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Postpartum hemorrhage: from insight to action

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Citation

Ramler, P. I. (2022, September 20). *Postpartum hemorrhage: from insight to action*. *Safe Motherhood*. Retrieved from <https://hdl.handle.net/1887/3464217>

Version: Publisher's Version

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Note: To cite this publication please use the final published version (if applicable).

CHAPTER 8

SUMMARY

NEDERLANDSE SAMENVATTING

SUMMARY

In this thesis we focused on gaining insight into severe postpartum hemorrhage associated with severe maternal outcome and aimed to evaluate maternity care at different stages of bleeding in the course of postpartum hemorrhage. In **Part I** we investigated women in need of massive blood transfusion because of postpartum hemorrhage in order to improve our understanding of postpartum hemorrhage associated with severe maternal outcome and to compare management strategies and maternal outcome between different settings. In **Part II** we evaluated maternity care at different stages of bleeding following childbirth, i.e.: onset of hemorrhage (timely recognition of women at risk of progression of hemorrhage), persistent hemorrhage (evaluation of obstetric interventions to cease persistent hemorrhage), and end of hemorrhage (learn lessons once a maternal death from obstetric hemorrhage has occurred).

Part I: Massive blood transfusion in relation to postpartum hemorrhage

In **chapter 2** and **chapter 3** we addressed the incidence, causes, management and outcome of women who had received a so called ‘massive blood transfusion’ (i.e. ≥ 8 units of packed red blood cells transfused within 24h following birth) because of postpartum hemorrhage in the Netherlands within the time frames 2004–2006 and 2011–2012 using two nationwide population-based cohort studies. We showed that postpartum hemorrhage with massive blood transfusion was associated with high rates of severe maternal outcome. Although we observed a decreasing incidence between both time frames, the incidence of women who received massive blood transfusion after birth in the Netherlands remained significantly higher than that of some other settings with similar healthcare systems and resources. Furthermore, we observed considerable variation in the obstetric and hematologic management between different settings. Our study results showed the importance of nationwide studies into severe postpartum hemorrhage and the urgent need to evaluate and compare the management strategies to deduce a best practice to manage these severe obstetric-related bleedings and improve maternal outcome. Evidence-based uniform management guidelines are essential.

Part II: Evaluation of maternity care during and after postpartum hemorrhage

Onset of hemorrhage: timely recognition of women at risk of progression of hemorrhage

In **chapter 4** we evaluated the implementation of ROTEM® FIBTEM A5 as part of standard clinical care during the onset of postpartum hemorrhage and its ability to identify women at risk of progression to severe postpartum hemorrhage (composite endpoint of a total blood loss >2000mL, transfusion of ≥ 4 units of packed red blood cells, and/or need for an invasive intervention to stop the bleeding). Our results showed that the point-of care test FIBTEM A5 lacks the capability to discriminate between women with and without progression to severe postpartum hemorrhage when routinely measured between 800–1500mL of blood loss after childbirth. Furthermore, FIBTEM A5 values were only moderately correlated with fibrinogen concentrations, for which ROTEM® FIBTEM is a surrogate measure. Although we found no evidence to support the implementation of ROTEM® FIBTEM A5 as part of standard clinical care during the onset of bleeding, targeted use might still be useful to identify women at risk of progression and to withhold blood products and surpass formulaic transfusion protocols.

Persistent hemorrhage: evaluation of obstetric interventions to cease persistent hemorrhage

In **chapter 5** we compared the outcomes of women who had intrauterine balloon tamponade with women who underwent uterine artery embolization as initial management for persistent postpartum hemorrhage (i.e. refractory to first-line therapy according to cause of bleeding) by constructing a propensity score matched-cohort. We showed that initial management by intrauterine balloon tamponade has the potential to cease bleeding and obviate the need for uterine artery embolization in a majority of women without an increased risk of peripartum hysterectomy or maternal mortality. Furthermore, we demonstrated no significant differences in total blood loss or units of packed red blood cells transfused. Two-thirds of the women within our propensity score-matched cohort with an estimated blood loss of 1000-7000mL can be spared an additional intervention when intrauterine balloon tamponade is used as the intervention of first choice during the course of persistent postpartum hemorrhage. However, because of the small sample size of 50 women in each intervention arm, our propensity score-matched cohort was underpowered to demonstrate equivalence. Nevertheless, our study design could be used as a useful framework for future comparative research during persistent postpartum hemorrhage where a randomized controlled trial is not likely to be feasible.

End of hemorrhage: learn lessons from obstetric hemorrhage-related maternal deaths

Chapter 6 contains a nationwide mixed-methods prospective case-series of maternal deaths due to obstetric hemorrhage in the Netherlands that were reported to the Dutch Maternal Mortality and Severe Morbidity Audit Committee in 2006–2019. We demonstrated that the obstetric hemorrhage-related maternal mortality ratio (MMR) in the Netherlands in 2006–2019 was low. However, the obstetric hemorrhage-related MMR remained comparable to the previous enquiry in the Netherlands in 1993–2005. Our confidential enquiries brought to light important lessons learned to improve the quality of maternity care during obstetric-related bleedings, avoid maternal deaths and reduce the obstetric hemorrhage-related MMR in the Netherlands in the following years. Our study findings indicate that continuous efforts are necessary to improve maternal safety. We argue for the implementation of a recurring obstetric hemorrhage-related theme-based cycle of confidential enquiries into maternal deaths to repeatedly evaluate care and formulate lessons learned to improve maternal outcome.

Chapter 7 contains the general discussion in which we demonstrate that postpartum hemorrhage is and remains a topic that requires attention to improve maternity care and maternal safety. However, to further improve maternity care and maternal outcome during severe blood loss after childbirth we pledge for a necessary ‘next step’ in which the occurrence and management of severe postpartum hemorrhage is continuously monitored, evaluated and improved. In order to do so our attention should be focused on:

- Developing an international consensus definition of severe postpartum hemorrhage to enable within- and cross-country comparison in search for optimal management strategies and best maternal outcome
- Establish a continuous and systematically registration system for severe postpartum hemorrhage on a nationwide scale in order to gather and evaluate data over time
- Performing maternal near miss audits of severe postpartum hemorrhage in addition to maternal mortality reports because of obstetric hemorrhage in order to identify opportunities to further improve the quality of maternity care

