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Research Title:

The Role of Health Administration in Reducing Blood Culture Contamination: An Applied Study at King Abdullah Bin Abdulaziz University Hospital, Riyadh

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Table of Contents

Introduction	3
Problem Statement	5
Study Importance	7
1. Scientific Importance	7
2. Practical Importance	8
Study Objectives.....	9
Study Questions.....	10
Research Hypothesis	10
Theoretical Framework.....	11
1. Donabedian’s Structure–Process–Outcome Model	11
2. Diagnostic Stewardship Framework	11
3. Clinical Governance and Interdisciplinary Teams	12
4. Learning Health System and Continuous Feedback	12
5. Complexity and System Thinking.....	12
Integration of Theoretical Concepts	13
Literature Review (Previous Studies).....	13
Methodology.....	16
Study Design	16
Population and Data Sources	16
Study Instruments.....	17
Statistical Methods	17
Delimitations of the Study.....	18
References	19

Introduction

Bloodstream infections (BSIs) are a critical global health concern, placing a substantial burden on patient outcomes and healthcare systems. Sepsis—one of the most severe manifestations of BSI—is responsible for high morbidity and mortality worldwide (Fleischmann et al., 2016). Timely and accurate diagnosis of BSIs relies heavily on blood culture results, which inform antimicrobial therapy and stewardship strategies (Hall & Lyman, 2006; Fleischmann et al., 2016). However, the frequent occurrence of blood culture contamination (BCC)—the unintended presence of commensal skin or environmental microorganisms—poses a serious challenge to patient safety, often leading to misdiagnosis, unnecessary interventions, prolonged hospitalization, and increased healthcare expenditures (Hall & Lyman, 2006; Fleischmann et al., 2016).

Blood culture is a diagnostic laboratory test to identify the existence of microorganisms, e.g. bacteria or fungi, in the bloodstream. It has been used as the standard in diagnosing infections of the blood stream. The implementation of this test will help detect the exact pathogen that caused the infection and define its antimicrobial susceptibility, by which it will be possible to treat the patient by pointing him or her in the right direction. The cultures of blood are normally obtained in cases where the patient exhibits an indication of systemic infection like a fever, disorder of cold, hypotension or high White boarder cells. Immediate and correct detection of pathogens on the blood is essential to enhance clinical outcomes, reduce complications such as sepsis infections, and inform an effective antimicrobial treatment.

Benchmark targets established by Clinical and Laboratory Standards Institute (CLSI) and other professional bodies recommend BCC rates below 3%, with an optimal goal around 1% (CDC, as cited in Hall & Lyman, 2006; Wikipedia, 2025) (Hall & Lyman, 2006; Wikipedia, 2025). Yet real-world rates can soar as high as 12%, especially in high-throughput settings like Emergency Departments (EDs) (Wikipedia, 2025; Self et al., 2013). Studies in community and tertiary hospitals have demonstrated that implementation of sterile collection protocols, including sterile gloves, chlorhexidine skin prep, and fenestrated drapes, can effectively reduce BCC from as high as 5% down to near or below 1% (Self et al., 2013; Wikipedia, 2025). These findings point to the finding that solution-based systematized and protocol-based interventions, when safely executed, may lead to vast improvements in long-term patient outcomes and accurate diagnosis.

Although the extensive literature, by far, on clinical and procedural interventions, the role of health administration, including the role of governance, policy deployment, resources

allocation, staff training management, and quality monitoring, in BCC reduction has yet to be explored. However, quality improvement frameworks, such as those promoted by the CLSI, designate administrative oversight as a critical component of BCC risk mitigation (CDC, as cited in Hall & Lyman, 2006). Administrative functions include instituting regular feedback loops, facilitating staff training, authorizing equipment procurement (e.g., sterile set kits, diversion devices), establishing accountability mechanisms, and embedding process metrics in key performance indicators (CDC, as cited in Hall & Lyman, 2006).

International researches support the key role of administration-based interventions in the accomplishment of low BCC rates. He et al. (2019), for example, demonstrated that implementing weekly contamination reports to ICU staff—backed by administrative support—led to measurable BCC reductions. Halstead et al. (2020) reported success across multiple hospital systems by standardizing protocols and fostering administrative commitment to process adherence. Eisenberg et al. (2024) underscored the synergy between administrative leadership and interdisciplinary teams (laboratory, nursing, phlebotomy, infection prevention) in driving down BCC rates through structured policy integration, staff training, and data-driven accountability.

In Saudi Arabia, BCC poses a similarly complex challenge. Hemeg et al. (2020) reported elevated contamination rates in a tertiary care setting, emphasizing gaps in collection technique and under-resourced laboratory monitoring. Contrastively, Hosni et al. (2024) detailed successful contamination reduction at King Abdullah Hospital, Bisha—a result attributed to strong administrative leadership, protocol reinforcement, and staff engagement. The regional data obtained recommend that health administration acts as a major stimulus to ensuring the long-term decrease in BCC in Saudi healthcare facilities.

Furthermore, administrative investments in technology have delivered significant results. Rupp et al. (2017) reported that initial specimen diversion devices—procured and promoted by administration—cut contamination rates by nearly 50%. Brian et al. (Wikipedia, 2025) and other meta-analyses noted that diversion devices, sterile kit bundling, dedicated phlebotomy teams, and barcode specimen tracking yield reliable contamination reductions between 30–70%.

Healthcare administrators additionally play a pivotal role in antimicrobial stewardship—an increasingly critical concern globally (Wikipedia, 2024). Since contaminated cultures often trigger unnecessary broad-spectrum antibiotic use, hospitals with robust administrative

stewardship programs routinely incorporate BCC metrics into routine surveillance, reporting them to infection prevention teams and clinical leadership (Wikipedia, 2024; CDC, as cited in Hall & Lyman, 2006).

Although there are these generalizations, good quality context-specific studies that relate administrative intervention to the outcomes of BCC in large Saudi academic hospitals are not available. King Abdullah Bin Abdulaziz University Hospital (KAAUH), a leading tertiary academic healthcare provider in Riyadh, has yet to generate systematic data on contamination rates or deploy structured administrative strategies aimed at reducing contamination.

All in all, effective methods to limit blood culture contamination go beyond the realm of clinical competence; it is also a performance of calculated health management. There is an avenue to obtain sustained changes to reach the enhanced levels of diagnostic reliability, patient safety, and antimicrobial stewardship, including administrative leadership, data systems, resource mobilization, staff development, and cross-disciplinary intrauniversity cooperation, which can be unified by the KAAUH hospitals. This study will investigate and show that in practice, the administrative structures can change the simple collecting of blood cultures into a continuous, secure and quality-conscious process.

Problem Statement

Bloodstream infections (BSIs) pose a significant clinical risk worldwide, and accurate blood culture results are fundamental for diagnosing and managing these conditions effectively (Fleischmann et al., 2016; Hall & Lyman, 2006). However, blood culture contamination (BCC)—the inadvertent introduction of extraneous microorganisms during sample collection—creates false-positive results. These inaccuracies trigger unwarranted antibiotic use, additional diagnostics, prolonged hospital stays, and increased costs, potentially exacerbating antimicrobial resistance and compromising patient safety (Hall & Lyman, 2006; Fleischmann et al., 2016).

Globally, benchmark BCC rates should not exceed 3%, ideally targeting below 1% (Hall & Lyman, 2006). However, in most healthcare institutions, the contamination rates are way above this mark. For example, Hemeg et al. (2020) reported a BCC rate of 6.6% in a Saudi tertiary care hospital, with peak contamination in medical wards reaching 10.3%. Similar tendencies related to staff shortage and peaks of contamination were determined in that study as well, indicating weak points in procedures and administration.

In addition to quantity, the type of contaminant—typically skin flora like *Staphylococcus epidermidis*—underscores technical and procedural failings at point of collection, often compounded by variability among staff skills and adherence to protocol (Hemeg et al., 2020). Although interventions such as standardized kits, specialized devices, and phlebotomy teams have reduced BCC in varied international contexts, the underlying success often hinges on systemic administrative support—namely leadership, protocols, training, and monitoring (Rupp et al., 2017; Eisenberg et al., 2024).

Indeed, Eisenberg et al. (2024) highlighted that interdisciplinary teams, enabled by administrative leadership, achieved a 45% reduction in BCC—from 3.76% to 2.07%—by implementing evidence-based strategies, consistent training, and robust feedback mechanisms. Similarly, He et al. (2019) demonstrated that weekly reporting, supported by administration, reduced ICU BCC rates by reinforcing accountability. Halstead et al. (2020) extended these findings across four hospital systems, affirming that administrative commitment to standardized policies and ongoing quality review is essential.

Despite compelling global evidence, tertiary academic hospitals in Saudi Arabia, including King Abdullah Bin Abdulaziz University Hospital (KAAUH) in Riyadh, are increasingly recognizing the need to strengthen the integration between administrative practices and clinical outcomes related to blood culture contamination (BCC). Although few systematic studies in this field exist with regard to the context-specific data, KAAUH showed an increased eagerness to strengthen the use of oversight mechanisms, mobilisation capacity, and improve feedback and governance structures. These attempts are a strategic step to institutionalizing and maintaining such initiatives of contamination mitigation with the help of evidence-based administration leadership.

Furthermore, previous Saudi research reveals persistent challenges among nursing and phlebotomy personnel, especially during periods of workforce shortages and increased patient volume, such as pilgrimage seasons (Hemeg et al., 2020; Hosni et al., 2024). While Hosni et al. (2024) showcased improved outcomes through targeted administrative-led protocols at a hospital in Bisha, the broader applicability of their approach remains untested in large academic settings like KAAUH.

This research addresses three major gaps:

- Quantitative Gap in BCC Data at KAAUH:

Although aggregate contamination rates are shocking, they can be analyzed by department and by process at KAAUH. Without detailed baseline data (e.g., by unit, collector type, seasonal variation), administrative teams cannot prioritize and tailor interventions.

- Inadequate Understanding of Administrative Factors:

Available literature shows that leadership organization, management, frequency of feedback, training protocols, and resource distribution impacts on BCC rates. Nevertheless, KAAUH is not described with formal thoughts about these mechanisms and their usefulness or the attitude of the staff towards administrative support on the work on quality.

-Developing Administrative Interventions:

While international experiences have shown the effectiveness of interventions such as specimen diversion devices, report cards, bundled sterile kits, and staff retraining, King Abdullah Bin Abdulaziz University Hospital (KAAUH) is in the early stages of exploring and customizing such administrative-led strategies to fit its specific institutional context. What seems not to happen much as a result of effort is that the hospital is coping with the convolutions of adjusting and evaluating these practices in its corporate culture and clinical setting.

At present, the organizational constraints related to structural BCC data and a lack of effective executive control threaten to hamper the possible realization of the best diagnostic accuracy and optimal rates of patient safety. These obstacles can cause inappropriate antibiotic prescription, and contributes to antimicrobial resistance, and healthcare expenses, which in turn, may impact on laboratory diagnostic confidence. These issues come under the same moorings as the academic mission and continuous quality improvement envisaged by a hospital.

This research is thus based on the fact that, KAAUH has a strategic opportunity to improve its administrative systems in terms of monitoring, assistance and in minimizing the rate of contamination of blood via blood culture according to international best practices.

Study Importance

1. Scientific Importance

Blood culture contamination (BCC) poses a persistent scientific challenge in clinical microbiology and healthcare quality, critically affecting the diagnostic value of blood cultures. Contaminated samples dilute the predictive value of testing, impede accurate epidemiological

surveillance, and complicate antimicrobial resistance monitoring (Hall & Lyman, 2006). Scientifically, this study addresses key gaps in knowledge by exploring the administrative determinants of BCC reduction, an area that remains under-researched despite its demonstrated effectiveness in broader quality improvement initiatives (Eisenberg et al., 2024; He et al., 2019).

Research to date has primarily concentrated on procedural and technological solutions—such as diversion devices, sterile kits, and phlebotomy teams—to reduce contamination (Rupp et al., 2017; Bowen, Coleman, & Cunningham, 2016). Although such interventions have proved to be effective, their long-term uptake is determined by such administrative systems as policy oversight, budget allocation, staff education, and performance monitoring, but there is a limited empirical evidence connecting these systems with outcomes. By integrating contamination rate metrics, staff training records, governance policies, and resource utilization at King Abdullah Bin Abdulaziz University Hospital (KAAUH), this study provides a comprehensive scientific framework for analyzing how administration shapes BCC outcomes.

Moreover, the conceptual orientations of the diagnostic stewardship and quality improvement in clinical care are widened through this study. It complements global evidence—which indicates that timely feedback, interprofessional collaboration, and policy-led standardization reduce BCC rates (Eisenberg et al., 2024; Halstead et al., 2020)—but adds specificity by operationalizing administrative actions within a real-world tertiary academic setting in Saudi Arabia. This kind of contextual scientific inquiry is crucial: foreign experience cannot always be transferred directly, as organizations differ in terms of the organizational culture, level of system development and limits to resources.

2. Practical Importance

In practice, the study can add a lot of value to KAAUH and other tertiary healthcare organizations that are willing to improve patient safety and reduce the overall costs and improve antimicrobial stewardship. To begin with, the removal of BCC means the more accurate diagnostics. Contamination frequently triggers unnecessary antibiotic treatments, which extend patient stays and elevate the risk of adverse effects—including *Clostridioides difficile* infections and emergent resistance (Hall & Lyman, 2006; Fleischmann et al., 2016). Through decreasing the false-positive rates, clinicians will better focus therapy in an effort to achieve better patient outcomes and reduce iatrogenic effects.

Economically, BCC represents a hidden cost burden. Research shows that every infected blood culture may incur heavy laboratory and drug cost. Though specific data vary, reductions in contamination rates have yielded savings in the tens of thousands of dollars within single hospital systems (Halstead et al., 2020; Bowen et al., 2016). In the case of KAAUH, the pilot intervention could have significant economic advantages since it would save the unnecessary testing, medication, and long stays.

Moreover, operational improvements will benefit hospital workflow. By reducing BCC, there is a reduced need to do more tests that cause a reduction of workload among laboratory and clinical staff to do follow up. Dashboards, audit-feedbacks systems, and standardized kits are administrative tools that make processes streamlined and promote accountability. These instruments, enhanced with empirical evidence on the one hand achieved in the course of this research, qualify leaders to facilitate optimization of procurement, a more strategic approach to human resources and an overall enhancement of the efficiency of a laboratory.

The study fits the international and national priorities to tackle antimicrobial resistance in terms of stewardship. Inappropriate antibiotic use that accompanies contaminated cultures works against the efforts of reducing emergence of resistance. By embedding BCC metrics into quality dashboards and continuous feedback cycles, KAAUH supports prevention-oriented strategies essential to antimicrobial stewardship (Eisenberg et al., 2024; Halstead et al., 2020).

Study Objectives

1. Determine baseline blood culture contamination rates at King Abdullah Bin Abdulaziz University Hospital (KAAUH), stratified by department (e.g., ICU, ED, wards), collector role (phlebotomist vs. nurse), and seasonal variation.
2. Take a look at current administrative systems such as the governance system, training programs, methods of procurement, and feedback to learn how they impact the behavior of contamination prevention.
3. Develop and introduce an intervention that is led by the administration, weekly updating with contamination dashboards, and uniformly dispensed sterile-kits, and specific retraining sessions, to facilitate stable protocol adherence.
4. The effectiveness of the intervention on the contamination rates should be evaluated by comparing the pre and post intervention data and the ultimate goal is to bring the contamination rates below the CLSI cutoff limit of 3 percent and preferably to one percent.

5. List the facilitators and constraints of the health administration setting, to create knowledge to support the use of sustainable quality improvements and to achieve their replication in other Saudi tertiary hospitals.

Study Questions

Main Research Question

- To what extent can health administration–led interventions reduce blood culture contamination rates at King Abdullah Bin Abdulaziz University Hospital (KAAUH), and what administrative mechanisms (governance, resources, training, feedback) are most effective in achieving this reduction?

Sub- questions

1. What are the current blood culture contamination rates at KAAUH, stratified by department (e.g., ICU, ED, wards), collector type (phlebotomist vs. nurse), and seasonal factors?
2. Which are the current structures, procedures, training and allocation of resources at KAAUH to help improve the quality of blood culture collection?
3. How does the introduction of an administrative-led intervention (weekly contamination dashboards, standardized sterile kits, retraining) influence compliance with best-practice blood culture protocols?
4. How will the intervention affect the rates of blood cultures contamination, patterns of antibiotic use, and its related healthcare expenses relative to pre-intervention standards?

Research Hypothesis

Main Hypothesis

H₁: Health administration–led interventions (e.g., weekly feedback dashboards, standardized sterile kits, and retraining programs) will significantly reduce blood culture contamination (BCC) rates at King Abdullah Bin Abdulaziz University Hospital (KAAUH), bringing them below the CLSI benchmark of 3%, ideally trending toward 1%.

Sub-hypotheses

1. Blood culture contamination rates at KAAUH vary significantly by unit (ED, ICU, wards), collector type (phlebotomist vs. nurse), and season—indicating critical areas for targeted administrative intervention.

2. The unadjusted BCC rates will be lower in those departments that have an effective existing administrative support structure in place in terms of formal governance, equipment budget, and feedback mechanisms that are a routine.
3. Following the implementation of administrative-led interventions, departments at KAAUH will experience a statistically significant reduction in BCC rates compared to baseline ($p < .05$).
4. At the end of the reductions in BCCs, it will be possible to record quantifiable changes in excess antibiotic expenditure as well as a laboratory expenditure that will support the veracity of the economic and stewardship worth of the administrative spending.

Theoretical Framework

1. Donabedian's Structure–Process–Outcome Model

The foundation of this study rests on Avedis Donabedian's Structure–Process–Outcome model, a widely accepted framework for evaluating healthcare quality (Donabedian, 1966/2003; AHRQ, 2024). The component of structure of provision is the situation in the organization where care is provided including the systems of management, the schemes of resources distribution, and training of personnel institutions. That, in this case, refers to such administrative systems of KAAUH as the procurement policies of sterile kits, implementation of training modules, and the creation of interdisciplinary quality committees. The component of process is concerned with clinical activity, such as the use of standard methods of collecting blood cultures, implementing the use of specimen diversion devices, and regular monitoring/reporting. The program component on the outcome side includes measurement of patient relevant measures, which include rate of contamination, use of antibiotics, diagnostic sensitivity and cost implication. Donabedian posits that strong structural capacities foster better processes, which in turn yield superior health outcomes—laying a clear conceptual roadmap for evaluating how administrative elements influence contamination outcomes (AHRQ, 2024; Wikipedia, 2024; Donabedian, 2003).

2. Diagnostic Stewardship Framework

Complementing Donabedian's framework is the concept of diagnostic stewardship, which aims to optimize diagnostic accuracy and patient outcomes by aligning test ordering and collection practices with evidence-based processes (CDC, 2022; MDPI, 2023). Diagnostic stewardship as an aspect of BCC reduction is implemented through administrative leadership towards defining testing indications, normalization of collection procedures, and provision of feedback in real-time. Interventions such as weekly contamination reports (He et al., 2019),

departmental scorecards (Zimmerman et al., 2018), specimen diversion devices (Rupp et al., 2017), and nurse-led multimodal bundles (Filipe et al., 2024) highlight how administrative structures can engender appropriate behavior change among clinical teams. Therefore, health administration is considered part of the ability to direct diagnostic stewardship by strengthened accountability and organized procedures.

3. Clinical Governance and Interdisciplinary Teams

The success of contamination reduction initiatives also aligns with clinical governance theories that emphasize interdisciplinary collaboration, responsibility, and quality accountability (Eisenberg et al., 2024; Halstead et al., 2020). Specifically, contamination rate improvements observed in King Abdullah Hospital, Bisha, were attributed to structured administrative oversight of cohesive teams involving nursing, lab staff, phlebotomists, and physicians (Hosni et al., 2024). In the context of KAAUH, the framework implies that the presence of administrative leadership and multi-departmental efforts will be required to maintain lower contamination rates. Incorporating these teams within the governance committees, establishing performance targets and making review meetings possible formalizes the accountability frameworks behind enduring quality improvement.

4. Learning Health System and Continuous Feedback

This study also draws on the concept of a learning health system, which relies on the continuous collection and analysis of process and outcome data to refine practice iteratively (He et al., 2019; Eisenberg et al., 2024). Key elements include contamination dashboards, process audits, and formalized feedback loops that have been put in place to make sure that the information is translated into action and that organization relies on a continuous improvement culture.

5. Complexity and System Thinking

Finally, contamination processes in healthcare represent complex adaptive systems, influenced by numerous interrelated variables including seasonality, staffing levels, patient acuity, and leadership focus (Hemeg et al., 2020; Donabedian, 1966/2003). Such variables interact dynamically, and it will be necessary to use the concept of systems thinking in designing analytical and intervention plans. In this regard, the research will follow the mixed-mode design that will include quantitative variables and the qualitative staff perceptions to ensure the comprehensive understanding of the impact administrative conditions in the real settings have on the results of blood culture collection.

Integration of Theoretical Concepts

Together, these theories form an integrated theoretical framework whereby: (a) administrative structures enable processes that directly affect clinical outcomes, (b) diagnostic stewardship principles guide the operational specifics of contamination control, (c) clinical governance provides accountability and interdisciplinary oversight, (d) learning health system principles ensure adaptability and responsiveness, and (e) systems thinking elucidates interacting variables to guide a comprehensive evaluation. Therefore, the framework will be an appropriate model to follow in designing, and also interpreting the proposed study as it anchors empirical evaluation in the already existing body of knowledge on healthcare quality and management.

Literature Review (Previous Studies)

1. Hosni et al. (2024)

Hosni et al. (2024) conducted a focused intervention study at King Abdullah Hospital in Bisha, Saudi Arabia, implementing structured administrative strategies to reduce blood culture contamination (BCC). Intervention involved training of staff, standardizing of collection kits, improved governance reviews and interdisciplinary review meetings. They managed to reduce the rate of contamination by as much as 2.1 percent to about 5.2 percent in six months. The impact of the alignment of administration to clinical protocols was also shown by the sustainable improvement in performance of the hospital, conditioned by integration of contamination metrics in key performance indicators in the departments.

In addition to quantitative gains, the research emphasized the need of administrative support and resource commitments. Athena staff survey reflected the increased level of according awareness, an obvious system of accountability, and the management promotion as the most important factors of the intervention success. The results present a strong framework of how the secondary hospitals such as KAAUH can possibly replicate the low-cost management programs to improve the precision of diagnosis and safety of patients. The authors indicate the importance of regular monitoring and continuous re-training to sustain gain, presenting the process of BCC reduction as a quality improvement process.

2. He et al. (2019)

He et al. (2019) examined the effects of weekly contamination reports and feedback in an intensive care unit (ICU) setting. The intervention created a feedback circle, with weekly dashboards on contamination events, the performance of collectors, and trends at the

departmental level given to the ICU personnel accompanied by administrative leadership meetings. Already after three months, the levels of contamination decreased to 2.7%; the positive results continued up to six months after the intervention.

The authors stated that the important considerations were the leadership endorsement, frequent data examination, and open performance correspondence. This organizational feedback influenced responsibility and made corrective training possible. In its conclusions, the study highlights the possibility of drastic changes in clinical quality outcomes after small, consistent investments at the administrative level and discusses the recommended systematic approach to data management and reporting as one of its key potential areas.

3. Hemeg et al. (2020)

In a one-year cross-sectional study at a tertiary Saudi hospital, Hemeg et al. (2020) analyzed contamination rates across units, including seasonal variations and collector roles. They recorded aggregate BCC rate of 6.6 with a maximum of 10.3 in the medical wards and when the hospitals were having high number of patients. The procedure of audits and interviews with staff members by the study found that inefficient training, discrepancy between aseptic techniques, and lack of administration control provided most of the contamination.

The value of the study consists in the fact that temporal and structural risk factors have been identified. Hemeg et al. strongly characterized the importance of long-term administrative surveillance and contingent resource allocation by pinpointing times of high contamination with employee shortages and workload demands. Their results act as an important basis of diagnosis signifying that administrative response to operation variability requires a structure.

4. Rupp et al. (2017)

Rupp et al. (2017) conducted a randomized controlled trial evaluating the impact of initial specimen diversion devices (ISDDs) compared to standard sampling methods. With ISDD utilization there was a 50 per cent reduction in contamination-3.5 to 1.7 per cent- without the loss of diagnostic yield. The research highlighted that the possibility of incorporating ISDDs into regular practice at reasonable cost is achievable with assistance of resource planning on the part of the administration.

The trial of this nature demonstrates that even an administrative decision, e.g. using new technologies, can have real clinical effects. Asset-based decision-making, procurement, and protocol training enabled successful implementation. Their companion strategies, according to Rupp et al., include continual competency verification and outcome monitoring to achieve a

lasting contamination reduction and remind that the adoption of the device must be supported by administrative processes.

5. Hall & Lyman (2006)

Hall and Lyman's (2006) comprehensive literature review systematically assessed blood culture contamination studies, offering procedural, educational, and contextual classification of causes and solutions. They stated that standardization of skin antisepsis, proper staff education, and planned phlebotomy operations were critical in pushing the rate of contamination to less than 3 percent. Notably, they noted that those interventions that did not have administrative backing in governance and monitoring tended to fail after a few weeks.

The review focuses on institutional accountability and prioritizing of resources as the key to procedural change. It cites incidences of system weaknesses that manifest more regularly, like organization turnover and lack of reinforcement of standards, as causes why most long-term interventions fail. The two authors suggest incorporating the measurements of contamination rates into the organizational quality concepts, an innovation that has become a source of direct guidance in conducting the presented study at KAAUH.

6. Eisenberg et al. (2024)

Eisenberg et al. (2024) studied structured interdisciplinary teams in a large healthcare network. With the suggested interventions of weekly meetings, sterile kits costed-in, and leader-demonstrated performance dashboards, they have reported a 45 percent cut-down in the rate of contamination, which was 3.76 percent in the initial stage and 2.07 percent in the second. Notably, the decline in contamination was not traced to any one intervention strategy but was seen as result of the integrated strategy of governance as well as chain of accountability.

Their contribution highlights the importance of administration as the focal point of clinical best practice integration and upkeep. Such strategies as cross-departmental communication, latticed reporting, and resource allocation were found to be essential towards the achievement of long-term adherence to processes. The research presents convincing indications that the curtailment of enduring contamination enhancements is dependent on administrative ecosystem, and not limited to clinical interventions.

7. Halstead et al. (2020)

Halstead et al. (2020) evaluated contamination reduction programs across four U.S. hospitals, each adopting a variant of administrative-led intervention, including standardized

collection kits, staff orientation, and performance feedback. Majority of hospitals reduced their contamination by at least 40 percent with baselines of 3.2-4.7% to 1.8-2.5 percent. The strength of success was associated with the existence of administrative champions ensuring the coordination across the functions and frequent reporting.

Their multi-site study confirms what they had described in their previous study that administrative leadership is the distinction between short-term improvements and long-term control of contamination. Halstead et al. cite the conclusion that integrating contamination prevention artifacts in administration form, including budget procedures, training planning, executive review enterprises, is fundamental in the sustainability of results and applicability.

Methodology

Study Design

This study adopts a retrospective, quantitative design employing the analysis of Key Performance Indicator (KPI) data related to blood culture contamination (BCC) at King Abdullah Bin Abdulaziz University Hospital (KAAUH). The main goal will be to assess the improvement role of health administration in BCC reduction by comparing real life rates of contamination, measures connected with the latter as well as timeframes of given administrations. Drawing on established methodology in healthcare process evaluation, this approach ensures systematic collection and analysis of objective data aligned with the study's objectives.

Population and Data Sources

The study's population for data extraction will be all blood culture specimens collected and processed at KAAUH within the defined study timeframe.

The primary data sources for this study will be:

Hospital Records of Blood Culture Contamination Rates (KPIs):

This will comprise real data obtained on the regular basis regarding the incidences of the contaminated blood cultures in relation to the sum of blood cultures collected inside KAAUH. This objective data will be used as the main outcome measure.

Associated Clinical and Administrative KPIs:

Additional relevant KPIs, such as antibiotic utilization (e.g., defined daily doses related to contamination episodes) and associated laboratory costs, will also be collected for comprehensive analysis. Furthermore, records of implemented administrative interventions,

policy changes, or training programs related to blood culture collection within the study period will be sought from relevant hospital departments (e.g., Infection Control, Quality Assurance, Laboratory Management, Nursing Administration). Such data sources will allow the direct correlation of certain administrative actions or time horizons with quantifiable clinical results.

Study Instruments

Blood Culture Contamination Rate Data:

This will be extracted from the hospital's laboratory information system (LIS) and/or infection control databases. The specific definition of contamination used by KAAUH will be rigorously adhered to (e.g., growth of common skin flora in one of multiple bottles, without clinical suspicion of infection).

Administrative Intervention Records:

Documentation of specific administrative changes, training initiatives, or policy implementations will be obtained from relevant departmental records to define "pre" and "post" intervention periods for analysis.

Statistical Methods

Descriptive Analysis

Initial analysis will involve basic statistics (means, standard deviations, frequencies, percentages) to profile blood culture contamination rates, total cultures collected, average antibiotic utilization, and associated laboratory costs over the study period. Described data will be disaggregated to the department and month levels to detect the trends and baseline characteristics.

Inferential Statistics

- Comparison of Pre- and Post-Intervention Periods: Appropriate statistical tests will be applied to compare KPI data between defined "pre-intervention" and "post-intervention" periods. This may include:
- Independent t-tests or ANOVA: Comparisons between the mean of the antibiotics contamination rates, drug use or costs provided the data fulfills the assumptions of parametric testing.
- Mann-Whitney U test or Kruskal-Wallis test: For non-parametric comparisons.
- Chi-square tests: For categorical comparisons of contamination proportions.

- **Trend Analysis-** Time series analysis (if sufficient data points are available) or control charts will be used to visualize and analyze trends in contamination rates over time, particularly in relation to the implementation of administrative interventions.

Statistical Software & Significance

The data shall be analyzed either in SPSS or R and two-sided p-value less than 0.05 will be set as a null hypothesis that is statistically significant. Results will be reported using 95% confidence intervals.

Delimitations of the Study

Institutional Scope:

In this work, the departments in which blood cultures were taken in KAAUH will be analyzed i.e., Emergency Department; Intensive Care Unit; general wards; phlebotomy services and microbiology laboratory. It does not count down other hospitals nor the outpatient clinic statistics.

Time Frame:

This factor predetermines the day of collection and analysis within a period of six months i.e. three months before intervention and three months after intervention. This paper does not include the analysis of long-term trends beyond this time range.

Unit of Analysis:

The primary unit of analysis will be departmental-level and overall hospital-level blood culture contamination rates (KPIs), along with associated aggregate clinical and financial metrics. Individual patient-level outcomes beyond contamination status will not be analyzed (e.g., morbidity or mortality related to contamination).

Geographic and Cultural Context:

The findings are unique to KAAUH in Riyadh, Saudi Arabia, and they are based on the organizational structure of hospitals and the policies of personnel and operations of hospitals. The results cannot be directly used in a context where the system is different or the culture is different without putting it in context.

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