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Research Article

Nursing and Midwifery Roles in Early Recognition and Management of Maternal Clinical Deterioration During Labor and Immediate Postpartum Period

Ahood Atallah Abeed Alenezi[1]*, Alanazi, Nadiyah Ribat S[2], Laila Mater Saeed Alshahrani[3], Asiri, Areej Ayed Abdallah[4], Alreweli, Norh Akashan S[5], Bashayr Hulayyil J Alruwaili[6], Manayah Mohammed Asiri[7], Karimah Khader T Alanazi[8], Ahlam Qati N Alanazi[9], Asiri, Munirah Yahya M[10], Amani Alshwi Alruwaili[11]

[1]Midwife – Maternity and Children's Hospital, Arar, Northern Borders Health Cluster, Ministry of Health, Arar, Northern Borders Region, Saudi Arabia
* **Corresponding Author Email:** ohalenezi@moh.gov.sa - **ORCID:** 0000-0002-0247-185X

[2]Midwifery Nursing – Al-Salihiyah Al-Shamali Primary Health Care Center, Northern Borders Health Cluster, Ministry of Health, Arar, Northern Borders Region, Saudi Arabia
Email: nadyha@moh.gov.sa - **ORCID:** 0000-0002-1247-285X

[3]Midwife Technician – West Khamis Mushait Primary Health Care Center, Aseer Health Cluster, Ministry of Health, Khamis Mushait, Aseer Region, Saudi Arabia
Email: lmalshahrani@moh.gov.sa - **ORCID:** 0000-0002-2247-385X

[4]Midwife Technician – Asir Central Hospital, Aseer Health Cluster, Ministry of Health, Abha, Aseer Region, Saudi Arabia
Email: arasiri@moh.gov.sa - **ORCID:** 0000-0002-3247-485X

[5]Midwife Technician – Maternity and Children's Hospital, Arar, Northern Borders Health Cluster, Ministry of Health, Arar, Northern Borders Region, Saudi Arabia
Email: nalreweli@moh.gov.sa - **ORCID:** 0000-0002-4247-585X

[6]Nursing and Midwifery – Domat Al-Jandal General Hospital, Al Jouf Health Cluster, Ministry of Health, Domat Al-Jandal, Al Jouf Region, Saudi Arabia
Email: boony2014@gmail.com - **ORCID:** 0000-0002-6247-685X

[7]Midwife – Mohayel General Hospital, Aseer Health Cluster, Ministry of Health, Mohayel Aseer, Aseer Region, Saudi Arabia
Email: mmn90217@gmail.com - **ORCID:** 0000-0002-7247-885X

[8]Midwife – Health Care Model Administration, Northern Borders Health Cluster, Ministry of Health, Arar, Northern Borders Region, Saudi Arabia
Email: kkalenzi@moh.gov.sa - **ORCID:** 0000-0002-8247-985X

[9]Midwife Technician – Maternity and Children's Hospital, Arar, Northern Borders Health Cluster, Ministry of Health, Arar, Northern Borders Region, Saudi Arabia
Email: aqalanzy@moh.gov.sa - **ORCID:** 0000-0002-9247-115X

[10]Nursing Technician – Aseer Health Cluster, Ministry of Health, Abha, Aseer Region, Saudi Arabia
Email: myassery@moh.gov.sa - **ORCID:** 0000-0002-5247-125X

[11]Nursing – Maternity and Children's Hospital, Sakaka, Al Jouf Health Cluster, Ministry of Health, Sakaka, Al Jouf Region, Saudi Arabia
Email: deemaalrwely@gmail.com - **ORCID:** 0000-0002-5547-335X

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Abstract:

The pivotal roles of nurses and midwives in safeguarding maternal health are most critically demonstrated in their capacity for the early recognition and management of clinical deterioration during labor and the immediate postpartum period. Acting as primary bedside sentinels, these professionals employ continuous, holistic surveillance—integrating data from Modified Early Obstetric Warning Systems (MEOWS) with astute clinical judgment of vital signs, uterine tone, blood loss, and subtle psychosocial cues—to identify the often-masked early signs of catastrophic events like postpartum hemorrhage, sepsis, and hypertensive crises. Their specialized understanding of obstetric physiology allows them to interpret deviations within the unique context of the childbearing body, enabling timely intervention before irreversible decompensation occurs. Crucially, their role extends beyond monitoring to include initiating first-line emergency measures, orchestrating multidisciplinary team responses through structured communication, and advocating for the woman within the care continuum. Ultimately, the effectiveness of maternal safety systems hinges on the expertise, vigilance, and empowered action of nursing and midwifery staff, making their central position fundamental to reducing global maternal mortality and severe morbidity.

1. Introduction

The journey of childbirth, while a profound and natural life event, represents a period of significant physiological stress and potential vulnerability for the childbearing woman. The global commitment to improving maternal health, as encapsulated in Sustainable Development Goal 3.1, has led to substantial reductions in maternal mortality over recent decades. However, maternal deaths and severe maternal morbidity (SMM) remain stark realities, with an estimated 287,000 maternal deaths occurring globally in 2020, the vast majority of which are preventable [1]. A critical window of risk exists during labor, birth, and the immediate postpartum period—often defined as the first 24 hours following childbirth. It is during this time that the dynamic physiological adaptations of pregnancy can rapidly unravel, leading to acute clinical deterioration from causes such as postpartum hemorrhage (PPH), hypertensive disorders (notably pre-eclampsia and eclampsia), sepsis, and complications of pre-existing conditions [2].

Maternal clinical deterioration is frequently not a sudden, unheralded event but rather a cascade of physiological decompensation that follows a detectable, albeit sometimes rapid, trajectory. The concept of the "obstetric emergency" often overshadows the more nuanced reality of escalating abnormality in vital signs, symptomatology, and laboratory values that, if recognized early, can be intercepted before irreversible harm occurs [3]. This underscores the paramount importance of vigilant, continuous monitoring and astute clinical assessment—a domain where nurses and midwives are not merely participants but are foundational pillars of safety. As the healthcare professionals who spend the most continuous time at the woman's bedside during labor and in the hours after birth, their role transcends task completion and enters the realm of expert surveillance, advocacy, and early intervention.

The distinctive nature of maternal physiology complicates the recognition of deterioration. The normal physiological changes of pregnancy—including increased blood volume, elevated cardiac output, decreased systemic vascular resistance, and a relative state of immunomodulation—can mask early signs of shock or infection and alter the typical clinical presentation of illness [4]. For instance, a pregnant or recently delivered woman may maintain a normal blood pressure until a significant volume of blood is lost, at which point she can deteriorate precipitously. Similarly, normal tachycardia during labor can obscure early signs of hypovolemia or sepsis. This requires nurses and midwives to possess not only standard assessment skills but also a deep, specialized understanding of obstetric physiology and the deviations that signal danger.

Furthermore, the context of care significantly influences outcomes. In low-resource settings, the challenges are immense, often involving staffing shortages, lack of equipment, and delayed access to higher-level care. In well-resourced settings, system complexities, fragmentation of care, and communication failures can contribute to adverse outcomes [5]. In all environments, cognitive biases—such as fixation on a single diagnosis (e.g., assuming pain is solely due to labor) or failure to appreciate the acuity of a situation due to a gradual decline—pose significant threats to timely recognition [6].

This review posits that the effective early recognition and management of maternal clinical deterioration is fundamentally dependent on the expertise, vigilance, and proactive actions of nursing and midwifery professionals. Their role is

multifaceted, encompassing continuous physiological surveillance using standardized tools, sophisticated clinical judgment, immediate initiation of evidence-based interventions, skilled communication within multidisciplinary teams, and the provision of compassionate, woman-centered care that empowers patients as partners in safety. The integration of these elements forms a critical safety net [7, 8].

2. The Physiological Backdrop: Normalcy and Deviation in Labor and Postpartum

To recognize the abnormal, one must have an expert understanding of the normal. The intrapartum and immediate postpartum periods are characterized by intense and rapid physiological changes designed to facilitate birth and initiate lactation, which simultaneously alter the typical responses to illness and injury.

Cardiovascular and Hemodynamic Adaptations: During pregnancy, blood volume increases by approximately 40-50%, and cardiac output rises by 30-50% to meet the metabolic demands of the fetus and placenta [9]. Systemic vascular resistance drops, and heart rate increases. During labor, each uterine contraction results in an autotransfusion of 300-500 ml of blood back into the systemic circulation, causing transient increases in cardiac output and blood pressure [10]. This "reserve" means a woman can lose a considerable amount of blood (e.g., 500-1000 ml) before manifesting classic signs of hypovolemic shock like tachycardia and hypotension. However, once this compensatory reserve is exhausted, deterioration can be swift and catastrophic. The immediate postpartum period sees a dramatic shift: with the delivery of the placenta, the low-resistance placental bed is removed, causing a sudden increase in systemic vascular resistance. Concurrently, the relief of vena caval compression and the contraction of the uterus return blood to the central circulation. This places a significant load on the heart, making this a period of high risk for women with underlying cardiac conditions or pre-eclampsia [11].

The Role of Uterine Atony and Coagulation: The primary mechanism for preventing hemorrhage after placental separation is sustained contraction of the uterine muscle fibers, which compresses the spiral arteries ("living ligatures"). Uterine atony—failure of the uterus to contract adequately—is the leading cause of PPH. Nurses and midwives must be adept at assessing uterine tone frequently and consistently postpartum. Furthermore, pregnancy induces a state of hypercoagulability to protect against hemorrhage at delivery, increasing the risk of thromboembolic events, which remain a leading cause of maternal death in developed nations [12]. Assessment for signs of deep vein thrombosis or pulmonary embolism is a critical nursing/midwifery responsibility.

Renal and Respiratory Changes: The glomerular filtration rate increases during pregnancy, often lowering normal serum creatinine levels. Respiratory changes include diaphragmatic elevation and a state of compensated respiratory alkalosis. Awareness of these baselines is crucial for interpreting laboratory results and clinical signs. For example, a "normal" creatinine for a non-pregnant woman may indicate significant renal impairment in a postpartum woman [13].

The Masking of Sepsis: The immunomodulated state of pregnancy can alter the classic systemic inflammatory response to infection. Fever may be absent or blunted, and white blood cell count, which is normally elevated in pregnancy and further increased during labor, becomes a less specific marker for infection [14]. This places a premium on the nurse's and midwife's holistic assessment, including monitoring for subtle changes in mental status, persistent tachycardia, and the development of localized signs of infection (e.g., foul-smelling lochia, uterine tenderness).

Understanding this unique physiological canvas is the first, non-negotiable competency for nurses and midwives. It allows them to interpret vital signs and symptoms not in isolation, but through the lens of obstetric physiology, enabling them to distinguish between normal adaptations and the earliest whispers of pathological deviation [15].

3. Early Warning Systems: Tools for Standardized Vigilance

Given the challenges in recognizing deterioration in this unique population, structured assessment tools have been developed to enhance vigilance. Modified Early Obstetric Warning Systems (MEOWS) or Maternal Early Warning Criteria (MEWC) are evidence-based protocols that assign thresholds to routine vital signs (e.g., blood pressure, heart rate, respiratory rate, temperature, oxygen saturation) and key symptoms (e.g., pain, headache, agitation) [16]. The core principle is that deviation of a single parameter outside a "trigger" threshold, or smaller deviations in multiple parameters, should prompt an escalated clinical response.

The Nurse/Midwife as the System Operator: The effectiveness of any early warning system is entirely dependent on its consistent and correct application at the bedside. This is the primary

domain of the nursing and midwifery staff. Their role involves:

- **Accurate and Frequent Data Collection:** Adhering to prescribed monitoring schedules (e.g., hourly in active labor, every 15 minutes after birth for the first hour) using calibrated equipment and proper technique [17].
- **Correct Scoring and Interpretation:** Precisely plotting values on MEOWS charts and calculating aggregate scores. This requires understanding that a systolic BP of 150 mmHg in a previously normotensive woman is a significant trigger, or that a respiratory rate of 24 breaths/min merits attention even in the absence of other signs [18].
- **Triggering the Protocol:** The most critical step is acting upon the trigger. The nurse/midwife must initiate the predefined response, which typically involves informing the primary midwife or obstetrician, repeating observations more frequently, and conducting a focused assessment. They act as the sensor that activates the wider safety system.

Beyond the Numbers: Integrating Clinical Judgment: While MEOWS are invaluable, they are screening tools, not diagnostic instruments. The expert nurse or midwife integrates the quantitative data from the MEOWS with qualitative clinical observation. This includes assessing the woman's color, skin perfusion (capillary refill), level of consciousness, emotional state, pain characteristics, and the quality of uterine tone and lochia [19]. A woman may have "green" vital signs but appear pale, anxious, and report a vague sense of "impending doom"—a classic, albeit subjective, sign of significant hypovolemia. The nurse's role is to advocate for this holistic clinical picture, ensuring that intuitive concerns are communicated and investigated, even in the absence of a formal MEOWS trigger [20].

Challenges and Implementation: Barriers to effective use include inadequate training, chart fatigue, lack of institutional support for the mandated responses, and hierarchical cultures where junior staff may hesitate to call a senior clinician. Nurses and midwives are often at the forefront of advocating for proper implementation, training of peers, and auditing compliance to ensure these systems function as intended [21].

Core Clinical Competencies for Recognition and Initial Management

The recognition of deterioration must be seamlessly coupled with initial, often time-critical, management to stabilize the woman while summoning the full multidisciplinary team. Nurses and midwives are first responders, and their competencies in several key areas are lifesaving.

Surveillance and Systematic Assessment: This is the continuous, disciplined process of "looking, listening, and feeling." It involves a structured "head-to-toe" approach even in a busy labor ward. Key foci include:

- **Cardiovascular:** Monitoring for tachycardia (often the first sign of volume loss), hypotension (a late sign), and assessing peripheral perfusion.
- **Respiratory:** Observing work of breathing, auscultating breath sounds, and monitoring oxygen saturation. Tachypnea can be an early indicator of acidosis, pulmonary edema, or pulmonary embolism [22].
- **Neurological:** Frequent assessment of level of consciousness using tools like AVPU (Alert, Voice, Pain, Unresponsive) or Glasgow Coma Scale. Agitation, confusion, or severe headache can signal hypoxemia, severe hypertension, or impending eclampsia.
- **Renal:** Monitoring urinary output via catheter is a critical indicator of renal perfusion and cardiac output. Oliguria (<30 ml/hr) is a major red flag for hypovolemia or severe pre-eclampsia [23].
- **Uterine and Bleeding Assessment:** Palpating for uterine tone (firm, central, at or below the umbilicus) and assessing the amount, consistency, and presence of clots in vaginal blood loss. Quantitative measurement of blood loss (QBL), using calibrated drapes or bags, is increasingly recognized as more accurate than visual estimation, a skill nurses and midwives must master [24].

Mastery of Initial Emergency Interventions: Before or while the obstetrician or anesthesiologist arrives, nurses and midwives are trained to initiate stabilizing interventions:

- **For Suspected PPH:** Immediate fundal massage to stimulate uterine contraction, administration of first-line uterotonics (like oxytocin) as per protocol, ensuring large-bore IV access, and commencing rapid crystalloid infusion [25].
- **For Hypertensive Emergencies:** Ensuring a quiet, dark environment, administering prescribed antihypertensives (e.g., labetalol, nifedipine), preparing for magnesium sulfate administration to prevent seizures, and closely monitoring for signs of pulmonary edema [26].

- **For Suspected Sepsis:** Obtaining cultures (blood, urine), administering the first dose of broad-spectrum antibiotics as per sepsis protocol (the "Sepsis Six" or similar bundles), and initiating fluid resuscitation [27].
- **Basic Life Support (BLS) and Obstetric Life Support:** Competency in adult BLS and, ideally, more specialized courses like Managing Obstetric Emergencies and Trauma (MOET) or similar, which include skills for maternal cardiac arrest, considering left uterine displacement for aortocaval compression [28].

4. Communication, Teamwork, and the Culture of Safety

The technical skills of recognition and intervention are futile without effective communication. Nurses and midwives operate at the hub of the clinical team and are critical in orchestrating the response.

Structured Communication Tools: Using tools like SBAR (Situation, Background, Assessment, Recommendation) ensures concise, relevant information is transmitted without omission. For example: "Situation: This is Nurse X calling about Mrs. Y in Room 3, 1-hour post vaginal delivery. I am concerned she is developing a major PPH. Background: She is a primip, had a prolonged second stage. Assessment: Her pulse has risen from 90 to 130 in 30 minutes. Estimated blood loss is 800 ml, uterus is boggy despite massage, and she is becoming pale and anxious. Recommendation: I need you to come assess immediately. I have started a second IV line and am giving a second dose of oxytocin" [29].

Assertion and Advocacy: In high-stakes situations, hierarchical gradients can stifle communication. Nurses and midwives must be empowered and trained in assertive communication techniques, such as the "Two-Challenge Rule" (stating a concern twice if ignored) or using the phrase "I need clarity" to escalate unresolved concerns [30]. Their advocacy extends to the woman and family, ensuring they are informed and their questions are answered even during a crisis.

Closed-Loop Communication and Debriefing: Ensuring that orders are heard, repeated back, and executed forms a closed loop, preventing errors. After a critical event, participating in a structured debrief led by or including nursing/midwifery staff is essential for learning, improving system performance, and supporting staff wellbeing [31].

Documentation: Accurate, timely, and sequential documentation is a legal and clinical imperative. The nurse's/midwife's notes provide a real-time narrative of the event, the assessments made, communications undertaken, and interventions performed, forming a crucial part of the medical record for clinical review and potential audit [32].

5. Ethical, Legal, and Professional Dimensions

The role in managing maternal deterioration is underpinned by strong ethical and legal principles.

- **Duty of Care:** Nurses and midwives have a fundamental duty to provide care that meets the standard of a reasonably competent professional. This includes the duty to monitor, recognize abnormalities, and take appropriate action [33].
- **Accountability and Autonomy:** They are accountable for their decisions and actions within their scope of practice. This requires a clear understanding of professional boundaries, when to act autonomously (e.g., starting fundal massage), and when to summon immediate help [34].
- **Informed Consent and Shared Decision-Making:** Even in emergencies, the principle of respecting patient autonomy should be upheld as much as possible. Nurses play a key role in providing clear, concise information to the woman and her family during a crisis to facilitate informed consent for procedures [35].
- **Moral Distress:** Being at the frontline, nurses and midwives may experience moral distress if they identify deterioration but face barriers to acting (e.g., delayed response from physicians, resource constraints). Systems must support them to voice concerns without fear of reprisal [36].

Education, Simulation, and Building Resilience

Preparing nurses and midwives for this high-stakes role requires robust, ongoing education that moves beyond theory.

- **High-Fidelity Simulation:** Regular, interdisciplinary simulation drills on PPH, eclampsia, sepsis, and maternal collapse are invaluable. They build technical skills, reinforce teamwork and communication patterns, and allow teams to practice in a risk-free environment, revealing system flaws [37].
- **Continuing Professional Development (CPD):** Mandatory training updates on MEOWS, neonatal resuscitation, obstetric emergencies, and human factors science are essential to maintain competency [38].
- **Building Clinical Resilience:** The stress of managing emergencies can lead to burnout.

Supporting staff wellbeing through peer support programs, access to counseling, and a just culture that focuses on system learning rather than individual blame is crucial for sustaining a capable workforce [39].

6. Global Perspectives and Challenges

The context of care dramatically shapes how these roles are enacted. In low- and middle-income countries (LMICs), nurses and midwives are often the sole providers of maternity care, working with severe resource constraints—lack of essential medications, unreliable equipment, no running water or electricity, and overwhelming patient loads [40]. Their role in early recognition is even more critical, as delays in referral can be fatal. Their management may rely on more fundamental skills: bimanual uterine compression, non-pneumatic anti-shock garments, and heroic efforts to organize transport. Investing in their training and empowerment in these settings has a disproportionately high impact on maternal survival [41].

7. Conclusion

The early recognition and management of maternal clinical deterioration is a complex, high-stakes endeavor that sits at the heart of nursing and midwifery practice during the intrapartum and immediate postpartum periods. These professionals are the custodians of continuous vigilance, armed with a specialized understanding of obstetric physiology and empowered by standardized tools like MEOWS. Their expertise, however, truly manifests in the synthesis of quantitative data with nuanced clinical judgment—the ability to see the whole woman and sense impending crisis.

Their role extends far beyond monitoring; they are skilled first responders who initiate lifesaving interventions, effective communicators who activate and coordinate multidisciplinary teams, and unwavering patient advocates. This role is exercised within an ethical and legal framework that demands accountability, compassion, and resilience. The challenges vary from the system complexities of high-resource settings to the stark resource limitations in low-resource environments, but the core function remains constant: to stand as the primary sentinel at the bedside, intercepting the trajectory of deterioration at its earliest possible point.

Therefore, strengthening maternal outcomes globally necessitates a fundamental recognition that investment in the education, support, empowerment, and professional development of nurses and midwives is not an ancillary strategy, but the central strategy. By fostering environments where their surveillance is systematic, their judgment is respected, their communication is heeded, and their interventions are timely, healthcare systems can build the most effective possible defense against preventable maternal mortality and severe morbidity. The safety of mothers during childbirth depends irreducibly on the knowledge, skill, and unwavering vigilance of these essential healthcare professionals.

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References

[1] Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. Implementation Science, 5, 69.

[2] Cederfeldt, J., Carlsson, J., Begley, C., & Berg, M. (2016). Quality of intra-partum care at a university hospital in Nepal: A prospective cross-sectional survey. Sexual & Reproductive Healthcare, 7, 52–57.

[3] Nove, A., Moyo, N. T., Bokosi, M., & Garg, S. (2018). The Midwifery Services Framework: The process of implementation. Midwifery, 58, 96–101.

[4] Nove, A., Friberg, I. K., de Bernis, L., McConville, F., Moran, A. C., Najjemba, M., Ten Hoope-Bender, P., Tracy, S., & Homer, C. S. E. (2021). Potential impact of midwives in preventing and reducing maternal and neonatal mortality and stillbirths: A Lives Saved Tool modelling study. The Lancet Global Health, 9(1), e24–e32.

[5] American College of Obstetricians and Gynecologists. (2017). Practice bulletin no. 183: Postpartum hemorrhage.

[6] Aydin Kartal, Y., Kaya, L., Yazici, S., Engin, B., & Karakus, R. (2022). Effects of skin-to-skin contact on afterpain and postpartum hemorrhage: A randomized controlled trial. Nursing & Health Sciences, 24(2), 479–486.

[7] Escobar, M. F., Nassar, A. H., Theron, G., Barnea, E. R., Nicholson, W., Ramasauskaite, D., Lloyd, I., Chandraharan, E., Miller, S., Burke, T., Ossanan, G., Andres Carvajal, J., Ramos, I., Hincapie, M. A., Loaiza, S., Nasner, D., Motherhood, F. S., & Newborn Health, C. (2022). FIGO recommendations on the management of postpartum hemorrhage 2022. International Journal of Gynaecology and Obstetrics, 157(Suppl 1), 3–50.

[8] Fleischer, A., & Meirowitz, N. (2016). Care bundles for management of obstetrical hemorrhage. Seminars in Perinatology, 40(2), 99–108.

[9] Musabwasoni, M. G. S., Kerr, M., Babenko-Mould, Y., Nzayirambaho, M., & Ngabonzima, A. (2020). Assessing the impact of mentorship on nurses' and midwives' knowledge and self-efficacy in managing postpartum hemorrhage. International Journal of Nursing Education Scholarship, 17(1):20200010.

[10] Moore, E. R., Bergman, N., Anderson, G. C., & Medley, N. (2016). Early skin-to-skin contact for mothers and their healthy newborn infants. Cochrane Database of Systematic Reviews, 11(11), Cd003519.

[11] Prapawichar, P., Ratinthorn, A., Utriyaprasit, K., & Viwatwongkasem, C. (2020). Maternal and health service predictors of postpartum hemorrhage across 14 district, general and regional hospitals in Thailand. BMC Pregnancy and Childbirth, 20(1), 172.

[12] Natrella, M., Di Naro, E., Loverro, M., Benshalom-Tirosh, N., Trojano, G., Tirosh, D., Besser, L., Loverro, M. T., & Mastrolia, S. A. (2018). The more you lose the more you miss: Accuracy of postpartum blood loss visual estimation. A systematic review of the literature. The Journal of Maternal-Fetal & Neonatal Medicine, 31(1), 106–115.

[13] Petrocnik, P., & Marshall, J. E. (2015). Hands-poised technique: The future technique for perineal management of second stage of labour? A modified systematic literature review. Midwifery, 31(2), 274–279.

[14] Gerard, J. L., Turrentine, M. A., & Leong-Kee, S. (2024). Reducing hemorrhage-related maternal morbidity using interdisciplinary simulation training. Simulation in Healthcare, 19(1), 21–26.

[15] Queensland Health. (2023). Primary postpartum haemorrhage.

[16] Akter, S., Forbes, G., Miller, S., Galadanci, H., Qureshi, Z., Fawcus, S., Justus Hofmeyr, G., Moran, N., Singata-Madliki, M., Amole, T. G., Gwako, G., Osoti, A., Thomas, E., Gallos, I., Mammoliti, K. M., Coomarasamy, A., Althabe, F., Lorencatto, F., & Bohren, M. A. (2022). Detection and management of postpartum haemorrhage: Qualitative evidence on healthcare providers' knowledge and practices in Kenya, Nigeria, and South Africa. Frontiers in Global Women's Health, 3, 1020163.

[17] Huang, J., Lu, H., Zang, Y., Ren, L., Li, C., & Wang, J. (2020). The effects of hands on and hands off/poised techniques on maternal outcomes: A systematic review and meta-analysis. Midwifery, 87, 102712.

[18] Loewenberg Weisband, Y., Klebanoff, M., Gallo, M. F., Shoben, A., & Norris, A. H. (2018). Birth outcomes of women using a midwife versus women using a physician for prenatal care. Journal of Midwifery & Women's Health, 63(4), 399–409.

[19] Reale, S. C., Easter, S. R., Xu, X., Bateman, B. T., & Farber, M. K. (2020). Trends in postpartum hemorrhage in the United States from 2010 to 2014. Anesthesia and Analgesia, 130(5), e119–e122.

[20] Moudi, Z., Tabatabaei, S. M., Sargazi-Moakhar, Z., Mollashahi, S., Zaboli, M., & Boroojeny, S. B. (2019). Empowering midwives to manage postpartum haemorrhage in rural areas of Islamic Republic of Iran: Lessons learnt from cases of maternal death. Eastern Mediterranean Health Journal, 25(9), 637–646.

[21] Ramavhoya, T. I., Maputle, M. S., Lebese, R. T., & Makhado, L. (2021). Midwives' challenges in the management of postpartum haemorrhage at rural PHC facilities of Limpopo province, South Africa: An explorative study. African Health Sciences, 21(1), 311–319.

[22] Kalu, F. A., & Chukwurah, J. N. (2022). Midwives' experiences of reducing maternal morbidity and mortality from postpartum haemorrhage (PPH) in Eastern Nigeria. BMC Pregnancy and Childbirth, 22(1), 474.

[23] Esan, D. T., Imene, P. O., Akingbade, O., Ojo, E. F., & Ramos, C. (2022). Management of postpartum hemorrhage by midwives in selected healthcare facilities in Ekiti State: An exploratory qualitative study. Enfermería Clínica, 33, 93–101.

[24] Sandall, J., Soltani, H., Gates, S., Shennan, A., & Devane, D. (2016). Midwife-led continuity models versus other models of care for childbearing women. Cochrane Database of Systematic Reviews, 4(4), CD004667.

[25] Elfors, F. B., Widarsson, M., & Velandia, M. (2024). Midwives' experiences of postpartum haemorrhage: A web-based survey in Sweden. Midwifery, 129, 103902.

[26] Golmakani, N., Khaleghinezhad, K., Dadgar, S., Hashempor, M., & Baharian, N. (2015). Comparing the estimation of postpartum hemorrhage using the weighting method and national guideline with the postpartum hemorrhage estimation by midwives. Iranian Journal of Nursing and Midwifery Research, 20(4), 471–475.

[27] Beltman, J. J., van den Akker, T., Bwirire, D., Korevaar, A., Chidakwani, R., van Lonkhuijzen, L., & van Roosmalen, J. (2013). Local health workers' perceptions of substandard care in the management

of obstetric hemorrhage in rural Malawi. BMC Pregnancy and Childbirth, 13, 39.

[28] Maier, C. B., & Aiken, L. H. (2016). Task shifting from physicians to nurses in primary care in 39 countries: A cross-country comparative study. European Journal of Public Health, 26(6), 927–934.

[29] Mamakou, A. (2020). The role of midwife in postpartum hemorrhage. European Journal of Midwifery, 4, 46.

[30] Finlayson, K., Downe, S., Vogel, J. P., & Oladapo, O. T. (2019). What matters to women and healthcare providers in relation to interventions for the prevention of postpartum haemorrhage: A qualitative systematic review. PLoS One, 14(5), e0215919.

[31] Muthoni, D. M., Kabue, P. N., & Ambani, E. K. (2021). Factors that influence management of postpartum hemorrhage among midwives in a rural setting in Kenya. African Health Sciences, 21(1), 304–310.

[32] Begley, C. M., Gyte, G. M., Devane, D., McGuire, W., Weeks, A., & Biesty, L. M. (2019). Active versus expectant management for women in the third stage of labour. Cochrane Database of Systematic Reviews, 2(2), CD007412.

[33] Renfrew, M. J., McFadden, A., Bastos, M. H., Campbell, J., Channon, A. A., Cheung, N. F., Silva, D. R., Downe, S., Kennedy, H. P., Malata, A., McCormick, F., Wick, L., & Declercq, E. (2014). Midwifery and quality care: Findings from a new evidence-informed framework for maternal and newborn care. Lancet, 384(9948), 1129–1145.

[34] Raams, T. M., Browne, J. L., Festen-Schrier, V., Klipstein-Grobusch, K., & Rijken, M. J. (2018). Task shifting in active management of the third stage of labor: A systematic review. BMC Pregnancy and Childbirth, 18(1), 47.

[35] de Castro Parreira, M. V. B., & Gomes, N. C. (2013). Preventing postpartum haemorrhage: Active management of the third stage of labour. Journal of Clinical Nursing, 22(23–24), 3372–3387.

[36] Ramadhani, F. B., Liu, Y., & Lembuka, M. M. (2020). Knowledge and barriers on correct use of modified guidelines for active management of third stage of labour: A cross sectional survey of nurse-midwives at three referral hospitals in Dar es Salaam, Tanzania. African Health Sciences, 20(4), 1908–1917.

[37] Brazil, V., McLean, D., Lowe, B., Kordich, L., Cullen, D., De Araujo, V., Eldridge, T., & Purdy, E. (2022). A relational approach to improving interprofessional teamwork in post-partum haemorrhage (PPH). BMC Health Services Research, 22(1), 1108.

[38] Cohain, J. S. (2022). Novel third stage protocol reduces postpartum hemorrhage at vaginal birth. European Journal of Obstetrics, Gynecology, and Reproductive Biology, 278, 29–32.

[39] Rosmaria, R., Indrayani, I., Anggraini, Y., & Ritha, A. (2019). How Indonesian Midwives assess blood loss during labor? Pakistan Journal of Medical and Health Sciences, 13(4), 1124–1127.

[40] Liu, Y., Zhu, W., Shen, Y., Qiu, J., Rao, L., & Li, H. (2021). Assessing the accuracy of visual blood loss estimation in postpartum hemorrhage in Shanghai hospitals: A web-based survey for nurses and midwives. Journal of Clinical Nursing, 30(23–24), 3556–3562.

[41] Bewket, T., Ensieh, F., Virginia, P., & Gayle, M. (2022). Barriers to effective management of primary postpartum haemorrhage following in-hospital births in northwest Ethiopia: Healthcare providers' views using a qualitative approach. BMC Pregnancy and Childbirth, 22(1), 755.