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Original Research Article

Monitoring Staff Compliance to Fresh Eyes Approach to Cardiotocography (CTG) Categorization (Buddy System) to Labor and Delivery Staff

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Abstract

Background: Accurate interpretation of cardiotocography (CTG) during labor is essential for identifying potential fetal compromise and supporting timely clinical decision-making. The Fresh Eyes approach uses collaborative CTG review by a second clinician as an additional safety process to support interpretation and escalation. ***Objective:*** To evaluate sustained compliance with the Fresh Eyes approach to CTG review and describe neonatal outcomes, particularly clinically confirmed hypoxic-ischemic encephalopathy (HIE), in a Labor and Delivery unit. ***Methods:*** A quality improvement study was conducted over 13 months, from July 2024 to July 2025. Eligible CTG records of mothers in active labor at ≥27 weeks' gestation were audited using an approved Fresh Eyes compliance checklist. Monthly compliance with core process indicators and neonatal-outcome capture within the audit was assessed descriptively. Delivery volume and clinically confirmed HIE cases were also monitored. ***Results:*** A total of 1,198 CTG records were audited. Compliance with Fresh Eyes review within 1–2 hours, documentation of clinicians' signatures and badge numbers, and documentation in BESTCare remained at 100% throughout the monitoring period. Neonatal outcomes were captured within the audit in 1,068 records (89.1%). Among 1,683 deliveries, five clinically confirmed HIE cases were identified, corresponding to 3.0 cases per 1,000 deliveries. Because Fresh Eyes compliance showed no variability, an association between compliance and HIE occurrence could not be statistically evaluated. ***Conclusion:*** The Fresh Eyes approach demonstrated sustained feasibility as a structured collaborative CTG review process. Continued monitoring of interpretation quality, neonatal-outcome capture within the audit, and multidisciplinary review of adverse outcomes is warranted.

Keywords: Cardiotocography; Fetal Monitoring; Quality Improvement; Patient Safety; Hypoxic-Ischemic Encephalopathy; Collaborative Review.

INTRODUCTION

Cardiotocography (CTG) is a routine technique for continuous fetal monitoring during labor that involves the simultaneous evaluation of fetal heart rate patterns and uterine activity. The primary aim is to help detect early signs of probable fetal impairment, so that clinical assessment and intervention may be performed promptly. Effective use of CTG involves not only appropriate monitoring but also accurate evaluation of fetal heart rate parameters within the wider maternal, fetal and intrapartum therapeutic environment. Current clinical guidance therefore stresses the significance of complete CTG monitoring, continuous reassessment, proper documentation and timely escalation when abnormalities or evolving risk factors are identified (National Institute for Health and Care Excellence [NICE], 2022).

The CTG is widely used, yet it is difficult to interpret and a matter of clinical judgment. Differences in knowledge, experience, situational awareness, and interpretation among healthcare staff may lead to heterogeneity in CTG classification and subsequent clinical decision-making. Recent categorization approaches for intrapartum CTG interpretation indicate sub-optimal interobserver agreement among midwives, demonstrating that consistent interpretation is still a

challenge in practice (Neri *et al.,* 2024). The findings underline the need for approaches to enhance standardized evaluation, communication, re-assessment, and collaborative decision-making within the framework of intrapartum fetal monitoring. The safety of fetal monitoring also relies on many other criteria beyond the technical reading of the CTG trace. A scoping review by Kelly *et al.,* (2024) highlighted cognitive, social, organizational, and work-system factors that may influence the safe use of electronic fetal monitoring. The findings suggest that the safety of fetal monitoring has to be enhanced by employing a systems approach that involves clinical competence, teamwork, communication, situational awareness, and organizational support. CTG education and training remain an important part of clinical practice; however, the available evidence on the direct impact of CTG education and training on maternal and neonatal outcomes is conflicting, and education must be supplemented by the implementation of reliable clinical processes and multidisciplinary safety strategies (Kelly *et al.,* 2021).

One such method is the Fresh Eyes Approach, often known as the Buddy System, whereby a second clinician independently reviews the CTG assessment to offer an additional clinical viewpoint. A buddy system for reviewing CTGs is a method for enhancing the reliability of CTG interpretation, as reported by Fitzpatrick and Holt (2008). The Fresh Eyes technique aims to improve collaborative evaluation, shared situational awareness, and notice of timely changes in fetal status, and reduce reliance on the interpretation by a single clinician. Similarly, the Fresh Eyes approach was designed as collaborative monitoring in the authorized study protocol, where two healthcare professionals assess CTG findings to reduce interpretation errors and improve safer clinical decision-making.

The Fresh Eyes technique also aligns with modern recommendations for intrapartum fetal monitoring. NICE guidance suggests that another clinician should check the hourly CTG evaluation in person, called “fresh eyes”, before the next examination is completed (NICE, 2022). Adding an impartial second review gives an extra safety measure to ongoing fetal monitoring and emphasizes the need for communication, interdisciplinary assessment and joint responsibility for fetal health.

Hypoxic-ischemic encephalopathy (HIE) is one of the most severe neonatal sequelae associated with considerable prenatal hypoxia-ischemia. HIE contributes to morbidity, mortality, and long-term neurodevelopmental damage in neonates, particularly in the setting of moderate-to-severe HIE. Thus, early detection of growing fetal impairment and appropriate clinical intervention are critical components of interventions aimed at reducing unnecessary newborn injury. However, HIE is multifaceted and may be influenced by maternal, fetal, placental, obstetric, and healthcare system factors. Thus, CTG interpretation or adherence to a single fetal-monitoring intervention alone cannot explain the development of HIE.

Practice Gap and Rationale

HIE instances were a significant patient safety issue in the Labor and Delivery section at King Abdulaziz Hospital, Al Ahsa. In the approved project, 15 HIE incidents have been recorded, and the nursing team has been working to improve the practices related to monitoring and interpretation of CTG. The local clinical concern identified the need for a systematic strategy to enable reliable CTG categorization, and give an additional degree of clinical examination, and encourage prompt decision-making during labor.

Although the Fresh Eyes Approach offers a formal framework for collaborative CTG review, the introduction of a safety process does not automatically guarantee its consistent integration into ordinary clinical practice. Thus, a critical practice gap was the requirement to regularly assess adherence to the Fresh Eyes process to identify whether the needed components of the method were being reliably completed and documented. A structured audit tool was established for the study to measure Fresh Eyes completion within 1–2 hours, identification of primary and secondary clinicians by signature and badge number, documentation in the electronic health record BESTCare, and neonatal outcome.

Systematic monitoring of these indicators afforded a chance to assess dependability of implementation over time and suggest potential for further clinical improvement. Simultaneous monitoring of newborn outcomes, notably HIE, allowed the clinical team to assess outcome trends during the implementation. However, because HIE is affected by a variety of clinical and system factors, newborn outcome trends were analyzed in the light of Fresh Eyes compliance and not as evidence of a direct causative association.

The quality improvement initiative was thus implemented in an effort to increase the reliability of CTG monitoring through consistent use of the Fresh Eyes Approach, to encourage collaborative clinical decision-making and to support ongoing improvement in the safety and quality of intrapartum treatment. This rationale was in keeping with the approved procedure, which stressed monitoring compliance, improving interpretation of the CTG, facilitating prompt decision-making, and improving neonatal care.

Aim of the Study

This quality-improvement study aimed to monitor staff compliance with the Fresh Eyes Approach to Cardiotocography categorization (Buddy System)

among Labor and Delivery staff and to evaluate neonatal outcome trends, particularly the occurrence of hypoxic-ischemic encephalopathy, during the monitoring period. The study further aimed to identify opportunities to strengthen CTG interpretation, timely clinical decision-making, collaborative practice, and patient safety during labor.

Specific Objectives

The study aimed to:

1. Assess staff compliance with the Fresh Eyes Approach to CTG categorization during labor.
2. Identify opportunities for improvement in the implementation and sustained compliance with the Fresh Eyes Approach.
3. Describe neonatal outcome trends, particularly the occurrence of HIE, during the monitoring period.
4. Support timely clinical decision-making and collaborative CTG interpretation among Labor and Delivery staff.
5. Support ongoing improvement in clinical effectiveness, teamwork, leadership, and patient advocacy related to intrapartum fetal monitoring.

METHODS

Study Design

This retrospective quality improvement study evaluated staff compliance with the Fresh Eyes Approach to cardiotocography (CTG) categorization and described neonatal outcome trends, particularly hypoxic-ischemic encephalopathy (HIE), in the Labor and Delivery unit. The study involved retrospective analysis of existing CTG records and structured audit data and did not introduce an experimental intervention or alter routine patient care. The approved monitoring period was from July 30, 2024, to July 31, 2025, covering 13 months.

Study Setting

The study was conducted in the Labor and Delivery unit of King Abdulaziz Hospital, Al Ahsa, Saudi Arabia. The unit was selected because CTG is routinely used during labor to monitor fetal well-being and support clinical decision-making regarding potential fetal compromise. The setting also enabled monitoring of staff compliance with the Fresh Eyes Approach and neonatal outcomes during the study period.

Study Population and Eligibility Criteria

The study population consisted of CTG records of mothers in active labor managed in the Labor and Delivery unit during the monitoring period.

Records were eligible for inclusion when the mother was in active labor at a gestational age of 27 weeks or greater (≥27 weeks). Records involving mothers at less than 27 weeks' gestation and patients presenting to the Labor and Delivery unit for assessment but who were not in active labor were excluded.

Sampling and Sample Size

The number of CTG records available for audit was determined by the monthly delivery census and the number of eligible CTG records generated during the monitoring period. All eligible records available for audit according to the predefined project criteria were considered for inclusion rather than selecting a predetermined statistical sample.

Across the 13-month monitoring period, a total of 1,198 CTG files were audited. The number of files audited varied by month according to the number of eligible and available records. The monthly delivery census was maintained separately from the number of CTG records audited and was used to provide contextual information regarding clinical activity and as the denominator for reporting neonatal outcome rates.

No formal sample-size calculation was performed because the quality-improvement project used eligible clinical records available for audit during the predefined monitoring period.

Fresh Eyes Approach

The Fresh Eyes Approach, or Buddy System, was a second clinician reviewing the CTG assessment to provide an extra clinical perspective and assist with correct classification and timely clinical decision-making. The approved protocol stated that the Fresh Eyes Approach required a second clinician to assess the CTG data to ensure accurate classification and enable appropriate intervention if required.

The approach was implemented into routine CTG monitoring in the Labor and Delivery unit as an auxiliary clinical review process aimed at enhancing collaborative interpretation and patient safety.

Data Collection Instrument

Data were collected using a structured Fresh Eyes audit checklist developed specifically for the quality-improvement project and aligned with the clinical and documentation requirements of the Labor and Delivery unit.

The audit tool included four indicators:

1. Completion of the Fresh Eyes review within 1–2 hours;
2. Documentation of the signature and badge number of the primary and secondary clinicians;
3. Documentation in BESTCare; and
4. Neonatal outcome, including disposition to W1, NICU, or ICN.

The audit form recorded whether the predefined criteria were met or not met and enabled aggregation of

compliance data. It also captured the total number of files audited and the number meeting and not meeting the individual criteria.

For analytical purposes, completion of the Fresh Eyes review within the specified timeframe, clinician identification, and BESTCare documentation were treated as process indicators, whereas neonatal outcome was considered an outcome indicator.

Review of the Audit Instrument

The Fresh Eyes audit checklist and criteria were submitted to Quality and Patient Safety (QPS) for assessment before implementation and approved for use in operation in the Labor and Delivery unit. The criteria were judged relevant to the unit's clinical practices and monitoring requirements.

No formal pilot study was performed before the initiation of the audit. Thus, the instrument was not pilot-tested or tested for psychometric reliability.

Data Collection Procedures

Eligible CTG data were retrospectively reviewed utilizing a predefined Fresh Eyes audit methodology. Each audited document was compared to the predetermined Fresh Eyes criteria to ensure compliance.

The audit examined whether the Fresh Eyes review was performed within the allocated 1–2 hours, whether their signatures and badge numbers identified the primary and secondary clinicians, whether the assessment was logged on BESTCare, and whether the neonatal result was documented.

The accepted approach allowed for the assessment of CTG records and the aggregation of collected data to measure compliance and track outcomes. During the monitoring period, monthly summaries of audit findings were prepared. Fresh Eyes compliance was combined with monthly delivery volume and HIE occurrence to identify trends in process performance and neonate outcomes.

Study Variables and Outcome Measures

The key process outcome was adherence of personnel to the Fresh Eyes Approach to CTG categorization. Compliance was assessed against the preset audit criteria and expressed as a percentage:

Fresh Eyes compliance (%) = (Number of audited records meeting the specified criterion ÷ Total number of audited records) × 100

The various items of the Fresh Eyes checklist were also considered process metrics to evaluate compliance with specific needs of the strategy.

The main clinical outcome of interest was the development of HIE over the monitoring period. HIE cases were summarized monthly and examined alongside monthly delivery volume

Deliveries were used as a contextual denominator to account for variance in clinical activity across time. HIE occurrence was also calculated for standardized reporting as:

HIE rate per 1,000 deliveries = (Number of HIE cases /Total deliveries) x 1,000

Statistical Analysis

Data were analyzed using descriptive statistics. Frequencies and percentages were used to summarize monthly and overall compliance with each Fresh Eyes audit criterion. The total number of audited CTG records was reported for the complete monitoring period, and monthly audit volumes were described to demonstrate variation in the number of records reviewed. Fresh Eyes process compliance and neonatal-outcome capture within the audit dataset were analyzed separately because the first three indicators represented adherence to the Fresh Eyes clinical and documentation process, whereas the fourth indicator represented completeness of neonatal-outcome capture within the audit dataset. Monthly delivery volumes and HIE cases were summarized using frequencies and rates. HIE occurrence was reported as the number of cases and as cases per 1,000 deliveries. Temporal trends in Fresh Eyes compliance, neonatal-outcome capture within the audit dataset, delivery volume, and HIE occurrence were summarized using tables and graphical displays. Inferential analyses were considered only when supported by sufficient variability and appropriate data. Because the principal Fresh Eyes process indicators demonstrated complete compliance across the audited records, association testing between process compliance and HIE outcome was not considered appropriate. Accordingly, the analysis focused on descriptive trends rather than causal inference.

Data Management and Confidentiality

Data obtained from CTG records and Fresh Eyes audits were handled according to the approved data-management plan. Patient-identifying information was excluded from the analytical dataset, and data were coded or de-identified to protect confidentiality.

Access to study information was restricted to authorized research personnel. Electronic study data were maintained in secured, password-protected systems in accordance with institutional requirements for data confidentiality, storage, retention, and disposal.

Ethical Consideration

The study was approved by the King Abdullah International Medical Research Center (KAIMRC), and National Guard Health Affairs (Protocol No.

NRA25/012/5). The approval record shows that the project is approved at the Al Ahsa location.

This study was a retrospective analysis of existing clinical records and did not involve experimental intervention or alteration of usual therapeutic care. Patient confidentiality was ensured by de-identifying data and restricting access to authorized study staff according to the approved procedure.

RESULTS

Fresh Eyes Process Compliance

A total of 1,198 cardiotocography (CTG) records were audited over the 13-month monitoring period from July 2024 to July 2025. The number of records audited per month ranged from 41 in August 2024 to 132 in October 2024.

Compliance with the three core Fresh Eyes process indicators was consistently maintained throughout the monitoring period. All audited records met the criteria for completion of the Fresh Eyes review within 1–2 hours, documentation of the primary and secondary clinicians' signatures and badge numbers, and documentation in BEST Care, resulting in 100% compliance for each of the three indicators across all 13 months (Table 1).

Neonatal-outcome capture showed greater variability. Monthly capture ranged from 83% in December 2024 to 98% in August 2024. Overall, neonatal outcomes were captured in 1,068 of 1,198 audited records (89.1%).

Table 1: Monthly Compliance with Fresh Eyes Audit Indicators, July 2024–July 2025

Month	CTG Files Audited, n	Fresh Eyes Within 1–2 h, %	Signature & Badge No., %	BEST Care Documentation, %	Baby Outcome Capture, n (%)
Jul 2024	48	100	100	100	41 (85%)
Aug 2024	41	100	100	100	40 (98%)
Sep 2024	97	100	100	100	87 (90%)
Oct 2024	132	100	100	100	120 (91%)
Nov 2024	108	100	100	100	98 (91%)
Dec 2024	96	100	100	100	80 (83%)
Jan 2025	107	100	100	100	101 (94%)
Feb 2025	108	100	100	100	94 (87%)
Mar 2025	87	100	100	100	79 (91%)
Apr 2025	118	100	100	100	104 (88%)
May 2025	118	100	100	100	100 (85%)
Jun 2025	81	100	100	100	69 (85%)
Jul 2025	57	100	100	100	55 (96%)
Overall	**1,198**	**100**	**100**	**100**	**1,068 (89.1%)**

Note. Monthly percentages are rounded to the nearest whole number. The overall neonatal-outcome capture percentage was calculated from the pooled numerator and denominator (1,068/1,198).

The monthly source data support the consistently complete first three process indicators and the variability in neonatal-outcome capture.

Delivery Volume and Confirmed HIE Cases

A total of 1,683 deliveries occurred during the 13-month monitoring period. Monthly delivery volume ranged from 108 to 153 deliveries. Five cases were classified as clinically confirmed hypoxic-ischemic encephalopathy (HIE), corresponding to an overall confirmed HIE rate of 3.0 cases per 1,000 deliveries.

Confirmed HIE cases occurred in September 2024 (n = 1), October 2024 (n = 1), November 2024 (n = 1), and July 2025 (n = 2). No clinically confirmed HIE cases were identified during the remaining months, including seven consecutive months from December 2024 through June 2025.

Table 2: Monthly Delivery Volume and Confirmed HIE Cases, July 2024–July 2025

Month	Deliveries, (n)	Confirmed HIE, (n)
Jul 2024	122	0
Aug 2024	135	0
Sep 2024	141	1
Oct 2024	153	1
Nov 2024	135	1
Dec 2024	144	0
Jan 2025	126	0
Feb 2025	127	0
Mar 2025	117	0

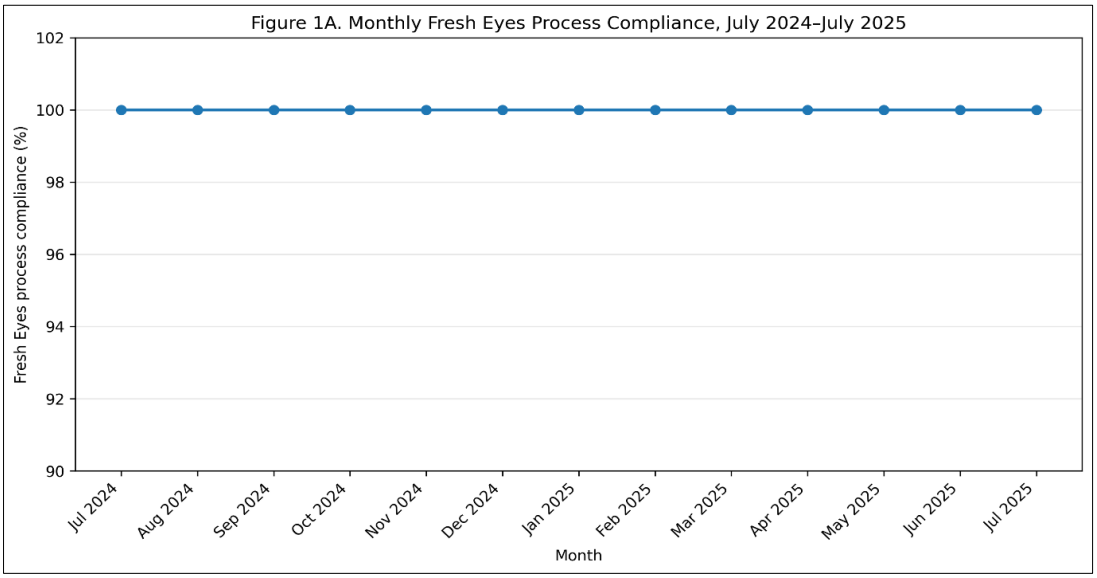
Month	Deliveries, (n)	Confirmed HIE, (n)
Apr 2025	124	0
May 2025	126	0
Jun 2025	125	0
Jul 2025	108	2
Total	**1,683**	**5**

The distinction between confirmed HIE and other initially identified neonatal events is important. The available case review supports confirmed cases in September, October, and November 2024 and two confirmed cases in July 2025; other recorded events were documented as not clinically diagnosed or not confirmed as HIE.

Trend in Fresh Eyes Compliance and Confirmed HIE

Figure 1 presents the monthly trends in Fresh Eyes process compliance and confirmed HIE occurrence. Fresh Eyes process compliance remained at 100% throughout the entire 13-month monitoring period (Figure 1A), demonstrating sustained adherence to the three core process indicators. In contrast, confirmed HIE cases varied over time (Figure 1B), with isolated cases occurring in September, October, and November 2024, followed by seven months without a confirmed case and two confirmed cases in July 2025.

Figure 1. Trends in Fresh Eyes Process Compliance and Confirmed Hypoxic-Ischemic Encephalopathy Cases, July 2024–July 2025 (A) Monthly Fresh Eyes process compliance remained at 100% throughout the 13-month monitoring period. (B) Monthly number of clinically confirmed HIE cases.



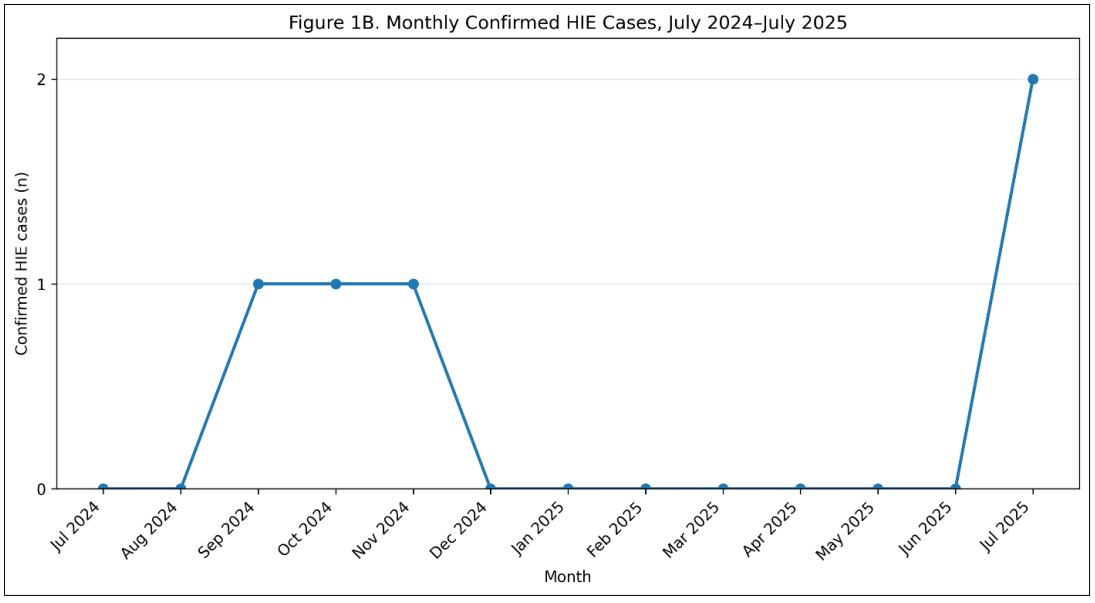


Figure 1A shows the 13-month Fresh Eyes process compliance trend at 100% throughout the monitoring period.

Figure 1B shows the monthly trend in clinically confirmed HIE cases, with one confirmed case each in September, October, and November 2024, and two in July 2025, based on the detailed case-review file.

Descriptive Interpretation of Process and Outcome Trends

Because Fresh Eyes process compliance remained constant at 100% across all 13 months, there was no variability in the process measure to support a meaningful statistical correlation between compliance and confirmed HIE occurrence. Consequently, the relationship between Fresh Eyes compliance and HIE outcomes was evaluated descriptively rather than inferentially.

The observed pattern of confirmed HIE should therefore be interpreted as a temporal clinical outcome trend occurring alongside sustained Fresh Eyes process compliance, rather than as evidence of an independent causal effect of the Fresh Eyes approach on HIE occurrence.

DISCUSSION

This quality improvement study aimed to evaluate sustained compliance with the Fresh Eyes approach to cardiotocography (CTG) review and to describe neonatal outcomes, particularly clinically confirmed hypoxic-ischemic encephalopathy (HIE), during a 13-month monitoring period. The main findings were 100% compliance with the three core Fresh Eyes process indicators, variability in neonatal-outcome capture within the audit dataset and five clinically confirmed HIE cases during the study period

Sustained Compliance with the Fresh Eyes Process

The most important finding in the process was 100% compliance with completion of Fresh Eyes review within 1-2 hours, signatures and badge numbers documented, and documentation in BESTCare sustained during the 13 months. The performance over time indicates that the Fresh Eyes technique has become part of everyday practice in the Labor and Delivery unit, not used sporadically.

Evidence for the subjectivity of visual CTG interpretation argues for the clinical value of a systematic second evaluation. A systematic assessment of the reliability and agreement of intrapartum fetal heart rate monitoring indicated high heterogeneity and variability in both inter-rater and intra-rater interpretation (Hernandez Engelhart et al., 2023). Variation between and within clinicians reading the same CTG traces has been shown in previous studies and points to the possible value of measures to promote reassessment and group reading (Devane and Lalor, 2005).

This difficulty is still apparent in more recent evidence. Neri *et al.,* reported only fair overall interobserver agreement among midwives using FIGO criteria on intrapartum CTG tracings, with particularly poor agreement on the assessment of variability. These results give a critical background for the Fresh Eyes approach: a second review does not erase the inherent subjectivity of CTG interpretation, but it provides a further opportunity to re-evaluate data, highlight disagreement and escalate concerns where interpretations diverge.

The present findings further suggest that high compliance levels were maintained despite variations in monthly audit and delivery quantities. This is essential from a quality improvement standpoint, since sustainability is a key factor in determining whether a clinical practice has been adopted in routine treatment. Thus the 13-month period allows for a demonstration of process stability and sustainability and not a short-term uptake after installation.

Neonatal Outcome Capture Within the Audit

All three key Fresh Eyes process indicators were 100% compliant. Neonatal outcomes were captured within the audit in 89.1% of Fresh Eyes audit records, with monthly rates ranging from 83% to 98%. This is reflective of the varied completeness of neonatal-outcome collection in the audit dataset despite continuing compliance with the basic Fresh Eyes process indications.

Importantly, this finding is indicative of the completeness of neonatal-outcome capture in the Fresh Eyes audit, and should not be taken as a reflection of incomplete neonatal-outcome documentation within the clinical record. Neonatal outcomes were available in the patient records but were not consistently captured in the Fresh Eyes audit data. In future audit cycles, better collection of these accessible outcomes would increase the completeness of the dataset and facilitate a more comprehensive study of the association between CTG review processes and subsequent neonatal outcomes.

Thus, the 89.1% neonatal-outcome capture rate is not a failure of clinical documentation but a potential for improvement in the audit process. Future cycles of quality improvement should strengthen the routine incorporation of available neonatal outcomes into the Fresh Eyes audit dataset with clearly demarcated audit duties, regular monitoring and feedback.

Confirmed HIE Outcomes

Five clinically confirmed cases of HIE were identified among 1,683 deliveries (an overall rate of about 3.0 confirmed HIE cases per 1,000 deliveries). The cases were not evenly distributed over the surveillance period. One confirmed case was detected in each of September, October, and November 2024, followed by seven consecutive months with no confirmed HIE cases

from December 2024 to June 2025. Two confirmed cases later occurred in July 2025.

The seven months without a confirmed case of HIE are clinically meaningful but should not be taken to mean that Fresh Eyes alone prevented HIE. However, the fact that there were two confirmed cases in July 2025, despite maintaining 100% Fresh Eyes compliance, should not be considered a failure of the process. Intrapartum fetal monitoring aims to detect early indicators of impaired fetal oxygenation to guide clinical therapy. Interpretation of CTG remains subjective and is only one aspect of the broader therapeutic approach (Hernandez Engelhart *et al.,*2023)

The broader literature also warns against believing that enhanced CTG interpretation per se necessarily translates into improved newborn outcomes. A systematic evaluation comparing conventional visual CTG interpretation with computerized CTG analysis indicated that computerized techniques did not routinely achieve significant reductions in metabolic acidosis or obstetric intervention, despite their potential to address observer variability (Ben M 'Barek et al., 2023; Mendis et al., 2023). This highlights the necessity to differentiate between process dependability, accuracy of interpretation, clinical decision-making, and final neonatal outcome.

Critically, Fresh Eyes compliance was maintained at 100% during the entire monitoring period. The major process variable was non-variable, and so a significant statistical connection between Fresh Eyes compliance and HIE occurrence could not be established. The approved plan does consider inferential analyses, if suitable, although such analyses depend on adequate variability in the variables being analyzed.

Thus, the observed pattern of confirmed HIE should be viewed as a temporal clinical outcome trend in parallel with sustained Fresh Eyes process compliance, rather than as proof of an independent causal influence of the Fresh Eyes strategy on HIE occurrence.

Clinical and Quality-Improvement Implications

The findings carry some consequences for clinical practice. First, persistent adherence helps to keep the Fresh Eyes approach as a standardized safety process for CTG review. The logic for collaborative review is especially significant when one considers the well-known interobserver heterogeneity of CTG interpretation. Evidence from systematic reviews and more recent research shows that different clinicians may interpret the same fetal heart rate trace differently (Hernandez Engelhart *et al.,* 2023).

Secondly, 100% process compliance should not be confused with 100% correctness of CTG interpretation. The audit confirms the second review and its documentation; it does not confirm that each CTG was interpreted accurately by both clinicians. This is an essential distinction in light of evidence that interpretation of CTGs is still prone to observer variation even when established parameters are followed (Neri et al.,2024)

Third, the completeness of neonatal-outcome capture within the Fresh Eyes audit is a measurable area for continued improvement. Improvement of this component would benefit the completeness of the clinical audit trail and allow for more meaningful linkage between CTG findings, subsequent clinical decisions, and newborn outcomes.

Finally, the recurrence of confirmed HIE despite continued procedure compliance emphasizes the need for multidisciplinary case evaluation rather than attributing an adverse neonatal outcome based on completion of Fresh Eyes. Future evaluations might consider CTG classification, timing of recognition, agreement between first and second reviewer, escalation, timing of obstetric intervention, maternal and fetal risk factors, cord blood gasses, Apgar scores, neonatal resuscitation and ultimate neonatal diagnosis. Such information would help to differentiate if an unfavorable result was potentially due to interpretation, clinical response, underlying fetal or maternal issues or other parts of the care process.

Strengths and Limitations

A strength of this project was the 13-month monitoring period, which allowed the measurement of persistent compliance as opposed to performance at a particular time point. The inclusion of 1,198 audited CTG recordings also resulted in a large process-level dataset representing typical clinical practice. Specification of clinically confirmed HIE from cases initially reported or evaluated as probable HIE further enhanced specificity of the clinical outcome measure.

There are a few limits to be aware of. First, this was a single-center quality improvement study restricting the generalizability of the findings to other maternity settings. The approved proposal also acknowledged limitations of its nonrandom sampling method.

Second, the high average of Fresh Eyes compliance resulted in no variability in the major process measure, and thus, no significant statistical assessment of the association between compliance and HIE occurrence. Third, the audit examined whether the Fresh Eyes review and the required documentation were completed, but did not independently analyze the correctness of the CTG interpretation or the inter-rater agreement between the two clinicians. This is particularly important because interobserver variability is a known drawback in CTG interpretation (Hernandez Engelhart *et al.,* 2023; Neri *et al.,* 2024).

Fourth, neonatal outcomes were not captured in approximately 11% of the Fresh Eyes audit records, which limited comprehensive analysis of the relationship between intrapartum monitoring and subsequent neonatal outcomes. This reflects incomplete outcome capture within the audit dataset rather than incomplete documentation in the clinical record.

Overall Interpretation

Results show that the Fresh Eyes approach was regularly introduced and sustained in the Labor and Delivery unit throughout the 13-month monitoring period. The 100% compliance with the three main process indicators is indicative of successful integration of collaborative CTG evaluation into ordinary clinical practice. This is clinically relevant given known variability in interpretation of CTG and ongoing need for techniques to facilitate consistent assessment and clinical decision-making (Hernandez *et al.,* 2023; Brown *et al.,* 2023).

At the same time, the findings indicate two significant points. First, long-term adherence to a safety approach by itself does not necessarily prove the correctness of CTG interpretation or influence on newborn outcomes. Second, the neonatal-outcome capture rate within the audit at 89.1% is a significant area for additional quality improvement. More complete capture of neonatal outcomes within the audit, ongoing surveillance, and multidisciplinary assessment of confirmed HIE cases should provide a more comprehensive picture of the relationship between CTG interpretation, escalation, clinical intervention, and newborn outcomes.

Overall, the study supports the feasibility and sustainability of the Fresh Eyes approach as a structured collaborative CTG review process. Larger multicenter studies with CTG interpretation accuracy, reviewer concordance, clinical interventions, relevant confounders, and neonatal outcomes would be needed to determine its independent relationship with HIE.

CONCLUSION

This quality improvement study demonstrated sustained compliance with the Fresh Eyes approach to cardiotocography (CTG) evaluation in the Labor and Delivery unit across the 13-month monitoring period. Overall compliance with the three primary process indicators completion of the Fresh Eyes review within 1–2 hours, documentation of clinicians' signatures and badge numbers, and documentation in BESTCare was 100% across the 1,198 audited CTG records. This result implies that the collaborative CTG review procedure was successfully embedded and maintained in ordinary clinical practice.

Conversely, capture of neonatal outcomes within the Fresh Eyes audit was more variable, with an overall capture rate of 89.1%, presenting an opportunity for ongoing quality improvement. There were five clinically confirmed cases of hypoxic-ischemic encephalopathy (HIE) among 1,683 deliveries, or around 3.0 cases per 1,000 deliveries.

There was a seven-month period with no cases of HIE, followed by two confirmed cases in July 2025; nevertheless, caution is warranted when interpreting these data. Fresh Eyes compliance was always 100%, so the study could not statistically link compliance variation to HIE occurrence. Furthermore, CTG interpretation by its nature is vulnerable to interobserver variability, and completion of a second review does not necessarily indicate the correctness of CTG interpretation or subsequent neonatal outcomes (Hernandez Engelhart *et al.,* 2023; Brown *et al.,* 2023).

Overall, the findings confirm the viability and sustainability of the Fresh Eyes approach as a structured collaborative CTG review process. The findings emphasize the significance of considering sustained process compliance as one element of a wider clinical safety system. Further evaluation of CTG interpretation, clinical escalation, obstetric interventions, and neonatal outcomes is needed to further understand the association between intrapartum monitoring processes and unfavorable neonatal outcomes.

RECOMMENDATIONS

Based on the study findings and supporting literature, the following recommendations are proposed:

1. **Sustain the Fresh Eyes approach as a standard CTG safety process:** The continuously high compliance rates seen throughout the 13 months encourage continuation of the organized second-review procedure. This is especially the case when comprehensive research shows diversity in the assessment of intrapartum fetal heart rate amongst clinicians (Hernandez Engelhart *et al.,* 2023) and the CTG recommendations themselves differ in interpretation and classification (Brown *et al.,* 2023)
2. **Continue regular compliance monitoring rather than discontinuing audits after achieving 100%:** Maintaining the observed level of compliance over time requires regular auditing. The frequency of audits may ultimately be modified based on consistent performance and organizational quality standards instead of presuming that existing performance would persist indefinitely**.**
3. **Strengthen Neonatal-Outcome Capture Within the Fresh Eyes Audit Process:** Neonatal outcomes were captured in 89.1% of Fresh Eyes audit data. This conclusion is attributable to variations in the completeness of outcome capture within the audit dataset rather than inadequate reporting in the clinical record. Future quality-improvement cycles should therefore seek to ensure consistent inclusion of accessible neonatal outcomes in the Fresh Eyes audit data. Clearly defined audit roles, regular monitoring and feedback can improve the

completeness of the dataset and the full evaluation of CTG review processes and subsequent neonatal outcomes.

4. **Incorporate Structured Case-Based CTG Review Into Ongoing Quality Improvement:** Future quality improvement activities should include structured reviews of selected CTG cases to complement normal monitoring of Fresh Eyes compliance. Attention may be focused on patients with aberrant or changing CTG findings, clinical worsening, escalation of care, emergency obstetric intervention or unanticipated neonatal outcome. Case-based analysis may help identify opportunities to strengthen CTG interpretation, timely escalation, multidisciplinary communication, and clinical decision-making
5. **Conduct multidisciplinary review of every confirmed HIE case:** Confirmed cases of HIE should be subjected to a structured multidisciplinary case review including the necessary obstetric, nursing/midwifery and neonatal teams. Review should include: CTG pattern and classification, agreement amongst reviewers, timing of recognition and escalation, obstetric interventions, maternal and fetal risk factors, cord blood gases, Apgar scores, neonatal resuscitation and final neonatal diagnosis. This would help determine where opportunities for improvement exist across the entire clinical pathway rather than attributing an adverse outcome to Fresh Eyes compliance alone.
6. **Maintain competency development in CTG interpretation and escalation:** Continuing education, case-based CTG review, competency evaluation, and multidisciplinary learning should be incorporated into the CTG Workshop with the Fresh Eyes approach. Improving staff knowledge of CTG interpretation, collaborative decision-making, team leadership, and patient advocacy were also recognized as key objectives for improvement within the initial authorized project.
7. **Undertake further research using broader clinical variables and comparison data:** Future research should include larger or multi-center data sets and evaluate maternal, fetal, obstetric and neonatal features, CTG classification, reviewer concordance, timing of intervention, and newborn outcomes. If there is sufficient variation, these data can enable more robust statistical analysis of factors associated with HIE. In the current study, a causal effect of Fresh Eyes cannot be determined as compliance was constantly at 100% and significant confounding factors were not fully evaluated.

The Fresh Eyes approach was shown as a continuing viable collaborative CTG safety process. Continued focus on interpretation quality, neonatal-outcome capture within the audit, multidisciplinary case review and wider clinical factors is vital to support continuing improvement in intrapartum and neonatal safety.

Closing statement

Overall, the findings support continued use and monitoring of the Fresh Eyes approach as a sustainable collaborative CTG safety process. Future quality-improvement efforts should focus on maintaining process reliability, strengthening neonatal-outcome capture within the audit, promoting case-based multidisciplinary learning, and evaluating broader clinical factors that may influence intrapartum and neonatal outcomes.

Ethics and Institutional Approval

The study protocol, entitled *"Monitoring Staff Compliance to Fresh Eyes Approach to Cardiotocography (CTG) Categorization (Buddy System) to Labor and Delivery Staffs,"* was reviewed and approved through the King Abdullah International Medical Research Center (KAIMRC) research approval process (Protocol No. NRA25/012/5). The approval record classified the project as Regular Research from the Eastern Region–Ahsa and documented the study status as approved, with PPDU approval. The Fresh Eyes audit checklist was also reviewed and approved for use by the institutional Quality and Patient Safety Department as part of the quality monitoring process.

Consent to Participate

Informed consent was not required, as this study was conducted as a quality improvement project using retrospective, de-identified clinical and audit data, with no direct participation of patients or staff and no collection of personally identifiable information.

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Conflict of Interest: The authors declare no conflicts of interest.

Data Availability Statement

The data supporting the findings of this study are not publicly available because they were derived from institutional clinical records and are subject to confidentiality and institutional data-protection requirements. De-identified data may be available from the corresponding author upon reasonable request and subject to institutional approval.

Author Contributions

All authors contributed to the conceptualization and methodology of the study, data collection, data curation, analysis and interpretation of the findings, and review and editing of the manuscript. Mary Reese M. Poticar, as the principal investigator, additionally provided overall study coordination and project administration. All authors critically reviewed the manuscript for important intellectual content and read and approved the final version for publication.

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