

# Assessment of the Impact of an Institutional Obstetric Hemorrhage Control Protocol: Analysis of Maternal Outcomes in a University Hospital in Southern Brazil

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## Abstract

**Introduction:** Postpartum hemorrhage (PPH) is considered an obstetric emergency and remains one of the leading causes of maternal morbidity and mortality. One strategy to address this issue is the implementation of institutional protocols that streamline and coordinate the care provided by the healthcare team. Despite this, many institutions still lack effective measures to ensure maternal safety during labor. **Objective:** To evaluate maternal outcomes before and after the implementation of an institutional protocol in a public university hospital for the management of postpartum hemorrhage. **Methodology:** This is an ecological and retrospective study based on publicly available aggregated secondary data from the Brazilian Unified Health System. Variables related to births and delivery complications between 2014 and 2024 at the General Hospital of Caxias do Sul were selected. Statistical analysis was performed using Fisher's Exact Test, applied through the OpenEpi software. A p-value < 0.05 was considered statistically significant. **Results:** Based on the findings, stability was identified in the treatment of complications related to the puerperium, in addition to a 19% reduction in uterine curettage procedures, one of the factors associated with PPH. However, a statistically significant increase in suturing of birth canal lacerations was observed, possibly associated with early identification and appropriate management. As a final protocol measure, puerperal hysterectomies increased quantitatively, possibly related to the early adoption of radical therapeutic measures aimed at reducing the number of deaths. **Conclusion:** Despite demonstrating some more drastic and definitive outcomes, this study reinforces the importance of institutional

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implementation of PPH protocols, which enable standardized, rapid, and effective care, especially in critical situations. The adoption of emergency kits in obstetric centers, as an essential component of these protocols, has been widely discussed and reinforced, becoming a global trend.

## Keywords

Postpartum Hemorrhage, Institutional Protocol, Emergency Kits, Puerperal Hysterectomy

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## 1. Introduction

Postpartum hemorrhage (PPH) accounts for approximately 29.3% of maternal deaths worldwide and represents the second leading cause in Brazil, being considered a preventable cause of death [1] [2]. According to the latest WHO/FIGO guidelines, it is defined as blood loss equal to or greater than 300 mL accompanied by alteration in at least one vital sign, or blood loss equal to or greater than 500 mL at delivery, regardless of the route of birth. The most common presentation occurs within the first 24 hours postpartum, although the late form may manifest up to six weeks after delivery [2]. Furthermore, uterine atony remains the leading cause, followed by birth canal lacerations, placental accreta spectrum disorders, and coagulopathies [1] [2].

One of the most effective strategies for controlling this scenario involves the standardization of management through structured institutional protocols [2] [3]. Through this approach, it is possible to ensure the immediate availability of essential materials, expedite the implementation of clinical measures, and guide the actions of healthcare teams [3]. Continuous multiprofessional training improves the efficiency of the care response, favoring early identification and management of hemorrhage [4] [5]. Even so, many cases of PPH remain unpredictable, reinforcing the need for delivery care in a hospital setting, a measure that has historically been fundamental to reducing maternal mortality [1]. International guidelines emphasize that the organization of health services through well-defined care pathways, standardized protocols, and rapid responses constitutes a central strategy to reduce maternal mortality due to PPH [6] [7].

Considering the relevance of this scenario, the present study aims to analyze maternal outcomes before and after the implementation of an institutional protocol for the management of PPH in a public hospital in southern Brazil. Structured around emergency care kits and in accordance with national and international recommendations [1] [2] [6] [8], the objective is to evaluate its impact on care delivery and on morbidity and mortality associated with obstetric hemorrhage.

## 2. Methodology

### 2.1. Study Design

This is a descriptive, ecological, retrospective study based on publicly available

secondary data, using the Hospital Information System of the Brazilian Unified Health System (SIH/SUS) [9]. Data from the years 2015 to 2024 were selected and filtered exclusively for the institution of interest—the General Hospital of Caxias do Sul.

In the absence of a specific code for postpartum hemorrhage in the SIH/SUS, obstetric procedures related to the management of puerperal bleeding were used as proxies for severity and intervention requirements. Although they do not constitute direct measures of postpartum hemorrhage, they demonstrate high specificity for severe events, albeit with limited sensitivity. Variables were identified according to the corresponding procedure codes, including a profile of births and delivery-related complications.

The following procedures were included: annual number of vaginal deliveries (code 0310010039), cesarean deliveries (code 0411010034), and cesarean deliveries with tubal ligation (code 0411010042), as well as treatment of complications predominantly related to the puerperium (code 0303100010), post-abortion/puerperal curettage (code 0411020013), suturing of pelvic tract lacerations (code 0411010077), manual removal of the placenta (code 0411010034), and puerperal hysterectomy (code 0411020030).

## 2.2. Statistical Analysis

In 2019, the institutional protocol for the management of obstetric hemorrhage was implemented. Therefore, based on this information, a quantitative comparison was performed between the periods before the implementation of the institutional protocol (2015-2019) and after its implementation (2020-2024). For statistical analysis, Fisher's Exact Test was applied using the OpenEpi software. A significance level of 5% was adopted ( $p < 0.05$ ).

## 2.3. Ethical Considerations

As this study is based on aggregated public data, approval by a Research Ethics Committee was not required.

## 3. Results

With the aim of promoting greater maternal safety and reducing adverse outcomes in the immediate puerperium, the institutional protocol seeks to decrease the incidence density of complications related to PPH through the standardization and uniform control of uterine involution and the necessary care provided during the postoperative hospital stay. In the pre-implementation period, a total of 9179 deliveries were performed, and in the post-implementation period, 8839, including normal deliveries and cesarean sections.

To evaluate the impact of the measures adopted throughout the study period, data related to the treatment of complications predominantly associated with the puerperium were analyzed. These included the use of antibiotic therapy for infectious conditions, antihemorrhagic agents, targeted analgesics and anti-inflamma-

tory drugs, and surgical interventions. It is possible to observe that there was stability in the number of cases associated with this category over the period analyzed (**Table 1**).

**Table 1.** Frequency and effect measures of obstetric procedures related to the puerperium before (2015-2019) and after (2020-2024) implementation of the institutional protocol.

Procedures	Years		p-value
	2015-2019	2020-2024	
Treatment of complications predominantly related to the puerperium	38	39	0.868
Post-abortion/puerperal curettage	146	118	0.172
Suturing of pelvic tract lacerations	25	51	0.002
Manual removal of placenta	2	8	0.097
Puerperal hysterectomy	14	23	0.152

Source: Prepared by the authors (2026).

In the context of third-stage labor complications, placental retention stands out, characterized by the inability to achieve complete or partial placental expulsion. In this regard, the performance of post-abortion or puerperal curettage decreased following the implementation of the protocol, possibly reflecting other factors such as improved clinical management or the temporal characteristics of the sample.

On the other hand, a statistically significant increase was observed in the number of birth canal laceration sutures ( $p = 0.002$ ). This procedure is performed during the fourth stage of labor, and its early identification and timely indication may be associated with lower rates of PPH in the immediate puerperium. As the final protocol measure, carried out after failure of previously adopted therapeutic approaches, puerperal hysterectomies are performed. Despite the quantitative increase in this intervention, this action did not reach statistical significance within the analyzed time frame.

#### 4. Discussion

Postpartum hemorrhage is strongly influenced by the quality of management during the first hours after the onset of bleeding, the so-called “golden hour”, as delays in intervention increase the risk of unfavorable outcomes [1] [2]. During this critical period, the focus of the healthcare team should be immediate control of blood loss and management of the lethal triad, composed of acidosis, coagulopathy, and hypothermia.

Although some cases occur unexpectedly, the literature describes several factors associated with a higher likelihood of PPH, such as multiparity, prolonged labor, previous cesarean section, postpartum curettage, instrumental delivery, thrombocytopenia, and hypofibrinogenemia [1] [2]. As a universal preventive measure, the

administration of 10 IU of oxytocin to all parturients is recommended [1]. During the monitoring of clinical and hemodynamic parameters, in addition to the estimation of blood loss, active management begins with the administration of uterotonics [1] [2].

The effective implementation of evidence-based interventions aimed at preventing, diagnosing, and treating PPH has been slow [4] [5]. This fact is reflected in the strategies proposed by the World Health Organization to address this complication, which establish as a goal the reduction of the global maternal mortality ratio to fewer than 70 deaths per 100,000 live births by 2030 [6] [7].

In this context, the hospital included in the present study implemented, starting in 2019, an institutional protocol aimed at reducing the incidence of PPH and its complications [2] [3]. Applicable to vaginal deliveries, cesarean sections, and intrauterine curettage, the protocol involves continuous surveillance of uterine hypotonia, rigorous monitoring of vital signs, and postoperative care, with an expected positive impact on hemorrhagic event rates, length of hospital stay, and hospital costs [2] [3]. Once the clinical situation is identified, a standardized emergency kit is used containing tranexamic acid, cefazolin, and uterotonic agents (methylergometrine, misoprostol, and oxytocin), in addition to consumable materials, in accordance with recommendations from established protocols [2] [3]. Furthermore, the service conducts monthly evaluations of the cases reviews, allowing for monitoring of indicators and continuous reassessment of care processes [4].

The findings of this study demonstrated an increase in the number of puerperal hysterectomies at the evaluated obstetric center. During the pre-implementation period, 14 hysterectomies were recorded, whereas 23 procedures were performed in the subsequent period, corresponding to a 64% increase, although without statistical significance. This is a high-risk intervention, whose complexity was potentially amplified in the context of the COVID-19 pandemic, as women in the immediate postpartum period were considered at higher risk for severe forms of the disease [8]-[10]. Moreover, in the presence of confirmed infection associated with uterine atony refractory to clinical management, there is a greater likelihood of complications and clinical deterioration, with potential benefit from early admission to an intensive care unit. This scenario may have contributed to the increased number of procedures, considering the greater presence of confounding factors related to case severity. On the other hand, the results may also reflect greater resource availability and standardization of care, favoring the adoption of earlier and, at times, more definitive interventions aimed at preventing severe outcomes associated with the progression of postpartum hemorrhage [2] [3].

A similar pattern was observed in the management of other puerperal complications. Before the introduction of emergency kits and the institutional protocol, 36 cases were recorded involving complications such as infections, the need for antihemorrhagic agents, analgesic management, and surgical interventions. After implementation, this number increased to 41 cases, indicating greater clinical

complexity and reinforcing the importance of prenatal care capable of early identification of risk factors for PPH [1] [5].

On the other hand, a reduction was observed in the need for curettage due to retained placental tissue. This finding raises the hypothesis that earlier and more assertive interventions—despite the increase in hysterectomies—may have contributed to a lower incidence of placental retention and, consequently to a reduced need for curettage [2]. The results suggest that standardized management, combined with the availability of emergency kits, may have promoted faster and more decisive interventions, reducing certain complications, albeit at the expense of an increase in more radical procedures [2] [3].

It is therefore evident that the topic discussed in this article is of global relevance and has been extensively debated worldwide [6] [7]. This approach has been adopted by international institutions such as the United Nations, through the standardization of protocols and the use of emergency kits, as well as by the California Maternal Quality Care Collaborative (CMQCC), which is dedicated to reducing preventable maternal morbidity and mortality and addressing racial disparities in obstetric care. In this context, the adoption of standardized kits in obstetric centers has demonstrated a positive impact: between 2014 and 2016, the implementation of kits in 99 hospitals in the United States resulted in a 20.8% reduction in severe maternal morbidity associated with hemorrhage [7] [8].

The study has limitations related to the use of public secondary data and its ecological design, which does not allow for control of individual clinical characteristics or direct causal inference. The unavailability, in the data source used, of direct indicators of postpartum hemorrhage severity—such as blood component transfusion, intensive care unit admission, and in-hospital mortality, among others—required the use of obstetric procedures as indirect markers. Although these markers are specific for severe events, they are less sensitive for comprehensive evaluation. In addition, potential variations in coding practices, organizational changes over the analyzed period, and the low frequency of certain events may have influenced the results and the statistical power of the comparisons performed.

Due to the increased complexity of care observed during the COVID-19 pandemic—when pregnant women were considered a high-risk group for disease-related complications—certain outcomes related to more radical interventions may have been influenced by this exceptional context. Thus, these events do not necessarily reflect exclusively the impact of the implemented protocol and may be partially associated with changes in clinical management, case severity, and healthcare dynamics imposed by the pandemic.

A systematic review published in the *American Journal of Obstetrics & Gynecology* (2024) showed that institutional postpartum hemorrhage bundles reduce severe maternal morbidity related to hemorrhage by promoting standardized interventions compared with non-protocolized management [11]. In the pharmacological field, the randomized WOMAN-2 Trial (The Lancet, 2024) evaluated

prophylactic tranexamic acid in parturients with moderate to severe anemia and concluded that the benefit is greater when the drug is incorporated into a structured therapeutic package than when used alone as a preventive measure (RR 1.05; 95% CI 0.94 - 1.19) [12]. A study published in *The Lancet Global Health* (2025) assessed early detection and bundled treatment for postpartum hemorrhage, including rapid administration of uterotonics, tranexamic acid, intravenous fluids, genital tract examination, and escalation of the level of care. Evaluation of these interventions demonstrated that their implementation improved adherence to management protocol steps and facilitated more rapid clinical responses to postpartum hemorrhage episodes, reinforcing that structured strategies may enhance the clinical effectiveness of standardized interventions compared with usual care across obstetric services in different countries [13]. Taken together, these data support the implementation of standardized postpartum hemorrhage response kits and protocols as an evidence-based strategy to reduce severe maternal morbidity.

## 5. Conclusions

Obstetric hemorrhage is responsible for one maternal death every four minutes, reinforcing the need for rapid and coordinated care responses based on institutionally consolidated protocols. The findings of this study demonstrate that the implementation of such protocols, combined with the use of rapid-response emergency kits, contributed to better organization of care, reduced delays in interventions, and improved maternal outcomes.

The systematic implementation of these tools proved to be aligned with national and international recommendations, demonstrating the potential to improve clinical practice, especially in settings of high demand and limited resources. Therefore, continuous investment in care improvement through multiprofessional training and the maintenance of efficient operational workflows contributes to enhanced maternal safety and to the reduction of complications associated with postpartum bleeding.

## Conflicts of Interest

The authors declare no conflicts of interest related to the publication of this article.

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