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TOWARD A SAFER OBSTETRIC TRIAGE SYSTEM: PHASE ONE ANALYSIS AND RECOMMENDATIONS

by
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ABSTRACT
OF THE PROJECT OF

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Background: Obstetric triage is a critical gateway for ensuring timely, safe, and patient-centered care for pregnant and postpartum women presenting through emergency services. In high-volume tertiary hospitals, inefficient triage workflows may result in delays, repeated assessments, increased left-without-being-seen (LWBS) rates, and compromised patient experience.

Purpose: The purpose of this nurse-led quality improvement project was to evaluate and improve the obstetric triage workflow at a tertiary hospital in the Eastern Province of Saudi Arabia by examining routing inefficiencies, identifying system-level root causes, and informing evidence-based redesign strategies guided by Lean methodology.

Methods: A Phase 1 diagnostic assessment was conducted using Lean methodology and Donabedian's structure–process–outcome framework. Data sources included a retrospective audit of obstetric emergency presentations from June to August 2025, analysis of formal patient complaints, direct workflow observation, and multidisciplinary stakeholder input. Process-based indicators such as routing accuracy, waiting times, LWBS rates, and safety signals were analyzed descriptively.

Results: Approximately one quarter of obstetric patients experienced repetitive routing between the Emergency Department and obstetric triage, resulting in an average additional delay of 50 minutes per case. While time to initial nurse assessment met international benchmark standards, downstream inefficiencies contributed to elevated LWBS rates in obstetric triage compared with the Emergency Department. Root cause analysis identified structural capacity constraints, fragmented governance, restricted nursing authority, policy gaps, and limited digital integration as primary contributors to these inefficiencies.

Conclusion: Phase 1 findings demonstrate that obstetric triage inefficiency in this setting is systemic rather than behavioral. The results establish a robust evidence base for Lean-informed, nurse-led redesign strategies, including workflow standardization, role clarification, and system-level process optimization, to enhance patient safety, operational efficiency, and maternal care quality.

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ABBREVIATIONS

ALOS — Average Length of Stay

BSOTS — Birmingham Symptom-Specific Obstetric Triage System

CTAS — Canadian Triage and Acuity Scale

ED — Emergency Department

EHR — Electronic Health Record

FMEA — Failure Mode and Effects Analysis

ICU — Intensive Care Unit

LWBS — Left Without Being Seen

MFTI — Maternal–Fetal Triage Index

MOH — Ministry of Health

NHS — National Health Service

OB/GYN — Obstetrics and Gynecology

PDSA — Plan–Do–Study–Act

QI — Quality Improvement

RCA — Root Cause Analysis

SCFHS — Saudi Commission for Health Specialties

CHAPTER I

INTRODUCTION

This project is situated in a Magnet-accredited tertiary hospital in the Eastern Province of Saudi Arabia, a referral hub for maternal and neonatal care. In 2024, the Women's Health Division documented 94,475 encounters, including 4,200 obstetric admissions. Within this division, a five-bed obstetric triage unit, located on the sixth floor of the Women and Children's Building, serves as the single-entry point for all pregnant and postpartum women presenting through the Emergency Department. Staffed by obstetric nurses and supported by physicians shared with labor and delivery, the triage unit is positioned at the junction of emergency and maternity services, making it highly sensitive to workflow inefficiencies.

Triage refers to the rapid sorting of patients by urgency to ensure that those with life-threatening conditions are assessed and treated first (Gilboy et al., 2012). It is a foundational process in emergency and obstetric care, acting as the gateway to timeliness, safety, and patient-centered outcomes. Globally, evidence shows that inefficient triage processes prolong waiting times, increase the risk of adverse outcomes, and undermine satisfaction. At the system level, inefficient triage models contribute to emergency department overcrowding and resource misallocation (Al Yasin et al., 2023). For mothers and newborns, even modest delays in recognition and treatment may result in preventable morbidity (Wolf et al., 2021).

The idea for this project was first raised by the OB/GYN nurse manager during a leadership meeting, when concerns about repeated transfers and delays for pregnant women presenting through the Emergency Department were formally voiced. These concerns were subsequently validated by internal audits and staff feedback gathered during rounds, which consistently highlighted duplication of work, patient dissatisfaction, and safety risks.

Despite the clinical importance of obstetric triage, no standardized nurse-led protocol or evidence-based framework currently guides patient routing in this tertiary hospital. This gap produces measurable inefficiencies and risks that will be examined in this project.

CHAPTER II

PROBLEM DESCRIPTION

The hospital currently uses a single front-door model. All pregnant and postpartum women first go to the Emergency Department (ED) for registration and initial screening. Those with suspected obstetric conditions are directed to the Obstetrics and Gynecology (OB/GYN) triage unit, while women with non-obstetric complaints stay in the ED. Although this system ideally promotes fairness by providing a single entry point for all patients, in reality, it does not meet the specific needs of obstetric cases. Without obstetric-specific screening tools, many women are unnecessarily redirected.

Internal audit data from June to August 2025 illustrated the extent of this problem (see Table 1). Monthly visits ranged between 360 and 475 obstetric patients to the ED, with 88.8–89.9% redirected to the OB/GYN triage unit. Of these, 24.2–26.3% were later returned to the ED after being identified with non-obstetric conditions. These looped transfers produced avoidable handoffs, repeated assessments, and longer journeys of care.

Table 1. Internal Audit Results for Obstetric Triage, June–August 2025

Month	Total Cases	Routed to OB Triage (%)	Returned to ED (%)	Avg Delay (min)	LWBS (ED)	LWBS (OB)
June	475	89.9%	26.3%	50	1.6%	14.3%
July	390	88.8%	24.2%	49	1.2%	12.5%
Aug	360	89.3%	25.8%	50	0.9%	9.8%

Note. LWBS = Left Without Being Seen; ED = Emergency Department. Data represent all pregnant/postpartum women presenting to the ED during the specified period

These summarized metrics highlight the scale and consistency of the issue across months. More granular metrics, including time to physician, disposition breakdown, and sentinel-like event tracking, are detailed in Appendix A. Time metrics highlighted inefficiencies: the average arrival-to-nurse assessment time was 12.7–12.9 minutes. According to hospital policy and international (NHS England, 2022; Canadian Association of Emergency Physicians, 2014), patients should be triaged within 10–15 minutes of arrival, with immediate recognition of life-threatening cases. Thus, front-end performance met expected standards; however, misrouted cases added approximately 50 minutes to decision-making and total stay, producing cumulative delays.

The impacts extended across quality indicators. Contrary to expectations given the specialized nature of OB/GYN triage, the rate of patients who Left Without Being Seen (LWBS) was higher in OB/GYN (9.8–14.3%) than in the ED (0.9–1.6%), suggesting that congestion and workflow delays were more pronounced in the obstetric setting. This disparity reflects the unique operational pressures in the OB/GYN triage area, where all patients funnel through a limited five-bed space that frequently reaches capacity.

Formal patient complaints submitted during the first and second quarters of 2025 reinforced these findings. A total of 26 complaints were reviewed during this period, of which approximately 20 related to obstetric services. The majority cited delays in admission, prolonged waiting in hallways, slow nursing response, and miscoordination between units. Several also described concerns about privacy and dignity when women were accommodated in corridors or crowded triage areas. The dominant themes were:

- Delays in access to care: patients waiting extended periods before evaluation or transfer.
- Duplication of processes: repeated assessments in both ED and OB/GYN triage that prolonged care without added value.
- Limited responsiveness: unmet requests for assistance with mobility, toileting, or comfort.
- Communication failures: contradictory information provided by different staff members.
- Compromised dignity: women left exposed in hallways or seated in overcrowded waiting areas.

Although relatively few complaints specifically referenced the obstetric triage unit, the same themes were evident in triage-related encounters. Patients reported being transferred to OB/GYN triage without a proper ED assessment, waiting for extended periods in chairs when all triage beds were occupied, and undergoing duplicate questioning before being redirected back to the ED. In one illustrative case, a woman in active labor described waiting nearly two hours before being evaluated because no triage beds were available.

Taken together, the combination of formal complaints and triage-specific scenarios underscores how workflow inefficiencies are experienced at the patient level. They confirm that congestion, duplication, and fragmented processes manifest not only as operational delays but also as diminished satisfaction, compromised dignity, and erosion of trust in the care system.

Admission rates also diverged substantially: 58–63% for women triaged in OB/GYN compared with 30–35% for those managed in the ED. This reflects the distinct patient groups created by the current routing model but required duplicated assessments and repeated transfers, prolonging care without adding clinical value.

During the audit, 18 cases of non-obstetric emergencies (appendicitis, pulmonary embolism, acute coronary syndrome) experienced delays exceeding 30 minutes because patients were initially routed through OB/GYN triage. Four required intensive care admissions. While not classified as sentinel events, they represent safety signals that highlight the risks embedded in the current workflow.

The current workflow follows a looped pattern that begins with ED registration and administrative intake, followed by an initial screen by the ED triage nurse. Pregnant and postpartum women suspected of having obstetric conditions are transferred to the OB/GYN triage unit for a second assessment by nurses and shared physicians. However, for approximately 25% of cases, this process is reversed: after triage, women are returned to the ED when their condition is determined to be non-obstetric. Each transfer adds a new waiting period, repeated clinical assessments, and breaks in continuity, resulting in an average delay of 50 minutes per misrouted case.

As shown in Figure 1 (see Appendix B), these looped transfers are visualized in the current pathway from ED arrival to final disposition. The figure illustrates the primary decision point, whether the condition is obstetric or not, and highlights the back-and-forth movement for nearly one in four patients. It also shows the contribution of duplicative routing to delays in care and increased length of stay.

Taken together, the findings highlight the seriousness of the problem. Nearly one in four women experienced repetitive transfers, with an average of 50 minutes added to their care journey. Outcomes were directly compromised: timeliness deteriorated, Left Without Being Seen (LWBS) rates were higher in OB/GYN, patient satisfaction declined, and safety signals emerged. These results confirm that inefficiency in the current triage model is not theoretical but a measurable source of harm, patient dissatisfaction, and system strain.

CHAPTER III

LITERATURE REVIEW

A. International Evidence

Unscheduled obstetric presentations account for a significant share of emergency department utilization worldwide. In the United States, 30.9% of pregnancies involve at least one emergency visit, most commonly for pain, hyperemesis, or threatened abortion (Cunningham et al., 2017). A Michigan cohort linked these visits to higher risks of preterm birth and low birth weight, emphasizing the importance of accurate and timely triage (Malik et al., 2017).

Similar findings have been reported in Canada and Europe, where a substantial proportion of obstetric visits end in reassurance or discharge rather than acute intervention, reflecting inefficient streaming and potential over-triage (Memtsa et al., 2020). Qualitative work in Canadian hospitals further highlighted women's experiences of anxiety, long waits, and repeated assessments during early pregnancy complications, reinforcing the need for clearer and more structured triage systems (Rojas-Luengas et al., 2019). In the United Kingdom, the establishment of Early Pregnancy Assessment Centers reduced unnecessary ED use, providing an alternative pathway that improved efficiency and patient experience (Hughton et al., 2025).

Patient perceptions also shape triage demand. In one U.S. study, 58% of women considered the ED the appropriate site for care, although only 40% reported symptoms requiring urgent attention (Kilfoyle et al., 2017). This gap between perceived need and clinical urgency has been consistently observed, underlining the importance of triage models that address both physiological and behavioral drivers of utilization.

Validated triage tools have shown measurable benefits. Implementation of the Obstetric Triage Decision Aid in Melbourne increased the proportion of women assessed within 15 minutes from 42% to 78% and reduced under-triage by 42% (McCarthy et al., 2022). Other systems such as the Birmingham Symptom-Specific Obstetric Triage System (BSOTS), the Maternal–Fetal Triage Index (MFTI), and the Obstetric Triage Acuity Scale provide structured acuity thresholds, though their adoption varies (Rashidi Fakari et al., 2019). Reviews confirm that effectiveness depends on governance, leadership support, and staff training (Abdalla Elsheikh et al., 2025). A scoping review also noted that fewer than 40% of obstetric units globally employ validated tools, citing gaps in standardization and mandate (Kassa et al., 2025). While this project does not aim to select or implement a specific triage tool during Phase 1, elements from validated systems, such as the acuity thresholds from MFTI and BSOTS, will inform the criteria explored in Phase 2 for local adaptation. These tools demonstrate that structured acuity classification can be effectively adapted across diverse healthcare models, and their implementation lessons offer a practical foundation for designing a context-sensitive triage framework suited to this hospital's operational realities.

Quality improvement studies demonstrate that structured redesign can deliver results.A Donabedian-model intervention halved waiting times and improved satisfaction from 63% to 88% (Naz et al., 2022). Lean-based redesigns have reduced waiting times by 29%, decreased length of stay by 26%, and lowered Left Without Being Seen (LWBS) rates (Kenny et al., 2024). The Institute for Healthcare Improvement's framework highlights Lean as a sustainable method for embedding visibility, eliminating waste, and standardizing flow (Institute for Healthcare Improvement, 2005).

B. Regional Evidence

Experience from the Gulf region illustrates that specialty-aligned triage systems can be effective in high-volume contexts. In Qatar, the redesign of obstetric emergency services using the Canadian Triage and Acuity Scale achieved 97% compliance with the 15-minute triage standard and satisfaction rates above 90% (Saleh et al., 2022). Nurse training, electronic integration, and clear role definitions were critical to this success. In the United Arab Emirates, Lean Six Sigma interventions reduced triage-to-decision times by 33% and improved staff confidence in acuity assignment (VanBlaricom & Simon, 2024). These results show that imported frameworks can succeed in the Gulf when supported by structured governance and system-level readiness.

At the same time, there is no region-wide standard for obstetric triage. Variation in nurse authority, triage rights, and digital support creates inconsistency across institutions. This variability signals an opportunity for structured regional benchmarking to identify transferrable practices and unify performance standards.

C. Local Evidence

In Saudi Arabia, public expectations are high despite limited awareness. A survey in Al-Ahsa found that only 59.4% of participants understood triage processes, yet 38.8% expected assessment within 5–10 minutes (AlNaim et al., 2024). Most Ministry of Health hospitals continue to use three-level triage systems, which lack the granularity of international tools (Qureshi, 2010; Al Yasin et al., 2023).

Recent reforms suggest growing readiness for nurse-led triage. The Saudi Commission for Health Specialties formally expanded the scope of practice for nurses and midwives, granting authority in clinical assessment and triage (Saudi Commission for Health Specialties, 2023). During the COVID-19 pandemic, King Abdulaziz Medical City successfully restructured its obstetric triage using front-door screening, fast-track routing, and nurse-led assessment, reducing transfers and time to decision (Madkhali et al., 2021).

These examples show that while Saudi hospitals are experimenting with redesign strategies, efforts remain fragmented and not yet standardized nationally. Regulatory support and nursing empowerment create a foundation for broader adoption of evidence-based triage.

CHAPTER IV

PURPOSE OF THE PROJECT

The purpose of this project is to evaluate and improve the obstetric triage workflow at a tertiary hospital in the Eastern Province of Saudi Arabia by identifying system-level inefficiencies and informing evidence-based workflow redesign strategies guided by Lean methodology. The project has three specific aims:

- To quantify the extent of repetitive routing in obstetric triage and its impact on quality indicators (timeliness, LWBS, patient satisfaction, safety).
- To identify root causes contributing to these inefficiencies using audit data, time-motion analysis, and staff/complaint feedback.
- Proposing evidence-based redesign strategies informed by Lean methodology.

This nurse-led quality improvement initiative is structured in two phases. Phase 1 establishes baseline measures through retrospective audit, time-motion analysis, root cause analysis, and staff feedback. Phase 2 will build on these findings to design targeted interventions, which may include standardized nurse-led screening, infrastructure adjustments, resource allocation, validated triage tools, and structured communication protocols. By linking measurable indicators to institutional performance and aligning with Saudi Vision 2030 goals for quality and efficiency, the project aims to strengthen maternal emergency care and enhance public trust.

CHAPTER V

METHODOLOGY

A. Design and Framework

This project was conducted as a nurse-led quality improvement (QI) initiative rather than a traditional experimental or observational research study. It was implemented under the hospital's Quality and Patient Safety governance structure and did not require institutional review board approval.

The methodological approach was deliberately diagnostic and systems-focused. Two complementary frameworks were applied to guide analysis: Lean methodology and Donabedian's structure–process–outcome model.

Lean methodology was used to identify operational inefficiencies within the obstetric triage workflow by mapping patient flow and classifying non–value-adding activities, including waiting, duplication, transportation, and over-processing (Womack & Jones, 2003; Lindsay et al., 2020). Lean provided the operational lens to understand how inefficiency manifested in daily practice.

Following Lean process mapping, findings were organized and interpreted using Donabedian's structure–process–outcome framework (Donabedian, 2003). Structural factors included triage capacity, staffing, physical layout, and digital infrastructure. Process factors encompassed routing decisions, handoffs, documentation, and approvals. Outcomes were reflected in measurable indicators such as waiting time, routing accuracy, left-without-being-seen (LWBS) rates, and safety signals. This framework explained why inefficiencies persisted and how structural conditions influenced process reliability and patient outcomes.

The project was structured into two phases. Phase 1, presented in this paper, focused exclusively on baseline assessment, diagnosis, and development of evidence-based recommendations. Phase 2, planned for future work, will involve co-design, implementation, and evaluation of targeted interventions using Plan–Do–Study–Act (PDSA) cycles and Failure Mode and Effects Analysis (FMEA).

B. Setting and Population

The initiative was conducted in a Magnet-accredited tertiary hospital in the Eastern Province of Saudi Arabia that serves as a regional referral center for maternal and neonatal care. In 2024, the Women's Health Division recorded 94,475 patient encounters, including approximately 4,200 obstetric admissions.

The obstetric triage unit consists of five assessment beds located on the sixth floor of the Women and Children's Building. This unit functions as the sole entry point for pregnant and postpartum women referred from the Emergency Department (ED). Obstetric nurses staff the unit, with physician coverage shared between obstetric triage, labor and delivery, and inpatient obstetrics.

The study population comprised all pregnant and postpartum women presenting to the Emergency Department and routed to obstetric triage during the audit period from June to August 2025.

C. Stakeholder Engagement

Stakeholder engagement was integrated throughout Phase 1 to ensure contextual accuracy and operational relevance. Clinical stakeholders included obstetric nurses, emergency nurses, and obstetric physicians. Administrative stakeholders included nursing leadership, operations personnel, and representatives from quality and patient safety. The patient experience team contributed insights related to complaints and dignity concerns.

Engagement occurred through leadership rounds, departmental meetings, and informal consultations. These interactions validated process maps, confirmed audit findings, and identified operational constraints affecting triage performance. Formal surveys and interviews were intentionally deferred to Phase 2 to avoid premature intervention bias during the diagnostic phase.

D. Data Sources

Multiple internal data sources were used to triangulate findings and strengthen diagnostic validity. Primary quantitative data were obtained from a retrospective audit of obstetric triage encounters between June and August 2025. These data included patient volumes, routing patterns, waiting times, admission rates, LWBS rates, and near-miss safety events.

Qualitative data were drawn from 26 formal patient complaints submitted during the first and second quarters of 2025. Complaint narratives were reviewed to identify recurring themes related to delay, duplication, communication failures, and compromised dignity.

Following project initiation, additional contextual data were obtained through structured, post-initiation observation of existing patient flow within the Emergency Department and obstetric triage unit. Observation templates were used to document patient movement, handoffs, waiting periods, and repeated processes as they occurred in routine practice. Brief informal staff interviews provided insight into communication barriers, role clarity, and workflow constraints. A detailed current-state process map, synthesized from retrospective audit data, complaint analysis, and observed workflows, is presented in Appendix B.

E. Measures and Indicators

Measures were selected to reflect nursing-sensitive, process-oriented indicators aligned with quality improvement principles rather than traditional inpatient outcome metrics. Structural indicators included triage bed capacity, nurse-to-bed ratios, physician coverage patterns, and availability of formal routing policies. Process indicators included time to first nurse assessment, number of interdepartmental transfers per encounter, frequency of repeated routing, and documentation duplication.

Outcome indicators included LWBS rates, complaint frequency related to delay or dignity, and near-miss safety events. Balancing measures included triage bed occupancy and perceived nursing workload.

Performance was benchmarked against national and international standards, including the 10–15 minute triage standard outlined by NHS England (2022), the Canadian Triage and Acuity Scale (Bullard et al., 2017), and the Saudi Commission for Health Specialties (2023) scope of practice.

F. Indicators and Measurement Considerations

To ensure meaningful evaluation of Phase 1, it is necessary to adopt indicators sensitive to triage workflow rather than traditional inpatient events since Traditional Nursing-Sensitive Indicators (NSIs) focus on inpatient outcomes such as falls, pressure injuries, and hospital-acquired infections. These measures do not capture the operational inefficiencies of emergency triage, such as duplicate routing, repeated handoffs, or delays to disposition.

For this reason, the present project employs process-based indicators, including time to first assessment, rate of repetitive transfers, and interdepartmental transfers. These metrics serve as proxies for nursing impact on maternal safety, timeliness, and patient experience. While not formally recognized by national NSI benchmarks, these indicators are consistent with nursing-sensitive domains of workflow efficiency and patient-centered safety, as recommended in quality improvement methodologies (IHI, 2005; Kenny et al., 2024). They will be tracked longitudinally to measure improvements in subsequent phases.

G. Analysis Methods

Analysis was conducted following project initiation using a structured, framework-based approach applied to retrospective and observational data only. Audit data, patient complaint narratives, and structured observation findings were reviewed and classified according to Lean waste categories, including waiting, transportation, over-processing, motion, defects, and underutilized talent.

Root cause analysis (RCA) and Donabedian's structure–process–outcome framework were then used as analytic tools to synthesize and interpret these existing data, rather than to generate new data. Categorized findings were mapped across structural, process, and outcome domains to identify systemic contributors to inefficiency. The analysis was descriptive and diagnostic in nature; no new data collection, causal inference, or intervention testing was undertaken in Phase 1.

H. Ethical Considerations

As a quality improvement initiative, the project did not require institutional review board approval. Authorization was obtained through the hospital's Quality and Patient Safety governance framework. All patient data were de-identified and analyzed in aggregate. Complaint narratives were anonymized, and staff participation in observations and interviews was voluntary and confidential, in accordance with ethical standards for quality improvement reporting (Ogrinc et al., 2016).

CHAPTER VI

RESULTS

A. Overview of Phase One Findings

Phase 1 focused on diagnosing inefficiencies within the obstetric triage system by transforming anecdotal concerns into verifiable operational evidence. Findings were derived from audit data, patient complaints, workflow observation, and multidisciplinary input.

Performance was evaluated against national and international benchmarks to establish the extent of deviation and identify priority gaps.

B. Workflow and Process Map Findings

The validated process map (Figure 1) demonstrated a looped routing pattern between the Emergency Department and obstetric triage. In the absence of obstetric-specific screening criteria at ED entry, nearly all pregnant and postpartum women were routed to obstetric triage, concentrating demand within a limited-capacity unit..

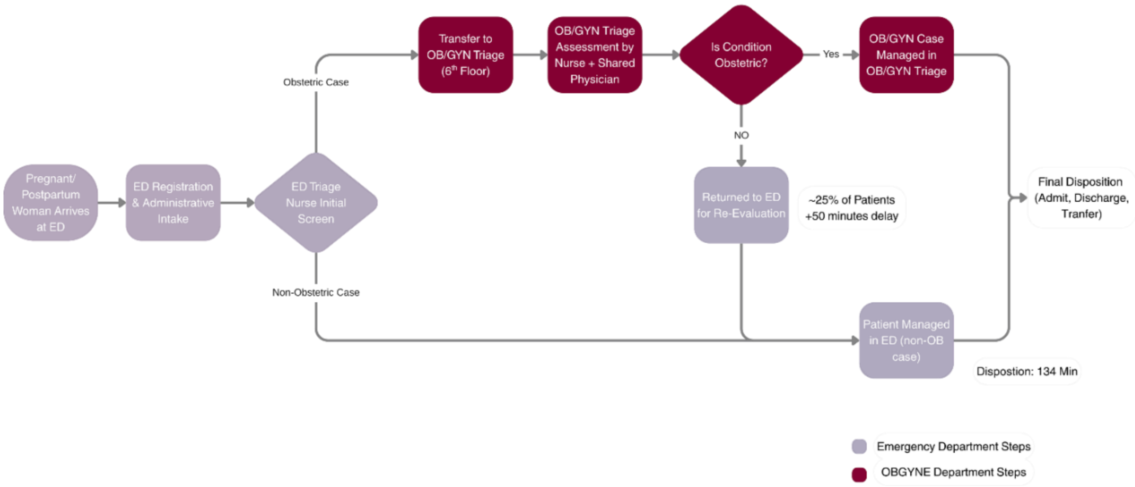

Figure 1. Current Obstetric Triage Process Map Demonstrating Duplicated Routing Between ED and OB/GYN Triage.

Observation and staff feedback identified the transition between the ED and OB/GYN triage as the most vulnerable segment of the workflow. Each transfer requires new registration, repeated documentation, and another waiting period before reassessment, extending the total care episode and diverting staff time from direct clinical tasks. Departmental discussions described this movement as “circular” and resource-intensive, consuming time without adding clinical value.

Three main forms of waste were evident: transportation (unnecessary patient movement between units), over-processing (repeated questioning and parallel documentation), and waiting (idle time between assessments or for physician review). These inefficiencies correspond to the average additional 50-minute delay observed in misrouted cases.

Structurally, the triage area’s five beds manage nearly 90 percent of obstetric presentations, often more than 400 per month, with shared physician coverage between triage and labor wards. This limited capacity creates chronic congestion, longer waiting times, and privacy concerns when semi-private areas are used as overflow spaces.

Feedback from nurses and physicians confirmed these observations: patients were occasionally assessed on chairs when no beds were available, residents covered multiple clinical zones simultaneously, and nurses spent substantial time coordinating approvals and bed availability instead of performing assessments. Together, these factors indicate that the current model operates under persistent structural strain, where space, staffing, and communication constraints combine to produce recurring delay and duplication.

C. Audit Findings: Routing, Delays, and LWBS

Between June and August 2025, monthly obstetric presentations ranged from 360 to 475 cases (Table 1). During this period, approximately 89% of patients were routed from the Emergency Department (ED) to obstetric triage, of whom 24–26% were subsequently rerouted back to the ED after initial assessment (Table 1).

Although time to initial nurse assessment consistently met benchmark standards, averaging 12.7–12.9 minutes, downstream delays were substantial (Table 1). Patients who were appropriately routed experienced an average total length of stay of approximately 135 minutes, whereas misrouted patients had an average stay of 186–190 minutes, representing an additional delay of approximately 50–55 minutes per encounter (Table 1).

Left Without Being Seen (LWBS) rates in obstetric triage ranged from 9.8% to 14.3%, markedly exceeding LWBS rates observed in the ED, which ranged from 0.9% to 1.6% (Table 1). Admission rates were also higher among patients managed in obstetric triage (58–63%) compared with those managed in the ED (30–35%). Detailed monthly audit data and expanded performance indicators are provided in Appendix A (Table 3).

D. Root Cause Analysis

Following the descriptive findings of Phase 1, a structured Root Cause Analysis (RCA) was conducted to explain why inefficiencies persisted despite acceptable initial triage performance. While audit data quantified delays and duplication, RCA was necessary to uncover the systemic drivers underlying these patterns and to distinguish structural failures from individual performance issues.

Consistent with quality improvement methodology, the RCA focused on identifying modifiable system-level causes rather than attributing fault to staff or isolated events. The analysis integrated Lean waste identification with Donabedian's structure–process–outcome model to ensure explanatory coherence and actionability.

The RCA followed a triangulated, document-based approach using evidence generated during Phase 1. Data sources included:

- Retrospective audit data (routing accuracy, delays, LWBS rates)
- Validated process maps (Figure 1)
- Formal patient complaints
- Multidisciplinary operational discussions and staff feedback

Potential causes were mapped across the validated workflow and retained only when supported by at least two independent sources. Causes were then grouped into six domains adapted from established RCA and systems engineering models: People, Process, Policy & Governance, Physical Environment, Technology, and Measurement.

Each domain was analyzed using Lean waste categories (e.g., waiting, over-processing, transportation, underutilized talent) and classified within Donabedian's structure–process–outcome framework to preserve analytic rigor. The resulting fishbone diagram (Figure 2) summarizes these relationships.

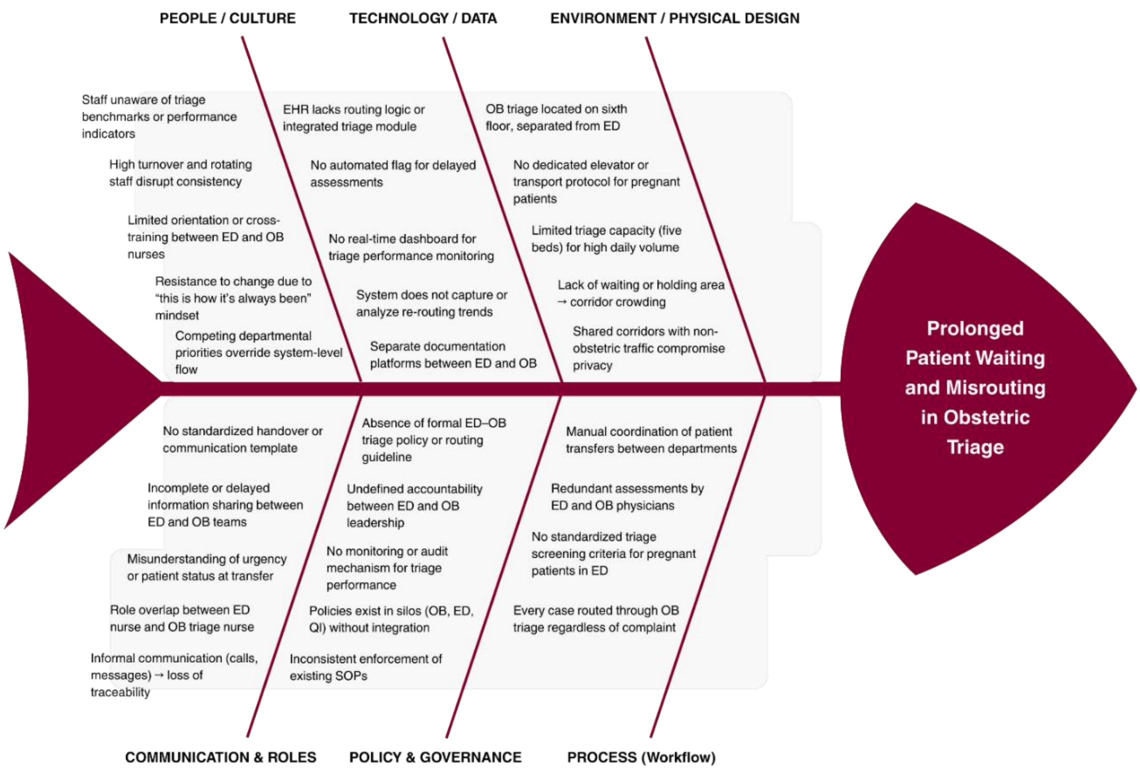

Figure 2. Root Cause Analysis (Fishbone Diagram) of Obstetric Triage Inefficiencies

1. Root Cause Findings by Domain

a. <u>People (Staffing, Roles, Authority)</u>

Analysis revealed a misalignment between clinical competence and decision-making authority. Although obstetric nurses possessed the skills to identify low-risk presentations, they lacked formal authorization to make independent triage decisions. This resulted in avoidable waiting for physician review, particularly during peak hours.

Additionally, physician coverage was frequently stretched across multiple clinical areas, including obstetric triage, labor and delivery, and inpatient units. This created unavoidable delays in decision-making and disposition. From a Lean perspective, this represents underutilized professional talent, while Donabedian analysis situates the issue within structural constraints affecting process reliability.

b. Process (Workflow Design and Handoffs)

The absence of a standardized obstetric screening algorithm at Emergency Department entry led to high variability in routing decisions. Patients were often transferred to obstetric triage by default rather than by defined criteria, resulting in unnecessary movement and repeated assessments.

Duplicate documentation across Emergency and OB/GYN systems compounded inefficiency, requiring nurses to repeat assessments and administrative tasks without adding clinical value. These findings align with Lean waste categories of over-processing, motion, and waiting and reflect process instability driven by upstream ambiguity.

c. Policy and Governance

Policy review confirmed that obstetric triage relied primarily on a general emergency triage policy (DP-ER-024), which lacks obstetric-specific routing criteria. No unified policy defined ownership of obstetric triage performance, nor were admission, discharge, and companion guidelines harmonized across departments.

This governance gap allowed variability to persist unchecked and diffused accountability across units. Under Donabedian’s model, policy ambiguity constitutes a structural deficiency that directly enables process inconsistency and outcome variability.

d. Physical Environment

The physical configuration of the triage unit was a major contributor to congestion. Five triage beds served nearly all obstetric referrals, frequently exceeding capacity. When beds were unavailable, patients were assessed in chairs, hallways, or semi-private areas, compromising both efficiency and dignity.

From a systems perspective, environmental constraints translated directly into prolonged waiting times, privacy complaints, and LWBS events. This confirms Donabedian's principle that structure constrains process, with downstream effects on patient experience and safety.

e. Technology

Although electronic health records were in place, Emergency and OB/GYN modules functioned independently. There was no automated obstetric identifier at registration, nor were handoffs triggered digitally. Admissions and approvals depended on sequential manual steps, introducing administrative delays.

Lean analysis classified these issues as information flow waste, while Donabedian analysis identified technology limitations as structural contributors to process delay and outcome risk.

f. <u>Measurement and Feedback</u>

The RCA identified the absence of continuous performance monitoring as a meta-cause. Key indicators such as routing accuracy, LWBS rates, and triage bed utilization were not tracked in real time, and no routine dashboard existed to prompt corrective action.

Without feedback loops, inefficiencies recurred before detection, reinforcing reactive rather than proactive management. This absence of measurement undermines continuous improvement and sustains system fragility.

2. Root Cause Synthesis

The RCA demonstrated that inefficiency within obstetric triage is systemic and self-reinforcing. Structural limitations, policy ambiguity, and technology gaps disrupt workflow; restricted nursing authority and fragmented governance prolong delays; and absent performance monitoring prevents early correction.

Importantly, these findings confirm that delays are not attributable to staff effort or competence, but to misalignment between system design and clinical demand. This synthesis provided the foundation for targeted redesign recommendations and informed the subsequent gap analysis.

E. Gap Analysis

Following identification of root causes, a structured gap analysis was conducted to compare current-state performance with evidence-based best practices and regulatory standards, Table 2 summarizes these gaps. The purpose was to quantify deviation, prioritize areas of risk, and establish a rational basis for Phase 2 intervention design.

Table 2. Gap Analysis Comparing Observed Obstetric Triage Performance With National And International Benchmarks

Gap Domain	Current State (The Problem)	Best Practice (The Benchmark)	Impact On Safety & Efficiency
Quantitative Performance			
Length of Stay	135 min average in OB triage	≤ 45 min (NHS / International Standard)	+200 % deviation → prolonged wait raises risk of clinical deterioration in high-risk cases.
Left Without Being Seen (LWBS)	14.3 % monthly average	≤ 2 % (National / MOH benchmark)	7× above standard → critical safety signal and poor care experience.
Misrouting / Rework	25 % of patients sent to OB return to ED	≤ 5 % (goal for Lean optimized flow)	Wastes time & resources; creates duplicate documentation and patient confusion.
Process & Policy			
Triage Screening	No standardized tool (e.g., MFTS / BSOTS); subjective judgment	Dedicated obstetric triage tool (McCarthy 2022) + defined nurse authority	Root cause of misrouting → acuity assessment based on location not need.
Documentation	Duplicate registration in ED and OB Triage	Single-point EHR entry with interoperability	Waste of over-processing; increases error risk and reduces nurse availability.
Structural & Governance			
Unit Location	OB Triage on 6th floor , physically separated from ED	Co-located assessment unit adjacent to ED	Waste of transportation; built-in delay for every transfer.
Accountability	Unclear governance; nurses lack final disposition authority	Joint ED–OB governance committee with defined ownership	Waste of waiting / non-utilized talent; limits timely clinical decision-making.

Benchmarks were drawn from international guidelines (NHS England; Canadian Triage and Acuity Scale), regional experience, and national regulatory expectations (Saudi Commission for Health Specialties).

1. ***Current State Vs. Best Practice Comparison***

a. <u>Timeliness of Initial Triage</u>

- Expected standard: ≤15 minutes to initial assessment
- Observed performance: 12.7–12.9 minutes

- Gap: None

This confirms that frontline nursing performance at first contact met expected standards.

b. Routing Accuracy

- Expected standard: ≥95% correct routing
- Observed performance: ~75%
- Gap severity: High

Approximately one in four patients experienced unnecessary transfer and reassessment, resulting in an average additional delay of 50 minutes.

c. Left Without Being Seen (LWBS)

- Expected standard: ≤2%
- Observed performance: 9.8–14.3%
- Gap severity: High

Elevated LWBS rates indicate congestion, prolonged waiting, and compromised patient experience within obstetric triage.

d. Structural Capacity

- Expected standard: Capacity aligned with demand and acuity
- Observed performance: Five beds serving >400 visits per month
- Gap severity: Structural

Insufficient capacity forced workarounds such as hallway assessment, directly impacting dignity and flow.

e. <u>Policy and Governance</u>

- Expected standard: Unified obstetric triage policy with defined accountability
- Observed performance: Fragmented ED–OB policies
- Gap severity: Governance

Role ambiguity and inconsistent decision-making persisted due to lack of formal alignment.

f. <u>Digital Integration</u>

- Expected standard: Integrated electronic workflow with automated handoffs
- Observed performance: Manual, sequential approvals; separate systems
- Gap severity: Systemic

Technology design failed to support real-time decision-making or flow optimization.

g. <u>Nursing Empowerment</u>

- Expected standard: Nurse-led triage within defined criteria
- Observed performance: Physician-dependent decisions
- Gap severity: Cultural / structural

Restricted autonomy created avoidable decision bottlenecks.

The gap analysis demonstrates that while front-end triage performance met standards, downstream reliability deteriorated due to system design failures. Persistent misrouting, congestion, and elevated LWBS rates reflect structural and governance misalignment, not deficiencies in clinical assessment.

These gaps confirm that meaningful improvement requires system-level redesign, including policy integration, capacity realignment, digital enablement, and expansion of nurse-led decision authority. Incremental or isolated fixes would be insufficient to close these gaps sustainably.

F. Safety Signals and Patient Experience

Eighteen non-obstetric emergency cases, including appendicitis, pulmonary embolism, and acute coronary syndrome, experienced delays exceeding 30 minutes due to initial routing through obstetric triage. Four required intensive care admission. Although not classified as sentinel events, these cases represent important safety signals.

Patient complaints reinforced audit findings. Dominant themes included prolonged waiting, duplicate assessments, inconsistent communication, limited responsiveness, and compromised privacy. Several complaints described assessment in hallways or semi-private spaces when triage beds were unavailable.

G. Recommendations of Phase One

Based on the diagnostic findings of Phase 1, a set of system-level recommendations was developed to address the structural, procedural, and governance-related contributors to obstetric triage inefficiency. These recommendations are not intended as immediate interventions but as evidence-informed design principles to guide Phase 2 implementation and evaluation. Collectively, they emphasize strengthening nurse-led triage authority within defined clinical criteria, standardizing routing decisions at Emergency Department entry, and aligning policies governing admission, discharge, and companion presence across departments. Additional recommendations address physical capacity constraints, digital workflow fragmentation, and the absence of real-time performance monitoring. To ensure sustained accountability and cross-departmental coordination, the recommendations also propose a joint Emergency–Obstetrics governance structure for triage oversight. A detailed summary of the Phase 1 recommendations, mapped by domain and supported by evidence, is provided in Table 4 Appendix C.

CHAPTER VII

DISCUSSION

A. Interpretation of Findings

This Phase 1 analysis demonstrates that inefficiency within obstetric triage is fundamentally systemic rather than behavioral. Although initial triage assessment times consistently met international benchmarks, these early gains were subsequently eroded by downstream structural and process failures, including repeated routing, duplicated documentation, and congestion within a constrained triage environment. This disconnect between front-end performance and overall system efficiency underscores the limitation of evaluating isolated metrics without examining the broader care pathway.

The integrated use of Lean methodology and Donabedian's structure–process–outcome model provides critical explanatory depth. Lean analysis revealed where inefficiency manifested, primarily through waiting, transportation, and over-processing, while Donabedian analysis clarified why these inefficiencies persisted. Structural constraints, including limited triage capacity, fragmented governance, and restricted nursing authority, created conditions in which variability and delay became normalized features of routine workflow. These findings reinforce the principle that sustained inefficiency is rarely the result of individual practice but rather the predictable output of misaligned system design.

B. Comparison with Existing Evidence

The findings are consistent with international literature demonstrating that structured, nurse-led obstetric triage models improve patient flow, reduce duplication, and lower left-without-being-seen rates without compromising safety (McCarthy et al., 2022; Kenny et al., 2024). Evidence from comparable tertiary settings in Qatar and the United Arab Emirates similarly highlights the benefits of standardized routing and clear governance at the Emergency–Obstetrics interface (Saleh et al., 2022; VanBlaricom & Simon, 2024).

Beyond staffing and process, this study adds to the growing body of evidence emphasizing the role of physical environment and digital integration in triage performance. The observed impact of limited privacy and spatial congestion aligns with findings by Naz et al. (2022), while delays associated with manual approvals and fragmented electronic systems reflect challenges reported in regional health systems undergoing digital transformation (Madkhali et al., 2021). The absence of real-time performance monitoring further mirrors international observations that, without visual management and feedback loops, inefficiencies persist despite awareness and goodwill (Institute for Healthcare Improvement, 2005).

C. Organizational and Nursing Implications

At the organizational level, the findings indicate that incremental or isolated interventions are unlikely to yield sustained improvement. Addressing inefficiency within obstetric triage requires coordinated redesign across policy, environment, staffing models, digital infrastructure, and governance mechanisms. Importantly, the analysis highlights how fragmentation across departments obscures accountability and allows inefficiency to be reframed as operational inevitability rather than a remediable system failure.

For nursing leadership, this project reinforces the strategic role of nurses as both clinical experts and system stewards. Expanding nurse-led triage authority within defined criteria has the potential to reduce dependency on physician availability, improve flow, and enhance patient experience. This aligns with the Saudi Commission for Health Specialties' evolving scope of practice and Magnet principles emphasizing professional autonomy, shared governance, and evidence-based decision-making. More broadly, the nurse-led diagnostic approach adopted in this project demonstrates how nursing leadership can bridge clinical insight and administrative action to drive meaningful organizational change.

From a national perspective, these findings are particularly relevant within the Saudi healthcare transformation agenda. Saudi Vision 2030 emphasizes efficiency, patient experience, and workforce empowerment as pillars of system reform. The diagnostic gaps identified in this project, particularly fragmented governance, underutilized nursing authority, and limited digital integration, reflect broader system-level challenges faced by high-volume tertiary hospitals. Strengthening nurse-led triage within defined governance structures aligns not only with Magnet principles but also with the Saudi Commission for Health Specialties' expanded scope of nursing practice. As such, this project positions nursing leadership not only as a clinical function but as a strategic driver of operational reliability and patient safety

D. Strengths and Limitations

A key strength of this project lies in the triangulation of multiple internal data sources, including audit data, process mapping, complaint analysis, and multidisciplinary validation, which enhances diagnostic credibility and reduces reliance on anecdotal interpretation. The investigator's embedded role within the organization facilitated access to operational detail and stakeholder engagement, while multidisciplinary review helped mitigate potential bias.

Limitations include the retrospective nature of the data and the single-site setting, which may limit generalizability. Additionally, Phase 1 focused on operational and safety indicators and did not include formal patient-reported outcome measures, which will be incorporated in Phase 2. As a diagnostic initiative, this phase did not evaluate the effectiveness of proposed interventions, an intentional limitation addressed through planned implementation and evaluation cycles.

CHAPTER VIII

CONCLUSION

This Phase 1 diagnostic quality improvement initiative identified structural, procedural, and governance-related contributors to inefficiency within obstetric triage at a tertiary hospital in Saudi Arabia. Using Lean methodology and Donabedian's structure–process–outcome model, the project demonstrated that delays, duplication, and elevated left without being seen (LWBS) rates arise from system design rather than individual practice.

The findings establish a robust evidence base for targeted redesign and underscore the value of nurse-led diagnostic initiatives in driving organizational improvement. Phase 2 will build on these findings through structured implementation, risk prioritization using Failure Modes and Effects Analysis (FMEA), and outcome evaluation.

APPENDIX A

RETROSPECTIVE AUDIT DATASET: OBSTETRIC EMERGENCY PRESENTATIONS (JUNE–AUGUST 2025)

Table 3. Full Audit Dataset: Obstetric Emergency Presentations, June–August 2025

Indicator	June 2025	July 2025	August 2025
Total Pregnant Presentations	475	390	360
Routed to OB Triage	427 (89.9%)	347 (88.8%)	321 (89.3%)
Returned to ED after OB Triage	112 (26.3%)	84 (24.2%)	83 (25.8%)
Avg Time in OB Triage (mins)	136	134	135
Avg Time in ED (misrouted)	190	186	188
Avg Time to Nurse Assessment	12.9	12.7	12.8
Avg Time to Physician	41	43	44
Disposition Time in minutes (OB vs ED)	101 vs 154	100 vs 153	101 vs 153
LWBS in ED	1.6% (7)	1.2% (5)	0.9% (3)
LWBS in OB Triage	14.3% (21)	12.5% (18)	9.8% (14)
Sentinel-Like Events	6	7	5

APPENDIX B

PHASE 1 EVIDENCE-INFORMED REDESIGN RECOMMENDATIONS AND SUPPORTING RATIONALE

Table 4. Phase 1 Recommendations, Their Corresponding Domains, And the Rationale Supporting Each Proposed Action

Domain	Key Recommendation	Rationale / Evidence Link
People (Professional Authority & Staffing)	Introduce nurse-led obstetric triage authority for clearly defined low-risk presentations, with continuous physician availability for moderate- and high-acuity cases.	Root cause analysis identified restricted nursing authority as a contributor to avoidable waiting and decision delays despite adequate clinical competence. Evidence shows that nurse-led obstetric triage models reduce time to disposition and improve flow without compromising safety when embedded within structured criteria (Hughes et al., 2022; McCarthy et al., 2022). This recommendation aligns with the Saudi Commission for Health Specialties' expanded nursing scope and Magnet principles of professional autonomy.
Process (Workflow Design & Standardization)	Develop and standardize an obstetric screening and routing flowchart integrated at Emergency Department entry to guide early streaming decisions.	Gap analysis demonstrated that approximately one quarter of patients were misrouted, resulting in duplicated assessments and an average additional delay of 50 minutes. Standardized triage algorithms have been shown to reduce routing variability, duplication, and LWBS rates in high-volume emergency and maternity settings (Considine et al., 2020; Naz et al., 2022).
Policy (Governance & Role Clarity)	Establish a unified ED–OB obstetric triage policy covering routing, admission, discharge, and companion criteria.	Fragmented policies were identified as a structural driver of inconsistent practice and unclear accountability. Unified governance frameworks improve reliability, reduce ad hoc decision-making, and support sustained quality improvement

		(Hammond et al., 2019; Institute for Healthcare Improvement, 2005).
Environment (Physical Space & Privacy)	Reconfigure the obstetric triage environment to include a privacy-enhanced assessment bay and a short-stay chair or observation zone for moderate-acuity cases.	Structural capacity limitations contributed to congestion, hallway assessments, and compromised patient dignity. Environmental redesign aligned with patient acuity improves throughput, satisfaction, and perceived safety in maternity triage settings (Sampson et al., 2018; Naz et al., 2022).
Technology (Digital Integration & Automation)	Introduce an obstetric identifier at registration and enable automated ED–OB handoff alerts and digital approval workflows within the electronic health record.	Root cause analysis identified manual, sequential administrative processes and lack of interoperability as sources of administrative delay. Digital integration and automated alerts reduce duplication, improve coordination, and support real-time clinical decision-making (Molina et al., 2021; Madkhali et al., 2021).
Measurement (Performance Monitoring & Feedback)	Develop a real-time obstetric triage dashboard tracking routing accuracy, total encounter time, LWBS rates, and triage bed utilization, with routine multidisciplinary review.	The absence of continuous monitoring allowed inefficiencies to persist before detection. Lean systems emphasize visual management and regular feedback loops to sustain performance gains and accountability (Radnor & Osborne, 2013; Institute for Healthcare Improvement, 2005).
Governance (Oversight & Accountability)	Establish a joint Emergency–Obstetrics governance committee responsible for triage oversight, policy alignment, and performance review.	Diffuse ownership of the ED–OB interface was identified as a contributor to persistent inefficiency. Shared governance structures enhance coordination, clarify accountability, and support cross-departmental problem resolution in complex care pathways (Institute for Healthcare Improvement, 2005).

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