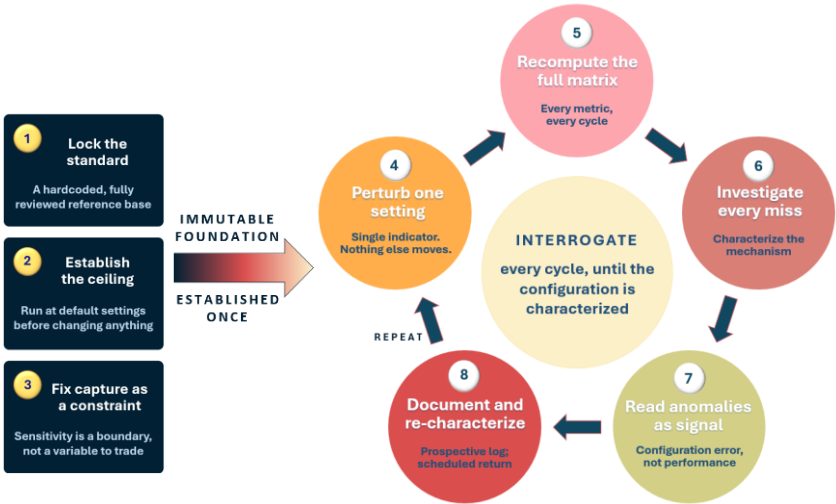


Image 2. A portable framework for interrogating beige box opacity. [Original graphic]. Iterative framework for interrogating a configurable clinical algorithm. Adapted from University Medical Center of Southern Nevada, 2026.

RESULTS

Interrogation of all eight indicators exposed four latent configuration faults. The keyword indicator performed string matching without evaluating assertion status, flagging a term whether noted to be present or explicitly denied. Procedure-specific diagnosis groups had been silently replaced with clinically incongruous codes, including a jawbone fracture diagnosis flagging a colon surgery. This logic had persisted over eight years. Three indicators had never been activated at all, and the returns to surgery indicator had invisibly used a single-method search instead of its more comprehensive setting without incident or warning. Successive changes, each directed by what the preceding one exposed, ultimately achieved complete capture of all 204 confirmed SSIs.

CONCLUSIONS

Configuration, not algorithm logic, is the dominant driver of this tool's performance. None of these latent findings were discoverable through routine use; each required calculated probing against a fixed standard. Alternate SSI detection pathways serve as governance, passively monitoring for performance drift that would otherwise go unseen. The beige box does not resist inquiry. It endures in plain sight, preserved by a digital literacy gap where tools reach clinicians faster than the most important question: how does this work? The framework herein answers that question anywhere: it is portable, iterative, vendor-agnostic, and executable by frontline clinicians without informatics credentials.

REFERENCES

References available upon request and QR code scan.

