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Strategy for Reducing Postpartum Hemorrhage Incidence Through the Implementation of Digital-Based Admission Screening: An Action Study in Hospitals

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ABSTRACT

Postpartum hemorrhage (PPH) remains the leading cause of maternal mortality globally, including in Indonesia, where it accounts for 30.3% of maternal deaths. While PPH often occurs suddenly, its risk can be predicted at the time of hospital admission through systematic screening. However, the effectiveness of such screening depends on healthcare worker compliance, which can be hindered by administrative burdens. This study aims to evaluate the effectiveness of implementing a digital-based PPH admission screening tool in improving staff compliance and reducing PPH incidence at Muhammadiyah Gresik Hospital. Using an action research methodology under the Plan-Do-Study-Act (PDSA) framework, the study was conducted in two cycles. Cycle 1 employed a manual (paper-based) screening form, while Cycle 2 introduced a fully digital format. The study population included all maternity patients admitted during the intervention periods, with total sampling applied. Data were collected through direct observation, medical record audits, and hospital quality reports, and analyzed descriptively by comparing compliance and PPH rates across cycles. The findings indicate that the transition to a digital format significantly increased staff compliance from 89% in Cycle 1 to 100% in Cycle 2. Importantly, this improvement in compliance was directly associated with a reduction in PPH incidence from 3% at baseline to 1% post-digital intervention. The study concludes that digital-based admission screening serves as a crucial cognitive aid for strengthening risk management and advancing toward the zero-preventable-harm patient safety target.

KEYWORDS Postpartum Haemorraghic (PPH); Admission Screening; PDSA; Healthcare Service Quality; Hospital Digitalization

INTRODUCTION

The persistently high maternal mortality ratio (MMR) remains one of the most critical and unresolved public health challenges in Indonesia (Saleh, Sukristyanto, & Handoko, 2026; Syairaji et al., 2024). Data indicate that the majority of these deaths are triggered by complications that arise suddenly in the postpartum period, where delayed or inadequate response can rapidly lead to fatal outcomes (Hidayati et al., 2026). Nationally, postpartum hemorrhage (PPH) is identified as the single largest direct cause, responsible for approximately 30.3% of maternal deaths, followed by preeclampsia/eclampsia at 27.1% and infections at 7.3% (Dwiyanti et al., 2023). This national trend is consistent with global data from the World Health Organization (WHO, 2023), which confirms PPH as the leading cause of maternal mortality worldwide, with the majority of deaths occurring within the first 24 hours post-delivery (Mawia, 2025). The urgency of addressing PPH is further underscored by its prevalence in East Java, which recorded 565 maternal deaths, of which 127 were directly attributable to hemorrhage (Ministry of Health, 2021).

At the local level, Muhammadiyah Gresik Hospital faces similar challenges. Data from the Quality Improvement (QI) Team covering the period from June 2023 to March 2024 show that the incidence rate of PPH in the maternity ward remained at 3% (Quality Improvement Team Program of Muhammadiyah Gresik Hospital, 2024). This figure is

considered suboptimal, as the hospital's target is 0% (zero tolerance for preventable maternal death) (Makuei, Abdollahian, & Marion, 2020). Preliminary analysis suggests that the absence of standardized instruments to identify at-risk patients during hospital admission is a major contributing factor (Krystkiewicz & Soyka, 2025; Yusop, Mat, Mustafar, & Ismail, 2025).

Early detection through admission screening has been internationally recognized as one of the key strategies for reducing the risk of maternal mortality (Padilla et al., 2021). The identification of risk factors at the time of admission is essential for ensuring medical team preparedness. Neary et al. (2021) emphasized that systematically predicting PPH risks can help plan more measurable interventions. This is corroborated by Ruppel et al. (2020), who validated that the stratification of admission risk in large obstetric populations is highly effective in mitigating the impact of postpartum bleeding. Scientific evidence indicates that the use of screening tools serves as a valuable cognitive aid, enabling clinicians to prepare resources in a timely manner, including managing blood stock availability and ensuring close monitoring of high-risk patients (Gammon et al., 2023). Therefore, this study focuses on implementing Plan–Do–Study–Act (PDSA)-based interventions to improve the quality of services through systematic admission screening (Galligan, 2026; Ohta, Kato, & Sano, 2025).

Although various studies have demonstrated the effectiveness of PPH risk screening, most have concentrated on the use of manual instruments or have not directly evaluated the impact of digital transformation on healthcare worker compliance and clinical outcomes in the context of Indonesian hospitals (Sanjaya et al., 2023; Wahyuningsih & Susanti, 2025). Furthermore, there is a lack of research employing the PDSA-based action research approach to assess the implementation of digital PPH risk screening (Fan, Shi, & Wang, 2026). Hence, this study seeks to bridge that gap by evaluating the effectiveness of digital-based PPH admission screening in improving staff compliance and reducing PPH incidence at Muhammadiyah Gresik Hospital (Darmawan, Wirakusumah, Rinawan, Purbasari, & Widiyanti, 2025).

The gap between proven screening concepts and their real-world implementation forms the core urgency of this study. Without a proper understanding of the implementation process, hospitals risk investing in tools that are theoretically sound but practically ineffective due to low adoption rates. This research is critical because it addresses a significant patient safety issue—preventable maternal death—by investigating not only what to screen for but also how to ensure that screening occurs consistently and effectively in a busy clinical environment. The findings are expected to provide actionable insights for hospital management, helping to translate quality improvement policies into tangible reductions in maternal harm.

This study aims to evaluate the effectiveness of implementing digital-based PPH admission screening in improving staff compliance and reducing the incidence of postpartum bleeding at Muhammadiyah Gresik Hospital.

METHOD

This research is an action research study that employs a sustainable quality improvement framework through the Plan–Do–Study–Act (PDSA) cycle. The study was conducted in the maternity ward of Muhammadiyah Gresik Hospital, with a population

comprising all mothers admitted for childbirth during the two intervention periods. The intervention targeted healthcare staff to assess their compliance in conducting admission screenings for pregnant women entering the pre-natal period during the intervention timeframe. The first intervention period was implemented from May to June 2024, and the second was conducted in August 2024. The intervention stages included Cycle 1, which involved testing the PPH risk screening form in a manual (paper-based) format, and Cycle 2, which introduced the transition to a digital PPH risk screening form. Data analysis was performed through a comparative evaluation of staff compliance in completing admission screenings and the incidence of PPH in the maternity ward of Muhammadiyah Gresik Hospital.

The study population consisted of all mothers admitted to the maternity ward of Muhammadiyah Gresik Hospital during the research period. The research sample was determined using a total sampling technique, encompassing all patients who met the inclusion criteria during the Cycle 1 and Cycle 2 intervention periods. The independent variable in this study is the implementation of digital-based PPH admission screening, whereas the dependent variables are staff compliance with screening procedures and the incidence of postpartum hemorrhage.

Data were collected through direct observation, medical record audits, and hospital quality indicator reports related to screening compliance and PPH events. Data analysis was conducted using a comparative descriptive approach by comparing staff compliance levels and PPH incidence rates across the baseline, Cycle 1, and Cycle 2 periods.

RESULT AND DISCUSSION

Based on the results of the intervention in Silus 1 and Cycle 2, there were several field findings obtained during the research implementation. The presentation of these results was prepared to answer the main problem, namely the high incidence rate of PPH in the maternity ward of Muhammadiyah Gresik Hospital. The implementation of quality improvement to reduce the rate of postpartum bleeding (PPH) is carried out through two main cycles documented in the *Plan-Do-Study-Act* (PDSA) framework. Data was collected through direct observation of officers' compliance in filling out screening forms and monitoring clinical data on PPH incidence in the maternity ward.

Details of each stage of the cycle are presented in the following table:

Table 1. Quality Improvement Stage Matrix Based on PDSA Cycle

Stages of PDSA	Cycle 1 (May-June 2024)	Cycle 2 (August 2024)
Plan	Identify PPH risk factors during admission using manual assessment instruments (paper).	Transformation of instruments into digital formats to improve accessibility and ease of charging.
Do (Implementation)	Trial of filling out a manual screening form by a nurse/midwife when the patient enters.	Implementation of digital forms with the support of Jaga doctors to help validate and complete data.
Study	Compliance of officers reached 89%. However, charging is inconsistent and data is often not	Officers' compliance increased significantly to 100%. Digitization makes it easy to track risks

	integrated in *real-time*.	instantly.
Act (Follow-up)	Decided to abandon the paper format due to the high administrative burden for officers.	Integrate digital forms into the unit's priority quality indicator (IMP) system permanently.

Evaluation in Cycle 1 revealed that while officers understood the urgency of risk detection, the paper-based manual screening format tended to be seen as an administrative burden amid high clinical workloads. This creates a gap between policy and practice on the ground, which is reflected in a compliance rate of 89%. From the results of Cycle 1, the transformation process from manual to digital systems was carried out, which was designed to overcome administrative obstacles that hindered the screening process. After the adoption of digital technology in Cycle 2, it was found that the transformation from manual to digital systems succeeded in eliminating these physical barriers. The integration of a system that facilitates *real-time* data input by doctors and midwives not only simplifies accessibility, but also significantly strengthens the validity of patient risk documentation. This is shown by the achievement of 100% compliance of officers.

Changes in screening methods have a direct impact on the performance of medical personnel and patient health outcomes. Comparison of quantitative outcomes between the period before the intervention, Cycle 1, and Cycle 2 showed a consistent improvement trend. This can be seen from the achievement of compliance and clinical indicators in Table 2.

Table 2. Achievement of Officer Compliance Indicators and Income Tax Incidents

Quality Indicators	Baseline (June 2023 – March 2024	Cycle 1	Cycle 2
PPH Screening Compliance	-	89%	100%
PPH Incident Incident	3%	3%	1%

In Cycle 1, the use of manual forms showed that although staff were aware of the importance of screening (89% compliance), physical barriers in the form of paper documents prevented data from being delivered promptly to other clinical teams. As a result, the PPH rate remained at 3%, as team preparedness was not automatically triggered. Meanwhile, in Cycle 2, after digitizing the instrument, the data entry barriers were minimized. The involvement of on-duty physicians within the digital system ensured that every patient admitted was stratified by risk without exception (100% compliance). Clinical outcomes demonstrated a significant reduction in PPH incidence to 1%.

The results of this study indicate that transforming screening instruments from manual to digital formats has a substantial impact on the quality of clinical services in the maternity ward. The achievement of 100% staff compliance in Cycle 2 demonstrates that information technology plays an essential role as a cognitive aid, alleviating the administrative burden on medical personnel.

The reduction in PPH incidence from 3% to 1% provides clear evidence of the effectiveness of early detection. These findings align with the study by Neary et al. (2021), which confirmed that systematic prediction of PPH risk greatly aids in planning measurable interventions. When high-risk patients are identified at admission, the medical team can implement preventive measures early, such as preparing adequate blood reserves, assigning more experienced personnel, and ensuring more intensive IV monitoring.

Although the results at Muhammadiyah Gresik Hospital demonstrated considerable success, it is important to consider the findings of Ruppel et al. (2020). In their study of the California Maternal Quality Care Collaborative (CMQCC) admission risk assessment criteria, they found that although risk stratification successfully differentiated the severity of PPH and enabled early preparation, the instrument still missed a significant proportion of bleeding cases. Ruppel et al. (2020) suggested that improving risk assessment for postpartum bleeding should include additional non-obstetric factors beyond those assessed at admission. This insight provides an important perspective for Muhammadiyah Gresik Hospital to enhance its digital screening forms further. Achieving a 1% incidence rate is a remarkable milestone, yet reaching the zero-incidence (0%) target will require incorporating additional non-obstetric variables or other clinical risk factors not currently covered in the instrument.

The increase in compliance from 89% to 100% demonstrates that digitization effectively reduces administrative barriers and enhances usability. This finding aligns with health technology theories asserting that digital systems improve documentation efficiency and staff compliance. Overall, the implementation of digital-based screening can serve as a model for other hospitals aiming to improve maternal safety and the quality of obstetric care.

This study has certain limitations, including its implementation in a single hospital, which restricts the generalizability of the findings. Additionally, it employed descriptive rather than inferential statistical analysis, limiting causal interpretations. Further research is recommended, involving multiple hospitals and applying more comprehensive statistical techniques to strengthen analytical rigor.

CONCLUSION

The implementation of digital-based PPH admission screening effectively increases officer compliance and reduces the incidence of PPH at Muhammadiyah Gresik Hospital. The use of digital technology is able to trigger better clinical awareness than manual methods. Hospitals are advised to integrate these screening systems into their comprehensive electronic medical record (EMR) systems and conduct regular audits of the risk variables used to ensure wider risk detection coverage. The implementation of digital-based screening is recommended to be integrated nationally as part of the maternal safety system.

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