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Humanizing Critical Care: Transforming ICUs Through Empathy and Innovation

ABSTRACT

Background:

Intensive Care Units (ICUs) in resource-limited settings face persistent challenges, including high infection rates, staffing shortages, and inconsistent patient-family engagement. Standardized ICU audits provide a structured approach to assessing and improving infection control, staff preparedness, and patient-centered care. This study evaluates a structured ICU audit framework innovation designed to drive iterative, evidence-based quality improvements through a targeted intervention cycle.

Methods:

A structured ICU audit framework was implemented at Evercare Hospital Lahore, Pakistan. The first audit in November 2024 involved structured observational assessments, infection surveillance data analysis, and multidisciplinary stakeholder interviews with a team of 20 ICU professionals, including physicians, nurses, infection control specialists, and administrative staff. Based on these findings, targeted interventions were implemented over three months, focusing on real-time infection surveillance, simulation-based staff training, and standardized patient-family engagement strategies. The second audit in January 2025 assessed measurable changes following these interventions, allowing for a comparative evaluation of ICU performance.

Results:

The initial audit revealed elevated hospital-acquired infection rates (40–50%), linked to inconsistent hand hygiene and inadequate ventilation. Staffing gaps due to heavy reliance on locum

personnel and limited simulation-based training reduced care continuity. Patient-family engagement remained inconsistent, with unclear visitation policies and fragmented communication. The January 2025 re-audit demonstrated improvements, including increased infection control adherence, enhanced staff training participation, and the implementation of structured family communication protocols.

Conclusion:

This longitudinal ICU audit highlights the value of structured, iterative quality improvement cycles. The model presents a scalable ICU auditing framework, with planned multi-site validations at Evercare Hospitals in Nigeria and Kenya to assess adaptability across South Asia and Africa.

Keywords: critical care transformation, Evercare hospitals, ICU audit, infection surveillance, LMICs, patient-family engagement, quality improvement, staff training.

BACKGROUND

Intensive Care Units (ICUs) play a pivotal role in managing critically ill patients, yet they remain constrained by systemic challenges, particularly in low- and middle-income countries (LMICs). Persistent issues such as high infection rates, staffing shortages, and inadequate patient-family engagement significantly impact ICU performance and patient outcomes. Addressing these barriers requires structured assessment methodologies that generate actionable insights for quality improvement.

Hospital-acquired infections (HAIs) are a major concern in critical care settings, with global estimates indicating that up to 30% of ICU patients develop HAIs, leading to increased mortality, prolonged hospital stays, and higher healthcare costs [1]. In LMICs, these rates tend to be higher due to inconsistent hand hygiene compliance, overcrowding, and inadequate ventilators [2, 3]. Despite the existence of infection control protocols, real-time monitoring and compliance enforcement remain inconsistent.

Staffing constraints further exacerbate ICU inefficiencies. High patient-to-provider ratios, reliance on locum personnel, and limited structured simulation-based training contribute to care discontinuity and increased burnout among ICU staff [4]. The absence of robust mentorship programs and emergency preparedness training reduces the chance of positive outcomes from the clinical teams when handling high-acuity cases [5]. Simulation-based training has been demonstrated as an effective strategy to enhance staff competency and preparedness [6].

Beyond clinical challenges, patient-family engagement remains underdeveloped in many ICUs. Inconsistent visitation policies, fragmented communication strategies, and limited staff training on patient-centered care create barriers to shared decision-making and transparency. Studies suggest that structured family engagement protocols can improve patient satisfaction and adherence to care plans, yet their adoption in LMIC ICUs remains sporadic [7, 8].

Traditional ICU audits serve as essential tools for identifying these systemic deficiencies. However, existing models often lack adaptability to resource-constrained environments and fail to provide real-time, iterative quality improvement cycles. Recent findings further indicate that implementing an electronic dashboard can increase compliance with ventilator bundle measures and reduce rates of ventilator-associated pneumonia (VAP), underscoring the value of ongoing, technology-driven solutions [9]. Many ICU audits in LMICs are conducted as one-time assessments, which do not incorporate structured follow-up mechanisms or continuous quality improvement strategies. This limits their ability to drive sustained ICU enhancements.

To address these limitations, a structured ICU audit framework innovation, CritiCore, was developed as part of Innovly's broader clinical audit initiatives. Innovly is a consultancy focused on developing structured, data-driven solutions for healthcare quality improvement, particularly in resource-limited settings [10]. CritiCore integrates real-time infection surveillance, simulation-based staff training, and standardized patient-family engagement strategies into a structured, stakeholder-driven quality improvement model. Unlike conventional ICU audits, which primarily focus on compliance-based evaluations, this approach is designed to enable ongoing assessment and intervention cycles, ensuring that improvements are iterative and measurable.

This structured ICU audit framework builds on ongoing clinical audit innovations being developed across other hospital units, with additional structured audit models under review for publication. By embedding human-centered design principles and emphasizing frontline stakeholder engagement, CritiCore provides a scalable ICU auditing model adaptable to diverse LMIC healthcare environments. Future implementation in Evercare Hospitals in Nigeria and Kenya will further evaluate its feasibility across varying ICU settings, strengthening its role as a data-driven approach to ICU transformation.

METHODS

Audit Design and Setting

This ICU audit was conducted at Evercare Hospital Lahore (EHL), a tertiary-care facility in Pakistan and a key site within the Evercare Group, a multinational healthcare network operating across South Asia and Africa. Evercare Group provides specialized medical services across multiple countries, with a focus on high-quality, accessible healthcare in resource-limited settings [11]. EHL was selected due to its high patient volume, integration of digital health systems, and role as a regional hub for intensive care services [12]. Additionally, EHL has been actively working toward the adoption of international ICU best practices while navigating challenges common to LMIC ICUs, such as staffing shortages, infection control limitations, and infrastructure constraints. Its inclusion in this audit allowed for an assessment of how structured quality improvement interventions can be applied in a high-burden ICU setting.

To address these challenges, this study employed a structured, two-phase longitudinal ICU audit framework, integrating Human-Centered Design Thinking (HCDT) principles to facilitate frontline-driven, real-time quality enhancement. The framework prioritizes iterative, action-oriented assessments with a focus on staff engagement, patient-family communication, and process sustainability. The two-phase audit approach included:

1. Baseline ICU audit (November 2024): A structured assessment of infection control, staff preparedness, and patient-family engagement.
2. Targeted intervention period: A three-month period during which evidence-based quality improvement strategies were implemented.
3. Post-intervention ICU audit (January 2025): A reassessment to evaluate the measurable impact of interventions on ICU performance.

The senior author, Asad Mian, an Emergency Medicine specialist with extensive experience in HCDT-driven audits across multiple hospital units, led the assessment, ensuring a systems-thinking approach to ICU quality improvement rather than a purely clinical perspective.

Audit Framework and Methodology

This ICU audit employed a structured, multi-component evaluation called CritiCore, developed by Innovly, a consultancy specializing in innovation management for healthcare quality improvement

[10]. CritiCore is a context-adapted ICU assessment tool, integrating structured observational assessments, stakeholder-driven evaluations, and real-time data analysis to enhance ICU operations in LMIC settings.

The assessment consisted of four key components:

1. JCI-inspired observational audits: ICU infrastructure, infection control compliance, and equipment functionality were evaluated using a standardized checklist aligned with Joint Commission International (JCI) accreditation principles for ICU best practices [13].
2. Structured stakeholder interviews: A multidisciplinary team of 20 ICU stakeholders participated in the audit, including intensivists, ICU nurses, infection control specialists, hospital administrators, and patient safety officers. A semi-structured interview approach was used to capture frontline challenges, workflow inefficiencies, and proposed quality improvement strategies.
3. Infection surveillance data review: A retrospective analysis of hospital-reported infection rates – for example, central line-associated bloodstream infection (CLABSI), catheter-associated urinary tract infection (CAUTI), ventilator-associated pneumonia (VAP), multidrug-resistant (MDR) infections - was conducted to identify trends and high-risk ICU processes. Data were benchmarked against global ICU infection control standards, including WHO infection prevention guidelines and Society of Critical Care Medicine best practices [14], [15].
4. Patient-family communication and engagement audit: Policies on visitation rights, shared decision-making, and structured communication were reviewed against international patient-centered care recommendations [13].

Audit Checklist Domains

The CritiCore audit checklist assessed ICU performance across six key domains, ensuring a holistic evaluation of ICU quality metrics:

1. Infection control compliance: Hand hygiene adherence, VAP protocols, central line bundle compliance, and antimicrobial stewardship practices.
2. ICU staffing and workflow efficiency: Nurse-to-patient and physician-to-patient ratios, workload distribution, and shift coordination.
3. Equipment and resource availability: Accessibility and readiness of life-saving equipment (e.g., ventilators, infusion pumps, portable imaging devices).
4. Patient-family engagement policies: Transparency in care discussions, structured communication frameworks, and the presence of family-inclusive decision-making processes.
5. Training and competency assessment: Simulation-based training participation rates, advanced life support certification status, and emergency preparedness drills.
6. Continuous quality improvement (CQI) integration: ICU-specific real-time monitoring dashboards, key performance indicator (KPI) tracking, and formalized audit feedback loops.

This structured approach ensures that ICU audits are iterative, frontline-driven, and contextually adaptable, moving beyond compliance-based assessments to drive sustained quality improvements in LMIC critical care settings.

Post-Audit Interventions

Following the initial audit, targeted interventions were introduced to address key deficiencies:

1. Infection control reinforcement: Increased hand hygiene surveillance, improved ventilation, and antimicrobial stewardship program enhancements.
2. Simulation-based ICU staff training: Structured resuscitation and emergency response simulations to improve ICU team preparedness.
3. Standardization of patient-family communication protocols: Implementation of structured ICU visitation schedules, caregiver education materials, and real-time patient status updates.
4. Deployment of Empatheon: A patient-family engagement intervention designed to enhance ICU communication strategies.

Empatheon: Origin, Purpose, and Implementation

Empatheon emerged from an HCDDT workshop held at EHL in May 2024, where five startup-oriented ideas were conceptualized as part of an innovation incubation process (paper in review). These ideas were developed to address ICU operational challenges through human-centered, scalable interventions. Empatheon was further refined as a structured model aimed at enhancing patient-family communication in the ICU setting.

The intervention included:

- Structured caregiver updates, ensuring real-time information on patient status.
- Training sessions for ICU staff, focusing on empathy-driven interactions and breaking complex medical information into understandable terms.
- Introduction of digital and printed patient-family information sheets, improving shared decision-making and reducing ICU-related distress.
- Tracking impact through caregiver feedback, collected via semi-structured surveys and real-time bedside observations.

Data Analysis and Ethical Considerations

Quantitative metrics, including compliance rates, staffing sufficiency, and infection control adherence, were analyzed for trends and comparative benchmarking. While global ICU standards (e.g., WHO, JCI, SCCM) provide key quality benchmarks, direct comparisons were adjusted for contextual challenges specific to LMIC settings. Infection control trends were reviewed alongside hospital infection surveillance logs to assess intervention impact, while staff and caregiver feedback was categorized into thematic domains to identify ICU workflow inefficiencies and quality improvement needs.

As this study was conducted as part of an internal ICU quality improvement initiative, formal Institutional Review Board (IRB) approval was not required. However, the hospital's leadership team reviewed and approved the audit methodology, ethical safeguards, and confidentiality protections, ensuring minimal disruption to clinical workflows.

RESULTS

The ICU audit at Evercare Hospital Lahore systematically evaluated critical domains of ICU performance, identifying key areas for improvement and tracking changes post-intervention. The structured baseline audit conducted in November 2024 revealed significant inefficiencies in infection control, staffing, equipment availability, and patient-family engagement, prompting a series of targeted interventions. A re-audit in January 2025 assessed measurable progress following these interventions, demonstrating key improvements while also highlighting areas requiring further refinement.

The baseline findings underscored persistent challenges in infection control compliance, with hospital-acquired infection (HAI) rates ranging between 40–50%. Contributing factors included inconsistent hand hygiene adherence, inadequate ventilation in isolation rooms, and gaps in antimicrobial stewardship compliance. To address these deficiencies, weekly hand hygiene audits were introduced, real-time infection surveillance dashboards were deployed, and adjustments to ventilation systems were initiated. The post-intervention audit in January 2025 revealed an increase in hand hygiene compliance, enhanced real-time tracking of infections, and partial improvements in air circulation within isolation areas. However, further enhancements to infection tracking mechanisms and ventilation upgrades remain a priority. Table 1 summarizes the key findings from the baseline ICU audit (November 2024).

Table 1: CritiCore: Key findings from the first audit (November 2024: Baseline)

Domain	Key Element	Status	Observations	Recommendations
Infection Control Compliance	Hand hygiene adherence	Partially met	Compliance rates inconsistent	Conduct weekly audits
Infection Control Compliance	Isolation room ventilation	Needs improvement	Air circulation issues observed	Design and approve isolation upgrades
ICU Staffing and Workflow	Locum staff dependency	Needs focus	High reliance on temporary staff	Introduce mentorship incentives
ICU Staffing and Workflow	Shift coordination	Limited	Operational inefficiencies present	Implement structured scheduling
Equipment and Resource Availability	Ventilator maintenance	Needs improvement	Inconsistent servicing schedules	Establish quarterly maintenance plan
Patient-Family Engagement	Visitation policies	Lacking	Unclear guidelines causing dissatisfaction	Standardize visitation framework

Domain	Key Element	Status	Observations	Recommendations
Training and Competency	Simulation-based training	Limited	Participation rates low	Expand mandatory training sessions
Continuous Quality Improvement	Real-time KPI tracking	Developing	No automated dashboards in place	Deploy digital tracking systems
Continuous Quality Improvement	Empatheon implementation	Not initiated	No formalized structure for patient-family engagement tracking	Define and implement Empatheon measurement framework

Following the baseline audit, a structured intervention framework was developed to address these gaps. This framework, as shown in figure 1, integrates infection control reinforcement, staffing optimization, patient-family engagement enhancements, and CQI measures to drive sustainable ICU transformation.

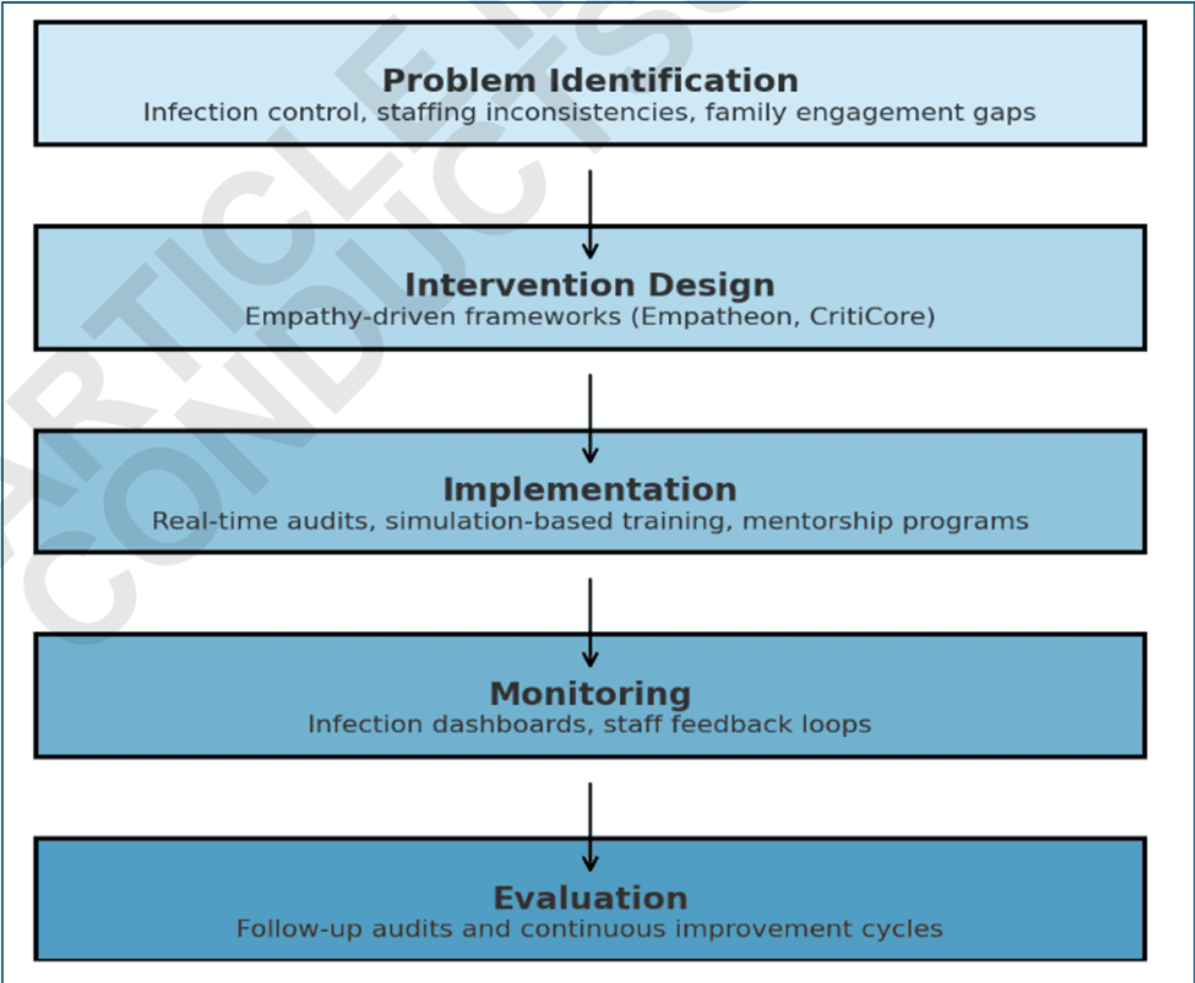


Figure 1. CritiCore ICU care transformation framework.

Targeted interventions over the three-month period focused on enhancing infection control adherence, reducing dependency on locum staffing, standardizing patient-family engagement, and improving ICU staff training. Key initiatives included:

- Implementation of structured shift coordination measures to reduce workload imbalances and improve care continuity.
- Expansion of simulation-based training sessions to enhance staff preparedness and emergency response effectiveness.
- Introduction of standardized patient-family engagement protocols, including structured visitation guidelines and transparent communication measures.
- Deployment of real-time KPI tracking dashboards to monitor infection control compliance, staffing sufficiency, and ICU operational efficiencies.
- Initial implementation of Empatheon to strengthen patient-family engagement through structured caregiver updates and real-time patient communication tools.

The January 2025 re-audit demonstrated measurable improvements across several domains. Hand hygiene compliance increased, structured visitation guidelines were successfully introduced, and staff participation in simulation-based training saw a significant rise. While improvements in locum dependency and ICU workflow efficiency were noted, the need for long-term staffing retention strategies remains an area of focus. Table 2 presents a comparative overview of post-intervention ICU performance (January 2025).

Table 2: Thematic summary of key ICU re-audit findings and quarterly update metrics following targeted interventions (January 2025)

Domain	Key Element	Status	Observations	Quarterly Update Metrics
Infection Control Compliance	Hand hygiene adherence	Improved	Compliance increased	Maintain weekly audit cycles
Infection Control Compliance	Isolation room ventilation	Needs further work	Partial ventilation upgrades completed	Finalize air circulation plans
ICU Staffing and Workflow	Locum staff dependency	Still a concern	Some reduction, but continuity gaps remain	Expand mentorship program
ICU Staffing and Workflow	Shift coordination	Improved	Structured scheduling implemented	Monitor staff workload balance

Domain	Key Element	Status	Observations	Quarterly Update Metrics
Equipment and Resource Availability	Ventilator maintenance	Partially met	Quarterly servicing schedules in effect	Assess predictive maintenance solutions
Patient-Family Engagement	Visitation policies	Improved	Standardized guidelines in place	Ensure adherence to SOPs
Training and Competency	Simulation-based training	Expanded	Higher participation rates observed	Integrate feedback for refinement
Continuous Quality Improvement	Real-time KPI tracking	Implemented	Digital dashboards deployed	Conduct multi-site validation
Continuous Quality Improvement	Empatheon implementation	In Progress	Caregiver feedback system piloted	Expand usage and measure long-term impact

Empatheon, introduced as a patient-family engagement intervention, addressed fragmented communication and inconsistent caregiver involvement observed in the baseline audit. Post-intervention findings indicate improved caregiver satisfaction through structured updates, fewer repetitive inquiries to nursing staff, and more transparent ICU communication workflows. However, variability in staff adherence to structured updates was noted, necessitating further training and reinforcement.

Looking ahead, multi-site validation of the CritiCore framework will be conducted in Evercare hospitals in Nigeria and Kenya to assess adaptability across diverse ICU environments. The integration of digital tracking systems, CQI mechanisms, and Empatheon enhancements will remain central to ensuring the sustainability and scalability of ICU performance improvements. While early interventions have yielded positive outcomes, continued monitoring and refinements are necessary to drive long-term transformation in ICU care.

DISCUSSION

The structured ICU audit conducted at Evercare Hospital Lahore identified key challenges in infection control, staffing, patient-family engagement, and quality improvement processes. Targeted interventions resulted in measurable improvements, though ongoing challenges remain in sustaining compliance, ensuring staff retention, and optimizing patient-family communication.

These findings align with broader challenges in ICU management within resource-limited settings, where infection control adherence, staff training, and engagement strategies are often difficult to standardize [1], [3].

The post-intervention audit demonstrated notable improvements, particularly in hand hygiene compliance, structured visitation policies, and the initial rollout of Empatheon for patient-family engagement. These changes reflect the impact of targeted, iterative quality improvement strategies, reinforcing the importance of structured audit frameworks in ICU settings [9], [15]. However, staffing constraints persist, with locum dependency affecting continuity of care. While shift coordination improved, long-term workforce retention remains a challenge, requiring additional policy and incentive-driven solutions [4].

A critical strength of this study is its integration into a multi-unit and multi-site validation process, with concurrent audits of emergency departments and pediatric spaces underway (papers in review). These audits reinforce the adaptability of structured quality improvement interventions across different hospital units. By evaluating ICU workflows alongside emergency and pediatric care environments, this research supports a hospital-wide transformation strategy, ensuring that quality improvement measures are not siloed but rather embedded within a broader, system-level approach [16].

Empatheon, introduced to enhance patient-family engagement, yielded promising preliminary results. Caregiver feedback indicated improved communication and reduced uncertainty about patient status. However, variability in staff adherence to structured communication protocols suggests a need for ongoing training and reinforcement. Similar findings have been reported in patient-centered ICU models globally, where sustained impact requires not just protocol development but also continuous feedback loops and staff engagement strategies [7].

Despite these improvements, several limitations must be acknowledged. The audit was conducted within a single hospital site, limiting direct generalizability. However, planned multi-site implementation in Evercare hospitals in Nigeria and Kenya will provide critical validation data on the adaptability of the framework across diverse healthcare settings. Additionally, while digital dashboards for infection tracking and KPI monitoring were introduced, their long-term utility depends on ongoing compliance and institutional buy-in [17]. Another limitation is the variability in staff participation in training programs and Empatheon implementation. While initial results were positive, ensuring long-term adherence to structured quality improvement measures remains an area for further research and intervention [8].

Future research should focus on further refining Empatheon to optimize patient-family communication and engagement while expanding simulation-based training programs to improve ICU staff preparedness and skill retention. Strengthening mentorship models is necessary to enhance workforce retention and reduce reliance on locum staffing. Additionally, assessing the long-term impact of real-time digital dashboards on infection prevention and ICU workflow efficiency will be crucial. The findings highlight the transformative impact of structured ICU audits, demonstrating that real-time infection monitoring, targeted training, and improved patient-family engagement can yield tangible improvements. As additional data from ICU, emergency department, and pediatric audits become available, cross-comparisons will offer deeper insights into how structured quality improvement frameworks can be adapted across clinical environments, ensuring sustained impact at both the unit and system levels.

CONCLUSION

This study demonstrates that structured ICU audits, combined with targeted interventions, can drive measurable improvements in infection control, staffing coordination, and patient-family engagement. The integration of digital tracking tools and multi-unit validation highlights the scalability of this approach across diverse healthcare settings. While challenges in sustaining compliance and staff retention persist, the findings provide a foundation for continuous refinement and broader implementation. Future multi-site assessments will be essential in evaluating the long-term impact and adaptability of these interventions, ensuring that ICU quality improvement strategies remain data-driven, patient-centered, and institutionally sustainable.

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