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Implementation of the MEOWS protocol in obstetric care: evidence on the prediction of serious maternal outcomes.

Implementation of the meows protocol in obstetric care: evidence on predicting severe maternal outcomes

Implementation of the meows protocol in obstetric care: evidence on the prediction of serious maternal outcomes.

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ABSTRACT

Introduction: Maternal morbidity and mortality remain a significant public health problem, often preceded by clinical signs of deterioration that may not be recognized in a timely manner. In this context, obstetric early warning systems, such as the Modified Early Obstetric Warning Score (MEOWS), have been proposed to support the early identification of serious maternal outcomes. Objective: To map the scientific evidence on the implementation of the Modified Early Obstetric Warning Score (MEOWS) protocol for predicting serious maternal outcomes. Method: A scoping review was conducted according to PRISMA-ScR, searching the PubMed/MEDLINE, SciELO, and LILACS databases, including studies published between 2020 and 2025. Comprehensive inclusion criteria were applied, with independent selection by three authors and resolution of disagreements by consensus. Results: Twenty-five studies were included, mostly observational and implementation studies. The findings indicate that high MEOWS scores are associated with early identification of severe maternal morbidity, ICU admission, and maternal near miss. The effectiveness of the protocol proved to be dependent on team adherence, standardization of care flows, and institutional response capacity.

Conclusion: MEOWS is a useful tool for clinical surveillance in obstetrics, especially when integrated into organizational patient safety strategies, although methodological heterogeneity remains a limitation in the current evidence.

Keywords: Modified Early Obstetric Warning Score. MEOWS. Early obstetric warning systems. Severe maternal outcomes.

ABSTRACT

Introduction: Maternal morbidity and mortality remain a major public health problem and are often preceded by clinical signs of deterioration that may not be recognized promptly. In this context, obstetric early warning systems, such as the Modified Early Obstetric Warning Score (MEOWS), have been proposed to support the early identification of severe maternal outcomes.

Objective: To map scientific evidence on the implementation of the Modified Early Obstetric Warning Score (MEOWS) in predicting severe maternal outcomes. Method: A scoping review was conducted in accordance with PRISMA-ScR guidelines, with searches of PubMed/MEDLINE, SciELO, and LILACS for studies published between 2020 and 2025. Broad inclusion criteria were applied, with independent selection by three authors and resolution of disagreements by consensus. Results: Twenty-five studies were included, mainly observational and implementation studies. Findings indicate that elevated MEOWS scores are associated with

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early identification of severe maternal morbidity, ICU admission, and maternal near miss. The effectiveness of the protocol depends on team adherence, standardized care pathways, and institutional response capacity. Conclusion: MEOWS is a valuable tool for obstetric clinical surveillance when integrated into patient safety strategies, although methodological heterogeneity remains a limitation in the current evidence.
Keywords: Modified Early Obstetric Warning Score. MEOW. Early obstetric warning systems. Severe maternal outcomes.

ABSTRACT

Introduction: Maternal morbidity and mortality continue to be an important public health problem, often preceded by clinical signs of deterioration that may not be recognized in time. In this context, obstetric early warning systems are proposed, such as the Modified Obstetric Early Alert Scale (MEOWS), to support the early identification of serious maternal outcomes. Objective: Map the scientific evidence on the implementation of the Modified Obstetric Early Warning Scale (MEOWS) protocol to predict serious maternal outcomes. Method: An exploratory review was carried out according to PRISMA-ScR, searching the PubMed/MEDLINE, SciELO and LILACS databases, including studies published between 2020 and 2025. Exhaustive inclusion criteria were applied, with independent selection by three authors and resolution of disagreements through

consensus. Results: Veintic five studies were included, mostly observational and implementation. The findings indicate that high MEOWS scores are associated with early identification of severe maternal morbidity, admission to the ICU and severe maternal morbidity. The effectiveness of the protocol depends on the compliance of the team, on the standardization of the flow of attention and on the institutional response capacity. Conclusion: MEOWS is a useful tool for clinical surveillance in obstetrics, especially when integrated with organizational patient safety strategies, although methodological heterogeneity remains a limitation of current evidence.

Keywords: modified obstetric early warning score. MEOWS. Early obstetric alert systems. Serious maternal outcomes.

INTRODUCTION

Maternal morbidity and mortality remain a significant public health problem globally, reflecting inequalities in access, quality of care, and the organization of health systems. It is estimated that a significant portion of maternal deaths and cases of severe maternal morbidity are potentially preventable through the early identification of signs of clinical deterioration and the timely implementation of appropriate interventions. In this context, strategies focused on patient safety and systematic clinical surveillance have been widely discussed as essential components of qualified obstetric care (KRAWCZYK et al., 2024; EDWARDS et al., 2020).

Serious maternal outcomes, including near-miss events, intensive care unit admission, sepsis, severe hemorrhage, and eclampsia, are often preceded by measurable physiological changes, such as alterations in vital signs and neurological status.
Despite this, such signs are not always recognized early in clinical practice, especially in healthcare settings marked by work overload and...
Fragmentation of care. Faced with this scenario, clinical early warning systems emerged as structured tools to standardize the surveillance of at-risk patients. Initially developed for non-obstetric populations, these systems were later adapted to pregnancies and the postpartum period, resulting in the so-called Early Obstetric Warning Scores. Among them,

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The Modified Early Obstetric Warning Score (MEOWS) stands out for its widespread recognition. national and international (SINGH et al., 2012; BLUMENTHAL et al., 2019; RUDAKEMWA et al., 2021; CASH et al., 2021).

Thus, the MEOWS protocol is based on the systematic assessment of clinical parameters, such as heart rate, blood pressure, respiratory rate, temperature, level of consciousness, and urine output, assigning scores that indicate the need for escalation of care. The central aim of MEOWS is to provide a simple and reproducible mechanism for the early identification of clinical deterioration in pregnant and postpartum women, reducing the exclusive dependence on the individual experience of professionals and promoting more timely care responses (SINGH et al., 2016; YADAV et al., 2023).

Despite its widespread adoption, the effectiveness of MEOWS in predicting and preventing severe maternal outcomes is still a subject of debate in the scientific literature. Observational studies suggest an association between high scores and the occurrence of severe maternal morbidity; however, there is considerable heterogeneity regarding the outcomes assessed, the cut-off points used, and the contexts of implementation. Furthermore, organizational challenges such as team resistance, workload overload, failures in recording vital signs, and lack of continuing education are highlighted as factors that compromise the adherence and sustainability of MEOWS in clinical practice (MACKINTOSH et al., 2014; NUGRAHENY et al., 2026; ARNOLDS et al., 2022).

In low- and middle-income countries, the challenges for implementing MEOWS are even more complex, due to structural limitations, a shortage of human resources, and... Weaknesses in referral and counter-referral systems. In the Brazilian and Latin American context, there is a growing interest in incorporating MEOWS as a patient safety strategy in obstetric care. However, they also highlight the need to adapt MEOWS to local realities and integrate it into public policies for maternal care, avoiding the uncritical adoption of models developed in other care contexts (WERLANG et al., 2026; KEFELI ÇELIK et al., 2024; TUYISHIME et al., 2020; RUDAKEMWA et al., 2021).

Given the above, it is essential to critically evaluate the available evidence on the implementation of the MEOWS protocol and its ability to predict serious maternal outcomes. Understanding the contexts of use, barriers, and facilitators of implementation, The results associated with the protocol are essential to support clinical, organizational, and policy decisions aimed at improving maternal safety. Thus, this study proposes to comprehensively map and analyze the recent literature on MEOWS, contributing to the improvement of obstetric care and the reduction of preventable maternal outcomes (EDWARDS et al., 2020; WERLANG et al., 2026).

The aim of this study was to map and critically analyze the available scientific evidence on the implementation of the Modified Early Obstetric Warning Score (MEOWS) protocol in pregnant and postpartum women, evaluating its ability to predict serious maternal outcomes and to identify factors related to its effectiveness, clinical application, and integration into obstetric care systems, in light of a scoping review.

METHODOLOGY

This study consisted of a scoping review, conducted according to the recommendations of the Joanna Briggs Institute (JBI) and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – extension for Scoping Reviews (PRISMA-ScR) guidelines. The objective was to map the available evidence on the implementation of the Modified Early Obstetric Warning Score (MEOWS) protocol in pregnant and postpartum women, focusing on the prediction of

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Severe maternal outcomes, such as severe maternal morbidity, near miss, intensive care unit admission, and maternal death, were investigated. A literature search was conducted in the PubMed/MEDLINE, SciELO, and LILACS (BVS) databases using a standardized strategy with descriptors related to the MEOWS protocol and maternal outcomes, including "Modified Early Obstetric Warning Score," "MEOWS," "early obstetric warning systems," and "severe maternal outcomes," combined with Boolean operators. Studies published between 2020 and 2025, in English, Portuguese, or Spanish, involving pregnant and/or postpartum women were considered. Comprehensive inclusion criteria were applied, with independent selection by three authors and resolution of disagreements by consensus. Observational studies, implementation studies, clinical audits, systematic reviews, and narratives that explicitly addressed the use of MEOWS or equivalent early obstetric warning systems were included.

Editorials, letters to the editor, conference abstracts, animal studies, and publications not directly related to the protocol or without analysis of maternal outcomes were excluded. After identifying the records, duplicates were removed, followed by screening by titles and abstracts and full-text reading of eligible studies, according to the defined criteria. The selection process followed the PRISMA-ScR steps and was presented in a flowchart. Data extraction used a standardized form, including author, year, study context, methodological design, population evaluated, characteristics of MEOWS implementation, and maternal outcomes analyzed. Data synthesis was performed descriptively and analytically, allowing for the mapping of patterns, identification of gaps, and support for future research on the effectiveness of the MEOWS protocol in preventing serious maternal outcomes.

RESULTS AND DISCUSSION

Results

Based on the search strategy applied to the PubMed/MEDLINE, SciELO, and LILACS (BVS) databases, 8,420 records related to early warning systems in obstetrics and the Modified Early Obstetric Warning Score (MEOWS) protocol were identified. After applying a temporal filter, considering studies published between 2020 and 2025, the number of records was reduced to 2,986. Subsequently, editorials, letters to the editor, conference abstracts, duplicates, and experimental animal studies were excluded, resulting in 684 potentially relevant studies. In a subsequent step, more specific thematic criteria were applied, requiring studies to explicitly address the implementation of MEOWS or obstetric early warning systems and their relationship with serious maternal outcomes, such as severe maternal morbidity, near miss, intensive care unit admission, or maternal death.

This stage reduced the number of publications to 362. Subsequently, the selection was restricted to articles published in English, Portuguese, or Spanish, totaling 311 records. In the next phase, the criterion of full-text availability was applied, essential for a detailed analysis of the implementation context and the outcomes evaluated, resulting in the inclusion of 176 studies. The screening of titles and abstracts allowed the exclusion of publications that addressed early warning systems without obstetric specificity, studies focused exclusively on neonatal outcomes, or works that mentioned MEOWS tangentially, leaving 64 articles for full-text reading. During the complete evaluation of the texts, studies that did not present empirical data on maternal outcomes, that described only institutional protocols without results analysis, or that presented relevant conceptual duplication were excluded. At the end of this process, 25 studies fully met the inclusion criteria and comprised the final sample of this scoping review. The included studies presented methodological diversity, encompassing observational (cohort, cross-sectional, and case-control) studies, of

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Implementation, clinical audits, and systematic reviews were conducted. Most publications were carried out in medium- and high-complexity hospital settings, involving both pregnant and postpartum women, with a predominance of analyses related to the intrapartum period and the immediate postpartum period. Regarding the outcomes evaluated, it was observed that the studies focused mainly on the prediction of severe maternal morbidity, the activation of rapid response teams, admission to the intensive care unit, early identification of obstetric sepsis, and the occurrence of maternal near misses. In general, the results indicated that high MEOWS scores are consistently associated with a higher risk of severe maternal outcomes, although the magnitude of this association varies among studies. Regarding the implementation of the protocol, the studies reported heterogeneity in the application criteria, cut-off points, and care escalation flows, reflecting local adaptations of MEOWS. Barriers related to team adherence, incomplete recording of vital signs, and structural limitations were frequently described, especially in resource-limited contexts.

On the other hand, several studies have pointed to improved communication between multidisciplinary teams and greater systematization of clinical surveillance after the adoption of the protocol. The process of identification, screening, eligibility, and inclusion of studies is summarized in the PRISMA-ScR flowchart, presented in Figure 1, which shows the progressive reduction in the number of records until the composition of the final sample for this scoping review.

FIGURE 1: PRISMA Flowchart.

Criteria / Filters	**PubMed/MEDLINE**	**SciELO**	**LILACS**
Records identified (initial search)	**5200**	**1900**	**1320**
Time filter (2020–2025)	**1820**	**720**	**446**
Exclusion by publication type	**610**	**210**	**154**
Articles after exclusion by type	**1210**	**510**	**292**
Application of thematic criteria	**420**	**160**	**102**
Filter by language	**300**	**110**	**78**
Full text filter available	**160**	**48**	**28**
Reading titles and abstracts	**160**	**48**	**28**
Reading of (eligibility) **text** **full**	**58**	**17**	**10**
Studies included in the final review	**15**	**6**	**4**

Source: Authors (2025)

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FIGURE 2: Summary of the most frequent results according to the articles analyzed.

Author/Year	**Title**	**More result prominent**
Singh A et al., 2016	Evaluation of maternal early obstetric warning system (MEOWS chart) as a predictor of obstetric morbidity	MEOWS performed well predictive capacity for obstetric morbidity.
Singh S et al., 2012	A validation study of the CEMACH-recommended modified early obstetric warning system (MEOWS)	An effective tool for early recognition of clinical deterioration.
Mackintosh et al., 2014	Value of a modified early Obstetric warning system (MEOWS) in managing maternal complications	It improves communication. clinical and decision-making decision.
Ryan et al., 2017	Validating the performance of the modified early obstetric warning system multivariable model	Associated with the forecast of admission to the maternal ICU.
Blumenthal et al., 2019	A validation study of maternal early warning systems	Good accuracy for detecting clinical deterioration early.
Edwards et al., 2020	Prioritizing maternal sepsis	It helps reduce morbidity when prioritizing the Sepsis recognition.
Tuyishima et al., 2020	Implementing the RI and MEOWS tool in district hospitals in Rwanda	Standardized surveillance. clinic in hospitals with limited resources.

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Author/Year	**Title**	**More result prominent**
Rudakemwa et al., 2021	High mortality rate of obstetric critically ill women in Rwanda	It reinforces the need for early warning systems.
Cash et al., 2021	Frequency and severity of prehospital obstetric events	Serious events present detectable clinical signs prematurely.
Suri et al., 2021	Prognosticating fetomaternal ICU outcomes	Physiological parameters early predict outcomes in the ICU.
Singhal et al., 2022	Use of the MEOWS chart as a predictor of peri-partum morbidity	Significant association with peripartum morbidity.
Arnolds et al., 2022	Comparison of early warning scores for predicting clinical deterioration	Scores show similar performance in prediction.
Kaur et al., 2023	Application of MEOWS in postpartum patients	It facilitated detection. early and the timely referral.
Yadav et al., 2023	Validating the performance of MEOWS for the prediction of obstetric morbidity	High scores correlated with severe maternal morbidity
Mortara et al., 2023	Impact and burden of sickle cell disease in critically ill obstetric patients	It reinforces the need for monitoring structured.

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Author/Year	**Title**	**More result prominent**
Kefeli Çelik et al., 2024	Validation of the Turkish version of the MEOWS chart	Good reliability and clinical applicability.
Krawczyk et al., 2024	Preparedness for severe maternal morbidity in European hospitals	Institutional preparation influences the response to serious events.
Xu et al., 2024	Comparison of the efficacy of early warning systems	Obstetric systems specific ones can present better performance.
Wasnik et al., 2024	Utilizing maternal morbidity as a novel screening tool	Structured tools They help in predicting morbidity.
Pezdirc et al., 2025	Obstetric-specific compared to a general early warning system	Greater precision in severe postpartum morbidity.
Balik et al., 2025	Preoperative early Physiologic warning scores in cesarean section	Preoperative scores They predict complications.
Mickiewicz et al., 2026	Early detection of septic patients' deterioration based on MEOWS	Early identification of septic deterioration maternal.
Werlang et al., 2026	Evaluation of a Canadian-adapted Can-MEOWS	Surveillance has improved. clinical and standardization assistance.
Nugraheny et al., 2026	Effectiveness of MEOWS training on midwives	The training increased the detection capability early.

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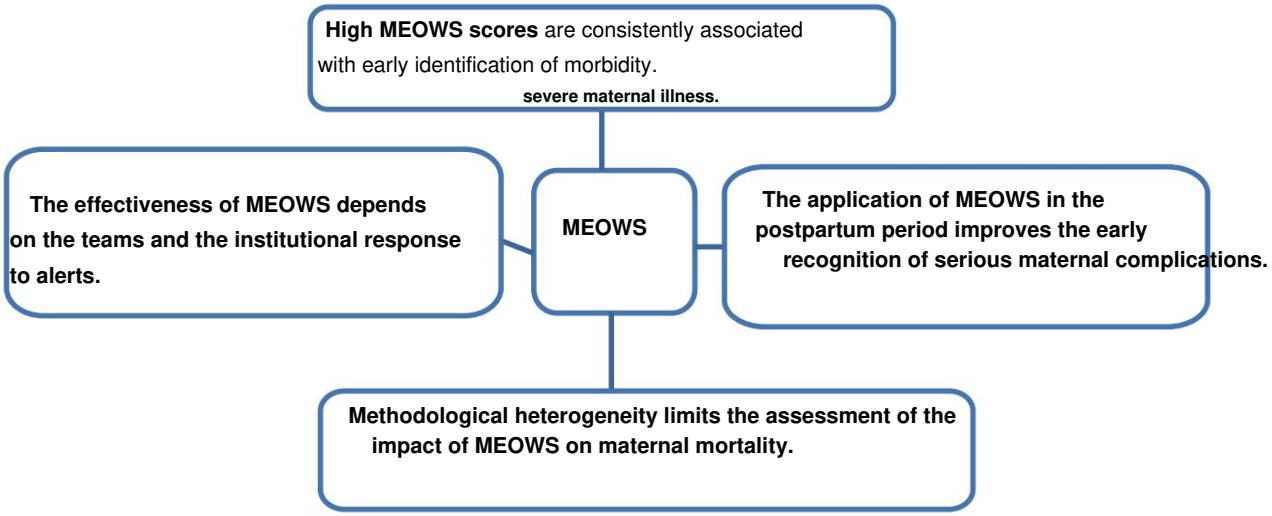

Source: Authors (2025)

Discussion

Maternal morbidity and mortality remain a significant challenge for healthcare systems globally, even in contexts with broad healthcare coverage. Evidence demonstrates that a large proportion of serious maternal outcomes, including near misses, intensive care unit admissions, and death, are preceded by clinical signs of physiological deterioration that could be recognized early. In this context, obstetric early warning systems, especially the Modified Early Obstetric Warning Score (MEOWS), emerge as structured tools to support the timely identification of complications in pregnant and postpartum women. The literature reviewed converges in pointing to MEOWS as a promising strategy to strengthen clinical surveillance, although it highlights gaps regarding standardization and the real impact on serious maternal outcomes (KRAWCZYK et al., 2024; EDWARDS et al., 2020).

Several observational studies and systematic reviews indicate that the MEOWS has good sensitivity for detecting clinical deterioration in obstetrics, especially in sepsis, severe pre-eclampsia, and obstetric hemorrhage. Singh et al. (2016) and Yadav et al. (2023) demonstrated a significant association between high MEOWS scores and the occurrence of severe maternal morbidity, suggesting that the tool can act as an early risk marker. However, the literature also points to considerable variations in the definition of cut-off points and the composition of the parameters evaluated, which makes direct comparison between studies difficult and limits the generalization of results (SINGH et al., 2016; YADAV et al., 2023).

The applicability of MEOWS in the postpartum period is another widely discussed aspect. Recent studies indicate that most serious maternal complications occur postpartum, a period when clinical monitoring tends to be reduced. Kaur et al. (2023) and Xu et al. (2024) observed that the systematic use of MEOWS in the postpartum period is associated with early identification of clinical deterioration and a higher rate of timely referral to intensive care. However, the authors highlight that adherence to the protocol in the postpartum period is frequently lower than that observed during pregnancy, which reveals organizational and cultural challenges in obstetric care (KAUR et al., 2023; XU et al., 2024).

The relationship between the use of MEOWS and the effective reduction of serious maternal outcomes remains a subject of debate. While some studies suggest a reduction in adverse events after the implementation of the protocol, others do not demonstrate a statistically significant impact on maternal mortality. Edwards et al. (2020) and Ryan et al. (2017) emphasize that MEOWS should

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It should be understood as part of a broader set of patient safety strategies, and not as an isolated intervention. The effectiveness of the protocol seems to depend heavily on the institutional capacity to respond quickly to generated alerts, including the availability of trained teams and well-defined care flows (EDWARDS et al., 2020; RYAN et al., 2017).

Barriers to MEOWS implementation are widely described in the literature. Qualitative and implementation studies point to team resistance, work overload, failures in vital sign recording, and lack of continuous training as factors that compromise adherence to the protocol. Mackintosh et al. (2014) highlight that, in many services, MEOWS is perceived as an additional bureaucratic requirement, rather than a clinical tool to support decision-making. These findings reinforce that the simple formal adoption of the protocol does not guarantee its effectiveness, requiring cultural and organizational change in obstetric care (MACKINTOSH et al., 2014; NUGRAHENY et al., 2026).

Analysis of studies conducted in low- and middle-income countries reveals additional challenges in implementing MEOWS. Tuyishime et al. (2020) and Rudakemwa et al. (2021) demonstrated that, although the protocol shows good capacity to identify at-risk patients, its implementation in resource-limited settings is hampered by a shortage of professionals, inadequate infrastructure, and fragmented care flows. On the other hand, these studies also suggest that MEOWS can have an even more significant impact in these scenarios by standardizing clinical surveillance and reducing the exclusive reliance on the individual experience of professionals (TUYISHIME et al., 2020; RUDAKEMWA et al., 2021).

A comparison between MEOWS and other obstetric early warning systems reveals a lack of consensus regarding the best model to adopt. Reviews and comparative studies indicate that different scores perform similarly in predicting severe maternal morbidity, although they vary according to the care context. Arnolds et al. (2022) and Pezdirc et al. (2025) highlight that the choice of system should consider local characteristics, epidemiological profile, and service response capacity, reinforcing the idea that there is no single solution applicable to all obstetric scenarios (ARNOLDS et al., 2022; PEZDIRC et al., 2025).

In the Brazilian and Latin American context, the studies analyzed point to a growing interest in adopting MEOWS as a patient safety strategy. Werlang et al. (2026) and Kefeli Çelik et al. (2024) observed that the implementation of the protocol contributed to greater systematization of clinical surveillance and improved communication among multidisciplinary teams. However, the authors emphasize the need to adapt MEOWS to local realities and integrate it into public policies for obstetric care, avoiding the uncritical adoption of models developed in other contexts (WERLANG et al., 2026; KEFELI ÇELIK et al., 2024).

Another recurring point in the literature is the need for continuous training of healthcare teams for the proper use of MEOWS. Studies emphasize that the early recognition of clinical deterioration depends not only on the score, but also on the ability of professionals to interpret the signs and act in a timely manner. Nugraheny et al. (2026) and Edwards et al. (2020) highlight that continuing education programs and clinical audits are fundamental to ensuring the sustainability of the protocol and maximizing its impact on the prevention of serious maternal outcomes (NUGRAHENY et al., 2026; EDWARDS et al., 2020).

The literature also points to important methodological limitations in the studies evaluated. The predominance of observational designs, the heterogeneity of the outcomes analyzed, and the absence of randomized clinical trials make it difficult to accurately measure the impact of MEOWS on reducing maternal morbidity and mortality. Furthermore, many studies use intermediate outcomes, such as team activation or transfer to the ICU, instead of...

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final clinical outcomes, which limits the interpretation of the results (BLUMENTHAL et al., 2019; WASNIK et al., 2024).

Finally, the comparative analysis of the articles shows that MEOWS should be understood as a clinical decision support tool, integrated into broader care systems oriented towards patient safety. Although there is consensus regarding its ability to identify pregnant and postpartum women at risk early, uncertainties persist regarding its isolated impact on serious maternal outcomes. Thus, the literature suggests that the success of MEOWS depends less on its technical structure and more on its integration into organized care models, with trained teams, defined workflows, and institutional commitment to the quality of obstetric care (KRAWCZYK et al., 2024; WERLANG et al., 2026).

CONCLUSION

Analysis of the available evidence on the implementation of the Modified Early Obstetric Warning Score (MEOWS) protocol suggests that obstetric early warning systems constitute a relevant strategy for strengthening maternal safety. The studies included in this scoping review indicate a trend of association between the use of the MEOWS protocol and the early identification of signs of clinical deterioration in pregnant and postpartum women, especially in contexts associated with severe maternal morbidity, such as sepsis, obstetric hemorrhage, severe pre-eclampsia, and admission to the intensive care unit. The results indicate that high MEOWS scores are associated with a greater risk of severe maternal outcomes, reinforcing the protocol's role as a clinical decision support tool.

However, the effectiveness of MEOWS is not limited to its technical structure, but strongly depends on its implementation and integration into care flows. Implementation studies highlight that the presence of clear escalation protocols, trained teams, and institutional capacity for rapid response are determining factors for the system's positive impact. It was also observed that the application of MEOWS in the postpartum period is particularly important, since a significant portion of maternal complications occur after childbirth. Despite this, adherence to the protocol in the postpartum period remains heterogeneous, highlighting gaps in the continuous clinical monitoring of women in the postpartum period. The systematic incorporation of MEOWS at this stage can contribute to reducing delays in the recognition of potentially avoidable complications. On the other hand, the review revealed important limitations in the literature, including methodological heterogeneity, diversity of cut-off points, variation in the outcomes analyzed, and a predominance of observational studies. These characteristics make it difficult to accurately measure the impact of MEOWS on reducing maternal mortality and reinforce the need for more robust and standardized studies. Given these findings, it is concluded that the MEOWS protocol should be understood as a tool to support clinical surveillance and obstetric patient safety, and not as an isolated intervention. Its effectiveness depends on integration with organized care practices, ongoing education of teams, and institutional commitment. The mapping of evidence carried out in this scoping review contributes to understanding the role of MEOWS in preventing serious maternal outcomes and provides support for improving obstetric care and for future research in the area.

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