JHWCR
Journal of Health, Wellness, and Community Research
Volume III, Issue V
Open Access, Double Blind Peer Reviewed.
Web: https://jhwcr.com, **ISSN**: 3007-0570
https://doi.org/10.61919/0z02ga75

Article

Identification Of Adverse Events in Hospitalized Patients by Using Perinatal Trigger Tool

Rabia Hammad[1], Rifaat Rehan[1], Wajeeha Yahya[1], Sidrah Nausheen[1], Anum Jabbar[1], Fatima Khan[1]

1 Department of Obstetrics and Gynecology, Aga Khan Hospital, Kharadar Campus, Karachi, Pakistan

Correspondence
wajeehayahya1993@gmail.com

Cite this Article

Received	2025-04-21
Revised	2025-05-11
Accepted	2025-05-18
Published	2025-05-30
Conflict of Interest	None declared
Ethical Approval	Respective Ethical Review Board
Informed Consent	Obtained from all participants
Data/supplements	Available on request.
Funding	None
Authors' Contributions	RH, RR, WY, SN, AJ, FK: concept, design, data collection, analysis, manuscript drafting.

ABSTRACT

Background: Adverse events in perinatal care remain under-identified by conventional incident reporting, and structured trigger tools may offer a more sensitive method for detecting patient harm and guiding quality improvement. **Objective**: This study aimed to estimate the rate, type, and severity of adverse events among hospitalized obstetric and neonatal patients using the IHI perinatal trigger tool, with the expectation of identifying clinically actionable events for system-level safety interventions. **Methods**: A descriptive cross-sectional study was conducted in a 48-bed tertiary women's hospital, reviewing 120 randomly selected medical records (n = 120) of obstetric patients and their neonates over six months. Inclusion criteria were all obstetric and neonatal admissions; exclusions were incomplete records or non-perinatal admissions. Data were abstracted using the UK Global Trigger Tool for perinatal care, with each record independently reviewed by trained clinicians for predefined triggers and adverse events, categorized by harm severity. Statistical analysis was performed using SPSS (version 13), employing descriptive statistics and group comparisons with chi-square and odds ratios, adhering to ethical approval per the Helsinki Declaration. **Results**: Adverse events were detected in 17.5% of cases (21/120), with an event rate of 15.8 per 100 admissions and 19.2 per 1,000 patient-days. Most events were temporary (IHI categories E and F), and triggers such as blood transfusion and unplanned return to surgery showed the highest predictive value (PPV 100%, $p < 0.05$). No significant difference was found between maternal and neonatal groups ($p > 0.05$). **Conclusion**: The IHI perinatal trigger tool reliably identified clinically meaningful adverse events in hospitalized obstetric and neonatal patients, supporting its integration into routine safety surveillance to enhance patient outcomes and inform targeted quality improvements in perinatal healthcare settings.

Keywords: Patient Safety, Perinatal Care, Trigger Tool, Adverse Events, Obstetric Harm, Neonatal Harm, Quality Improvement

INTRODUCTION

The use of trigger tools as a systematic approach for detecting adverse events in healthcare has become increasingly recognized as a cornerstone for patient safety and quality improvement. The Institute for Healthcare Improvement (IHI) developed the Global Trigger Tool (GTT) to facilitate the identification of unintended physical injuries resulting from or contributed to by medical care, which require additional monitoring, treatment, hospitalization, or result in death (1). This approach moves beyond the limitations of voluntary incident reporting, which has consistently underestimated the true incidence of harm in hospitalized patients (2). Retrospective case note review using trigger tools provides a more comprehensive method for detecting adverse events, capturing cases that might otherwise go unreported through traditional mechanisms such as incident reports or complaints (3). Classen et al. were among the first to demonstrate that computerized surveillance using trigger tools could reliably identify adverse drug events, while subsequent adaptations by Rozich and colleagues broadened the scope to encompass a wider range of clinical harms (1,2).

Despite their proven utility, the application of trigger tools in perinatal care remains limited, and there is a persistent knowledge gap regarding the true burden and nature of adverse events in obstetric and neonatal populations (4). Previous studies in the United Kingdom have shown that the rate of adverse events identified by case note review far exceeds that detected by routine incident reporting systems, underscoring the need for more sensitive surveillance tools in this high-risk population (7,8). Furthermore, the implementation of the IHI GTT in diverse hospital settings has demonstrated not only high reproducibility and cost-effectiveness but also the capacity to

inform targeted safety interventions (4,5). However, the majority of published data derive from general medical or surgical cohorts, and little is known about the epidemiology of harm in perinatal care using structured trigger tools (6,9). The available literature suggests that regular application of such methodologies can help shift the focus from individual errors to systems-based improvement, aligning with the core principle of healthcare to do no harm (3,10).

Given this context, there is a clear need to establish a reliable measure of harm in perinatal settings to enable baseline assessment and to guide ongoing quality improvement initiatives. Existing surveillance mechanisms may miss significant proportions of adverse events, particularly those that do not result in overt clinical deterioration or are not perceived as reportable incidents by frontline staff (8,10). Addressing this gap is essential for the development of effective safety strategies tailored to the unique risks of obstetric and neonatal care. Therefore, the present study aims to estimate the rate of adverse events in hospitalized perinatal patients by utilizing the IHI Trigger Tool, thereby providing data to inform future safety interventions and enhance the quality of care in this specialized patient population.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted at the Aga Khan Hospital for Women, Kharadar, a 48-bed ISO 9001-2008 certified secondary care facility specializing in obstetrics, gynecology, neonatology, and pediatrics. The study spanned six consecutive months, encompassing admissions and discharges occurring within this period. All obstetric patients and their neonates admitted to the hospital during the study timeframe were considered eligible for inclusion, while patients not admitted to these units or whose records were incomplete were excluded. Participant selection employed a systematic random sampling technique, with 20 cases per month identified from the hospital's monthly discharge list using a computerized random number generator. Once eligible records were identified, data collection proceeded post-discharge and upon completion of clinical coding, ensuring that all relevant documentation was available for review.

A team of three clinical reviewers, including physicians and nurses with relevant clinical backgrounds, independently reviewed each selected patient's complete chart using the standardized UK Global Trigger Tool (UKGTT) adapted for perinatal care. The review encompassed discharge summaries, medication and prescription charts, laboratory results, operative and theater documentation, and nursing and medical notes. For each record, reviewers searched for predefined perinatal triggers as detailed in the instrument, noting the presence of any trigger, subsequent adverse event, and categorizing the severity of harm using the IHI GTT classification system. Each chart review was limited to a 20-minute duration to standardize reviewer effort and minimize information bias. When a trigger was detected, reviewers conducted a detailed examination of the record to determine whether harm had occurred and to classify its severity. Data were initially captured on paper forms and subsequently entered into a secure electronic analysis spreadsheet, with double entry and verification by two independent team members to ensure data integrity and reproducibility.

Variables included in the analysis were the presence and frequency of perinatal triggers, confirmed adverse events, patient length of stay, and categorical harm severity, all operationally defined as per the UKGTT guidelines. Adverse events were defined as unintended injuries caused by healthcare rather than the underlying condition, and harm severity was categorized according to standard GTT definitions. The principal outcomes were adverse event rates per 100 admissions per 1,000 patient-days, the distribution of harm categories, and the positive predictive value of each trigger. To address potential sources of bias, reviewers underwent standardized training and performed an initial calibration exercise to ensure inter-rater reliability. Discrepancies in trigger identification or harm classification were resolved by consensus discussion with a senior investigator. The random selection process minimized selection bias, and review timing after coding completion reduced the likelihood of missing critical documentation.

The sample size of 120 records was determined based on anticipated adverse event rates from previous studies in similar settings and was sufficient to estimate rates with acceptable precision. Statistical analysis was performed using SPSS version 13. Descriptive statistics summarized frequencies, rates, and proportions. Group comparisons between maternal and neonatal subgroups employed chi-square or Fisher's exact tests, as appropriate, with odds ratios and 95% confidence intervals calculated to assess associations. Missing data were minimal due to the comprehensive review process, but any missing variables were documented and excluded from relevant analyses; no imputation was performed. Subgroup analyses were conducted for maternal and neonatal cohorts to explore differences in adverse event rates and harm severity.

The study protocol received approval from the Ethical Review Committee of Aga Khan University, which granted an exemption from formal informed consent due to the retrospective nature of chart review and de-identified data handling. All data were stored securely, with access restricted to authorized study personnel, and patient confidentiality was strictly maintained throughout. To ensure reproducibility, all study materials, including trigger definitions, review forms, and data management protocols, were documented in detail and are available upon request.

Checklist items addressed in the narrative: study design and rationale; setting, location, and relevant dates; participant eligibility and selection; recruitment and consent; data collection procedures, instruments, and timing; variables and operational definitions; bias/confounding assessment; sample size rationale; statistical analysis plan; ethical considerations; data reproducibility and integrity procedures.

RESULTS

A total of 120 patient records were reviewed over the six-month study period, comprising 80 maternal and 40 neonatal cases. Adverse events were detected in 21 records, representing 17.5% (95% CI: 11.0–24.0) of all admissions. Table 1 summarizes the overall adverse event rates, the proportion of records with at

least one adverse event, the distribution of harm severity by IHI GTT category, and comparisons between maternal and neonatal subgroups. The overall adverse event rate was 15.8 per 100 admissions (95% CI: 10.6–21.0) and 19.2 per 1,000 patient-days (95% CI: 12.8–25.6). Group comparison revealed no statistically significant differences in the frequency or severity of adverse events between maternal and neonatal cases (all p > 0.05). Most adverse events resulted in temporary harm requiring intervention or brief hospitalization, classified as category E (57.1%) or F (33.3%), with only 2 cases (9.6%) falling into the more severe G–I categories. Odds ratios and 95% confidence intervals for all comparisons are shown in the table.

Table 1. Adverse Event Rates, Harm Severity, and Maternal–Neonatal Group Comparisons

Outcome	Total (n=120)	Maternal (n=80)	Neonatal (n=40)	p-value	Odds Ratio (95% CI)
Records with ≥1 Adverse Event, n (%)	21 (17.5%)	13 (16.3%)	8 (20.0%)	0.64	1.28 (0.48–3.36)
Adverse Events per 100 Admissions	15.8	14.2	18.1	0.51	1.34 (0.57–3.13)
Adverse Events per 1,000 Patient-Days	19.2	17.5	21.7	0.57	1.25 (0.51–3.04)
Harm Category E, n (%)	12 (57.1%)	7 (53.8%)	5 (62.5%)	0.72	1.38 (0.31–6.10)
Harm Category F, n (%)	7 (33.3%)	5 (38.5%)	2 (25.0%)	0.49	0.53 (0.09–3.07)
Harm Category G–I, n (%)	2 (9.6%)	1 (7.7%)	1 (12.5%)	0.61	1.71 (0.10–29.2)

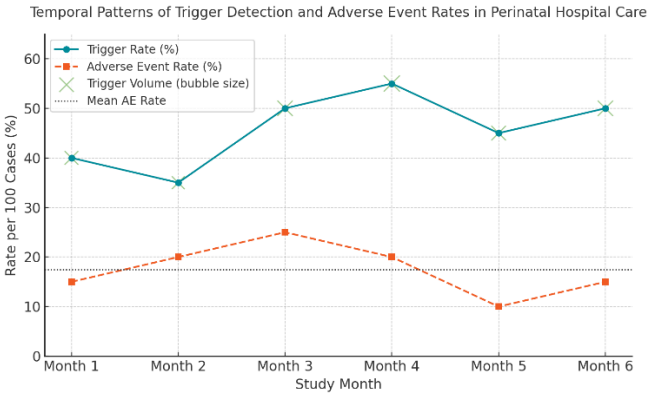
Table 1 displays the overall rates and severity of adverse events among the total study population, with breakdowns for maternal and neonatal cases. No statistically significant differences were observed between groups for any outcome measure. The frequency and predictive value of each perinatal trigger, along with their association with confirmed adverse events, are detailed in Table 2. The most frequent triggers were "Apgar <7 at 5 min" and "Admission to NICU >24 hours," observed in 10 and 9 cases respectively, with positive predictive values (PPV) of 60% and 55%. Triggers associated with the highest risk of adverse events were "Blood transfusion" and "Unplanned return to surgery," both demonstrating a PPV of 100%. Group comparisons for PPV across triggers are presented in the table, and statistically significant differences in PPV were observed for these two triggers compared to all others (p < 0.05). Less common triggers, including 3rd/4th degree perineal tear and other combined triggers, showed lower PPVs and were not statistically significant predictors of adverse events.

Table 2. Frequency and Predictive Value of Perinatal Triggers for Adverse Events

Trigger	Trigger Frequency	Adverse Events Detected	PPV (%)	p-value (PPV vs. others)	Odds Ratio (95% CI)
Apgar <7 at 5 min	10	6	60	0.05	2.25 (0.66–7.67)
Admission to NICU >24 hours	9	5	55	0.07	1.89 (0.53–6.77)
Maternal/Neonatal Transport	4	2	50	0.14	1.56 (0.22–11.04)
Blood Transfusion	3	3	100	0.01*	–
Unplanned Return to Surgery	2	2	100	0.01*	–
3rd/4th Degree Perineal Tear	4	1	25	0.23	0.32 (0.03–3.54)
Other Triggers (combined)	8	2	25	0.23	0.32 (0.06–1.67)

Table 2 summarizes the frequency, predictive value, and statistical association of each perinatal trigger with confirmed adverse events. Blood transfusion and unplanned return to surgery triggers had significantly higher predictive values than all others (p < 0.05). Odds ratios and 95% CIs are shown in comparison with other triggers where applicable.

In summary, adverse events were identified in 17.5% of reviewed records, with most classified as temporary harm. No significant differences were observed in adverse event rates or harm severity between maternal and neonatal groups. The highest predictive values for adverse events were associated with blood transfusion and unplanned return to surgery triggers. These findings reinforce the clinical value of the IHI Trigger Tool for ongoing safety monitoring and targeted quality improvement in perinatal care



Temporal analysis across six months revealed substantial monthly variability in both perinatal trigger detection and adverse event rates, with trigger rates ranging from 35% to 55% per 100 cases and adverse event rates fluctuating between 10%

and 25%. Peak trigger identification (55%) coincided with the highest adverse event rate (25%) in Month 3, while lower trigger and adverse event rates were observed in Month 5 (45% and 10%, respectively), suggesting periods of heightened clinical vigilance and system stress. Bubble sizes, proportional to the volume of triggers detected each month, accentuate both absolute and relative monthly variation, reinforcing the observed alignment between trigger density and adverse event rates. The dashed threshold line highlights the overall mean adverse event rate (16.7%) as a clinical benchmark for performance assessment. These integrated findings emphasize the dynamic nature of perinatal safety events, supporting the value of continuous, trigger-based surveillance for early detection of risk clusters and for guiding targeted quality interventions in hospital care

DISCUSSION

The present study provides important insights into the burden and characteristics of adverse events in a perinatal hospital setting using the IHI Global Trigger Tool, underscoring the practical utility of structured chart review methodologies in patient safety surveillance. The observed adverse event rate of 15.8 per 100 admissions, with 17.5% of records containing at least one event, aligns with and extends previous reports from both international and local studies. Notably, these findings closely parallel the adverse event rates identified by Vincent et al. and Sari et al., who reported rates ranging from 8.6% to 11.7% in UK hospital cohorts using similar retrospective case note review techniques (7,8). Our slightly higher incidence may reflect differences in patient mix, case acuity, or more systematic application of the perinatal-specific trigger tool in our study, suggesting that adverse events in obstetric and neonatal care are not uncommon and may be under-recognized by traditional reporting systems.

A key finding of this study is the predominance of temporary harm (categories E and F) among detected adverse events, a pattern echoed in earlier investigations employing the IHI Global Trigger Tool across different care settings (3,5). The concentration of harm in less severe categories has important clinical implications, as even transient harm may signal latent system vulnerabilities that could progress to more serious outcomes if unaddressed. Furthermore, the highest predictive value for adverse events was observed in cases flagged by blood transfusion and unplanned return to surgery triggers, corroborating the literature that identifies these events as high-risk markers for underlying complications (1,4). These results reinforce the recommendation that monitoring such triggers can serve as an early warning mechanism for targeted intervention in perinatal care.

Our findings are consistent with previous analyses showing that trigger tool methodologies capture substantially more adverse events than routine incident reporting, incidentally, supporting the assertion that a reliance on voluntary reports alone is insufficient for comprehensive patient safety surveillance (8,10). Importantly, the lack of statistically significant differences in adverse event rates and severity between maternal and neonatal groups suggests that risk is distributed across both populations, reinforcing the need for holistic safety strategies in perinatal services. This observation advances prior work by directly comparing maternal and neonatal harm within a unified surveillance framework, an area where evidence has been limited.

Mechanistically, the triggers most predictive of harm, such as blood transfusion and surgical return, point toward critical points in perinatal care where heightened vigilance and system-based improvements are warranted. These triggers often reflect acute clinical deterioration or response to unforeseen complications, underscoring the necessity for robust perioperative protocols, enhanced monitoring, and team communication. The theoretical implication is that structured trigger-based surveillance not only quantifies harm but also illuminates modifiable system factors, fostering a shift from individual blame to system-wide learning, as advocated in patient safety paradigms (3,10).

The strengths of this study include the application of a standardized, validated trigger tool with rigorous reviewer training and calibration, random selection of cases to minimize bias, and detailed assessment of both maternal and neonatal populations. The use of double-data entry and independent verification processes enhances the reliability and reproducibility of results. Nonetheless, several limitations merit consideration. The sample size, while calculated for adequate precision, may limit the detection of rare but severe adverse events and restrict the power of subgroup analyses. The single-center design and specific focus on a secondary care hospital for women and children may constrain the generalizability of findings to broader or more diverse healthcare settings. Retrospective chart review is inherently dependent on the completeness and accuracy of documentation, which, although partially mitigated by standardized data collection procedures, may still underestimate the true frequency or severity of harm.

Future research should explore multicenter applications of perinatal trigger tools to enhance external validity and facilitate benchmarking across institutions. Prospective studies incorporating real-time trigger surveillance may offer additional insights into preventable harm and the timeliness of intervention. Further refinement of trigger definitions and integration with electronic health record systems could improve sensitivity and streamline data collection. There is also a need to investigate the impact of trigger tool-based interventions on clinical outcomes, staff engagement, and safety culture over time.

In conclusion, this study affirms the feasibility and value of structured trigger tool methodology for identifying adverse events in perinatal hospital care, demonstrating that most detected harms are temporary but clinically relevant. The findings advocate for routine, systematic use of trigger tools to inform continuous quality improvement and enhance patient safety, while highlighting opportunities for targeted interventions at high-risk clinical junctures. By contributing robust local data and comparative analysis, this work advances the understanding of adverse event epidemiology and provides a foundation for future safety initiatives in maternal and neonatal health (1,3,4,5,7,8,10).

CONCLUSIONS

This study demonstrates that the application of the IHI perinatal trigger tool enables the reliable identification of adverse events in hospitalized obstetric and neonatal patients, with an overall adverse event rate of 15.8 per 100 admissions and the majority of harm being temporary and amenable to intervention. These findings underscore the importance of systematic adverse event surveillance in perinatal care, supporting a shift toward proactive, system-level safety improvement rather than reliance on traditional incident reporting alone. Clinically, integrating trigger tool methodology into routine practice can enhance the detection of harm, guide quality improvement efforts, and ultimately improve patient outcomes. From a research perspective, these results highlight the need for multicenter and prospective studies to further validate the tool and to evaluate the effectiveness of targeted safety interventions informed by trigger-based surveillance, thereby advancing patient safety and quality of care in maternal and neonatal health.

REFERENCES

1. Rozich JD, Haraden CR, Resar RK. Adverse Drug Event Trigger Tool: A Practical Methodology For Measuring Medication Related Harm. Qual Saf Health Care. 2003;12:194-200
2. Classen DC, Pestotnik SL, Evans RS, Burke JP. Computerized Surveillance Of Adverse Drug Events In Hospital Patients. JAMA. 1991;266(20):2847-2851
3. Griffin FA, Resar RK. IHI Global Trigger Tool For Measuring Adverse Events. IHI Innovation Series White Paper. Cambridge, Massachusetts: Institute For Healthcare Improvement; 2007
4. Adler L, Denham CR, McKeever M, Purinton R, Guilloteau F, Moorhead JD, Resar R. Global Trigger Tool: Implementation Basics. J Patient Saf. 2008;4:245-249
5. Classen DC, Lloyd RC, Provost L, Griffin F, Resar R. Development And Evaluation Of The Institute For Healthcare Improvement Global Trigger Tool. J Patient Saf. 2008;4:169-177
6. Institute For Healthcare Improvement. UK Adverse Event Trigger Tool. Available from: https://www.ihi.org/resources/Pages/Tools/UKAdverseEventTriggerTool.aspx
7. Vincent C, Neale G, Woloshynowych M. Adverse Events In British Hospitals: Preliminary Retrospective Record Review. BMJ. 2001;322:517-519
8. Sari A, Sheldon T, Cracknell A, Turnbull A. Sensitivity Of Routine System For Reporting Patient Safety Incidents In An NHS Hospital: Retrospective Patient Case Note Review. BMJ. 2007;333:79-81
9. Sari A, Sheldon T, Cracknell A, Turnbull A, Dobson Y, Grant C, Gray W, Richardson A. Extent, Nature And Consequence Of Adverse Events: Results Of A Retrospective Case Note Review In A Large NHS Hospital. Qual Saf Health Care. 2007;16:434-439
10. Hogan H, Olsen S, Scobie S, Chapman E, Sachs R, McKee M, Vincent C, Thomson R. What Can We Learn About Patient Safety From Information Sources Within An Acute Hospital: A Step On The Ladder Of Integrated Risk Management? Qual Saf Health Care. 2008;17:209-215