


## CLINICAL ARTICLE

## Obstetrics

# Video-assisted team debriefing for real-life management of major postpartum hemorrhage (DBRIEF trial): An interrupted time series analysis

Lena Rosvig<sup>1,2,3</sup>  | Lone Hvidman<sup>2</sup> | Ole Kierkegaard<sup>1</sup> | Niels Uldbjerg<sup>2,3</sup> | Stina Lou<sup>3,4</sup> | Tanja Manser<sup>5,6</sup> | Louis Halamek<sup>7</sup> | Lise Brogaard<sup>2,3</sup>

<sup>1</sup>Department of Obstetrics and Gynecology, Horsens Regional Hospital, Horsens, Denmark

<sup>2</sup>Department of Obstetrics and Gynecology, Aarhus University Hospital, Aarhus, Denmark

<sup>3</sup>Department of Clinical Medicine, Aarhus University, Aarhus, Denmark

<sup>4</sup>DEFACTUM – Public Health & Health Services Research, Aarhus, Denmark

<sup>5</sup>FHNW School of Applied Psychology, University of Applied Sciences and Arts North-Western Switzerland, Olten, Switzerland

<sup>6</sup>Division of Anaesthesiology and Intensive Care, Department of Clinical Sciences, Intervention and Technology, Karolinska Institutet, Huddinge, Sweden

<sup>7</sup>Department of Paediatrics, Stanford University, Stanford, California, USA

## Correspondence

Lena Rosvig, Department of Obstetrics and Gynecology, Horsens Regional Hospital, Sundvej 30, DK 8700 Aarhus, Denmark.

Email: [lenahede@rm.dk](mailto:lenahede@rm.dk)

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## Abstract

**Objectives:** Viewing video recordings of real-life events during debriefing sessions can enhance recall, deepen understanding, and create additional learning opportunities for healthcare professionals. At the department level, this study aimed to evaluate whether implementing video-assisted team debriefings in labor wards improved obstetric teams' clinical management of major postpartum hemorrhage (PPH, blood loss  $\geq 1000$  mL).

**Methods:** The DBRIEF trial was an interrupted time series analysis, conducted at two Danish maternity units: one secondary and one tertiary. The study included women who experienced major PPH following vaginal birth across three periods: (1) a “Baseline” period (January 2020–September 2020), (2) an “Assessment-only” period (October 2020–September 2021), and (3) an “Assessment-&-debriefing” period (October 2021–September 2022). In periods 2 and 3, an automatic video recording system captured major PPH events in all delivery rooms. In period 3, these videos were used for video-assisted team debriefings. At study completion, trained assessors, blinded to date of inclusion, reviewed all video recordings to evaluate teams' clinical performance using the “Team Obstetric Postpartum Hemorrhage” tool (TeamOBS-PPH) and non-technical performance using the “Assessment of Obstetric Team Performance” tool (AOTP). Register-based data on the incidence of major PPH was extracted for all three periods.

**Results:** Comparing the “Assessment-only” period ( $N=214$ ) to the “Assessment-&-debriefing” period ( $N=202$ ), the clinical performance score of teams increased from 84.8 (95% confidence interval [CI] 83.5–86.2) to 86.9 (95% CI 85.6–88.2) ( $P=0.029$ ), and the non-technical performance score increased from 68.0 (95% CI 66.2–69.9) to 74.3 (95% CI 72.6–76.1) ( $P<0.001$ ). The incidence of major PPH was 7.6% in the “Baseline” period, 7.5% in the “Assessment-only” period, and decreased to 6.7% in the “Assessment-&-debriefing” period ( $P=0.048$ ).

**Conclusion:** Video-assisted team debriefings might serve as a valuable tool to improve obstetric teams' management of major PPH.

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**KEYWORDS**

debriefing, education, learning, maternal care, patient outcome, postpartum hemorrhage, pregnancy, team performance, teamwork, training, vaginal birth

## 1 | INTRODUCTION

During a video-assisted team debriefing, the entire team reviews a video recording of an actual event.<sup>1,2</sup> When conducted as a performance debriefing, the focus is to transform the experience into learning through analysis and reflection.<sup>3,4</sup> The objectivity of video recordings can support the recall of an event<sup>1,2</sup> and is particularly valuable after emergencies, as the urgency and focused attention during the event might reduce the team's situation awareness and recall.<sup>1,5</sup> Studies on the potential effects of video-assisted team debriefings in a medical setting are limited to neonatal resuscitation teams<sup>6-8</sup> and trauma teams.<sup>9,10</sup> However, the findings from these studies might not be directly applicable to obstetric settings, where roles are less predetermined and women are conscious participants in their care. Therefore, we aimed to study the implementation of video-assisted team debriefings after major postpartum hemorrhage (PPH), defined as a blood loss  $\geq 1000$  mL,<sup>11</sup> the incidence of which has been rising for over a decade<sup>12</sup> despite interventions such as simulation-based team training and implementation of checklists.<sup>13,14</sup> Major PPH was the focus of this study because its successful management requires a multiprofessional team<sup>15</sup> to adhere closely to clinical guidelines<sup>16</sup> and exhibit highly effective non-technical skills (e.g., teamwork, leadership, and communication) despite working under intense time pressure.<sup>17</sup>

The primary aim of this study was to evaluate whether the implementation of video-assisted team debriefings in labor wards was associated with improved clinical performance and non-technical performance. Second, we aimed to assess whether it was linked to a reduced incidence of major PPH.

## 2 | MATERIALS AND METHODS

### 2.1 | Design

The study, based on the DBRIEF trial, was an interrupted time series analysis. The study included women who experienced PPH following vaginal birth between January 2020 and September 2022. In October 2020, an automatic video recording system was activated in all delivery rooms to record obstetric teams in action. In October 2021, healthcare professionals were invited to participate in video-assisted team debriefing sessions reviewing the care they had provided. The study was conducted across three periods:

1. The "Baseline" period with neither video recording nor video-assisted team debriefings (January 2020–September 2020)
2. The "Assessment-only" period with video recording but no video-assisted team debriefings (October 2020–September 2021)

3. The "Assessment-&-debriefing" period with both video recording and video-assisted team debriefings (October 2021–September 2022) (Figure S1).

### 2.2 | Setting

The study was conducted at two Danish maternity units, Horsens Regional Hospital (2300 deliveries/year, level III, six delivery rooms) and Aarhus University Hospital (4900 deliveries/year, level II, 12 delivery rooms).<sup>18</sup> In Denmark, PPH is primarily managed in the delivery rooms by a multiprofessional team consisting of midwives, obstetricians, and nursing assistants, activated at blood loss  $>500$  mL. In cases of retained placenta or uncontrolled bleeding, the patient was transferred to an operating theater. During the study period, no other teaching effort related to PPH was introduced in the departments.

### 2.3 | Population

During the three study periods, we included all vaginal births at the two hospitals. The incidence of major PPH across all three periods was calculated using registry-based data. Video recordings of women with major PPH and the team managing the hemorrhage were obtained during periods 2 and 3. All 18 delivery rooms were equipped with two cameras (HikVision MiniDome, 4 MP, CN) and one microphone (Monacor ECM, 10/WS, DK). Recordings were automatically activated upon the entry of the obstetrician into the room. The cameras were running in 5-min loops, and this was preserved when the obstetrician entered; hence, the preceding 5 min before entry of the obstetrician and the subsequent 5 min after the obstetrician had left the room were also recorded. Inclusion criteria: PPH occurring within 2 after vaginal birth. Exclusion criteria: Declined participation by the patient, her relatives, or a healthcare professional; gestational age  $<34+0$  weeks; and home births.

### 2.4 | Ethics

The study was approved by the Central Denmark Region Committee on Biomedical Research Ethics (1-16-02-169-20) in April 2020. Permission for Central Patient Register extraction for publication was approved in March 2023 by the Central Denmark Region Committee on Biomedical Research Ethics (1-45-70-29-23) and in April 2023 by Horsens Regional Hospital, the directorate (1-36-100-2-23).

All women who were expecting to give birth at the hospitals during periods 2 and 3 were informed about the study and the possibility of

video recording. Information was provided through written materials and an informational video. Healthcare professionals were regularly informed via printed materials and oral presentations. Additionally, each delivery room displayed a visible sign indicating that events in the room might be recorded. In cases where video recording occurred, all parties were asked to confirm or withdraw consent post-recording. Videos were included only if all parties (the patient, her relative, the healthcare team) provided written informed consent within 48h. Otherwise, recordings were deleted without review.

## 2.5 | Video-assisted team debriefings

Video-assisted team debriefings were conducted as close to the event as possible and when at least two primary team members were available. Debriefings were conducted as structured “performance debriefings”<sup>2</sup> and facilitated by trained debriefers well-versed in the “Strategies and Tactics for Debriefing Healthcare Scenarios.”<sup>19</sup> Prior to a video-assisted team debriefing, the debriefer selected 3–4 video clips to view and discuss regarding team performance and patient outcomes. The debriefing structure was based on “Gather, Analyse, Summarize.”<sup>20</sup> By asking open-ended questions, the debriefers encouraged teams to explore circumstances that contributed to high-level or suboptimal performances. Specific content discussed during the debriefings included clinical<sup>11,21</sup> and non-technical performance aspects.<sup>15,22</sup> Adherence to the debriefing method was documented using “Debriefing Assessment in Real Time” (DART) registrations.<sup>23</sup> The DART registration is a tool that was used to assess whether the debriefer was able to facilitate an active discussion during the debriefing and thereby support active discussion among participating team members (debriefees). Effective facilitation was defined as a [Debriefee responses]:[Debriefing questions + statements] ratio of at least 4:1.

## 2.6 | Outcomes

### Primary outcome: Obstetric team performance

At study completion, all videos were blinded for the date of inclusion and assigned for review in a random sequence computed using STATA. All raters independently assessed the videos and were blinded to the assessments of the other raters:

- “Clinical performance,” defined as guideline adherence, was assessed independently by two trained raters (senior obstetricians) using the “Team Obstetric Postpartum Hemorrhage” tool (TeamOBS-PPH).<sup>16</sup> TeamOBS-PPH comprises 19 items, rated as “not done” (0 points), “done partially” (1 point), or “done correctly” (2 points). The tool also includes a patient safety score. This results in a total score from 0 to 100 (Minimum passing level:  $\geq 60$ ; High performance level:  $\geq 85$ ).<sup>15,16</sup>

- “Non-technical performance,” including behavioral skills (e.g., teamwork, leadership, and communication), was assessed independently by two trained raters (an obstetrician and a fellow in obstetrics) using the “Assessment of Obstetric Team Performance” tool (AOTP).<sup>24</sup> AOTP comprises 18 items grouped into six categories: communication with the patient, task management, teamwork, situation awareness, communication with team members, and room environment. All items were rated on a Likert scale (1–5). This results in a total score from 18 to 90.

### Secondary outcome: Incidence of major postpartum hemorrhage

- The outcome measure “blood loss” (quantified by weighing) related to all vaginal deliveries at the hospitals was extracted from the Central Patient Register.

## 2.7 | Statistical analyses

Statistical analyses were performed using STATA version 18.0 software (StataCorp, Texas, USA).

To assess the impact of video-assisted team debriefings on team performance, we compared the “Assessment-only” period to the “Assessment-&-debriefing” period. Based on a previous study,<sup>15</sup> a power calculation was used to determine that 209 video recordings per group were needed to achieve 80% power and a significance level of 5%. Agreement between raters assessing clinical and non-technical performance was identified using interclass correlation and the Bland–Altman analysis and limits of agreement. The outcomes were analyzed using the  $\chi^2$ -test, the *t*-test, and regression analysis (unadjusted and adjusted).

To assess the impact that video recording and video-assisted team debriefings might have had on incidence of major PPH, we compared all three study periods. Registry-based data was analyzed using one-way analysis of variance.

## 3 | RESULTS

### 3.1 | Population and video inclusion

Registry-based data on time of birth and milliliter blood loss was available for all vaginal births during all three periods.

The video inclusion rate of major PPH events was 59% (214 videos of 363 cases) during the “Assessment-only” period and 57% (202 videos of 354 cases) during the “Assessment-&-debriefing” period (Figure 1). The main reasons for exclusion during the overall study period were missing consent in 186 cases overall (62%; often due to early discharge) and failing equipment in 70 cases overall (23%; camera/microphone not activated). Consent for video inclusion was

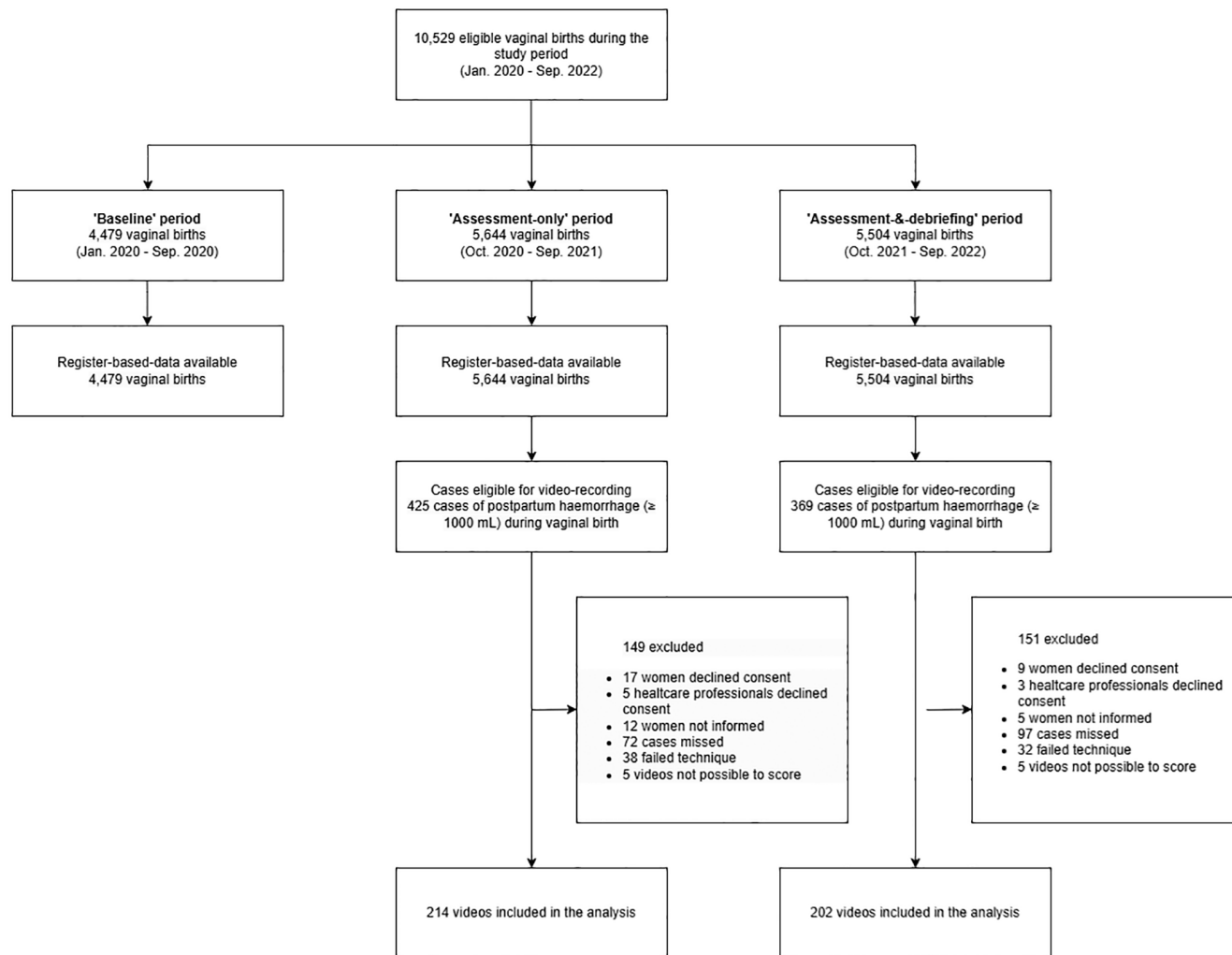


FIGURE 1 Inclusion of cases.

declined by women or their relatives in 26 cases (4%) and by healthcare professionals in eight cases (1%). The average obstetric team consisted of one obstetrician, three midwives, and one nursing assistant (Table S1). No hysterectomy or maternal death due to PPH was observed during the study period. Of the 416 videos, 30 were randomly selected for double scoring by blinded raters. The interrater agreement was 0.87 (95% confidence interval [CI] 0.74–0.94) for raters assessing clinical performance and 0.85 (95% CI 0.71–0.92) for raters assessing non-technical performance (Bland–Altman plots in Figure S2).

### 3.2 | Video-assisted team debriefings

During the “Assessment-&-debriefing” period, 90 out of 202 (45%) videos were used for video-assisted team debriefings (Table 1). The primary reasons for exclusion were logistical barriers including shifting work schedules that led to incompatibility in healthcare professionals' availability in 109 cases (97%) and declined consent by healthcare professionals to use the video for video-assisted team

debriefing in three cases (3%). The average duration of the debriefings was 39.5 min, with a median of four participants per session. The mean interval between event and debriefing was 4 weeks. The DART registration<sup>23</sup> showed a [Debriefee responses]:[Debriefing questions + statements] ratio of 4:1, indicating active discussions among participants. In total, 173 healthcare professionals (including 45 obstetricians, 117 midwives, and 11 nursing assistants) attended at least one video-assisted team debriefing. The labor and delivery units collectively have 75 physicians, 190 midwives, and 16 nursing assistants at any given time. Due to staff turnover, it is not possible to estimate the proportion of healthcare professionals who attended a debriefing.

### 3.3 | Obstetric team performance

When comparing the “Assessment-only” to the “Assessment-&-debriefing” period, we found that the clinical performance score increased from 84.8 (95% CI 83.5–86.2) to 86.9 (95% CI 85.6–88.2,  $P=0.029$ ; Table 2). The score increased continuously throughout the

entire "Assessment-&-debriefing" period ( $P=0.026$ ), reaching 89.5 (95% CI 86.2–92.8) by the end of the period (Figure 2).

The non-technical performance score increased from 68.0 (95% CI 66.2–69.9) to 74.3 (95% CI 72.6–76.1,  $P<0.001$ ) (Table 2). The score initially started increasing during the "Assessment-only" period and reached saturation at 74.8 (95% CI 72.7–76.9) halfway through the "Assessment & debriefing" period (Figure 2).

### 3.4 | Incidence of major postpartum hemorrhage

When comparing the three periods, we found that the incidence of major PPH ( $\geq 1000$  mL) was 7.6% during the "Baseline" period, 7.5% during the "Assessment-only" period, and decreased to 6.7% during the "Assessment-&-debriefing" period ( $P=0.048$ , Table 3). These

TABLE 1 Characteristics of video-assisted team debriefings.

<b>Videos eligible for debriefing</b>	<b><i>n</i> = 202</b>
Completed debriefings, <i>n</i> (%)	90 (44.6)
Videos not used for debriefings, <i>n</i> (%)	112 (55.5)
Not possible to gather team	109 (97.3)
Healthcare professional declines	3 (2.7)
Completed video-assisted team debriefings	<i>n</i> = 90
Team size, median (range)	
Total	4 (2–8)
Obstetricians	1 (0–3)
Midwives	2 (1–5)
Nursing assistants	0 (0–1)
Time from event to debriefing (weeks)	
Total, mean (range)	4 (0–11)
0–4, <i>n</i> (%)	50 (55.6)
$\geq 5$ , <i>n</i> (%)	40 (44.4)
Duration of debriefing (min), mean (range)	39.5 (25–60)
Video segments shown during debriefing, median (range)	3.5 (3–5)

TABLE 2 Teams' clinical performance and non-technical performance.

	"Assessment-only" period October 2020–September 2021	"Assessment-&-debriefing" period October 2021–September 2022	<i>P</i> -value
	<i>n</i> = 214	<i>n</i> = 202	
<b>Clinical performance</b>			
Total score (0–100), mean (95% CI)	84.8 (83.5–86.2)	86.9 (85.6–88.2)	0.029
High performance teams, score $\geq 85$ , %	56.7 (49.8–63.5)	62.4 (55.3–69.1)	0.459
Average performance teams, score 60–84, %	40.9 (34.3–47.8)	36.1 (29.4–43.2)	
Low performance teams, score $< 60$ , %	2.3 (0.8–5.3)	1.5 (0.3–4.3)	
<b>Non-technical performance</b>			
Total score (18–90), mean (95% CI)	68.0 (66.2–69.9)	74.3 (72.6–76.1)	$< 0.001$

Abbreviations: CI, confidence interval.

results remained unchanged after adjusting for maternal age, body mass index, gestational age, and parity.

## 4 | DISCUSSION

This study demonstrated that the implementation of video-assisted team debriefings at two labor wards was associated with improved clinical and non-technical performance of teams, as well as a reduction in incidence of major PPH.

A strength of the study is the use of video recordings to assess the actual management of PPH. Additionally, we applied validated checklists with high interrater agreement, and blood loss was quantified by weighing,<sup>25</sup> enhancing the reliability of assessments. We believe that the risk of selection bias was minimal, as only eight healthcare professionals (of approximately 300) and 26 women or their relatives (of 716) declined consent. A limitation is that it was not feasible to blind the raters to the identities of team members. Another limitation is that the study was not powered to assess changes in the incidence of major PPH  $> 1500$  mL.

The present study is the first to apply video-assisted team debriefings in obstetrics, and the results complement previous studies in trauma<sup>9,10</sup> and neonatal resuscitation<sup>6</sup> describing an effect of video-assisted team debriefings on clinical performance. Recommendations for implementing this debriefing model should be supported by a medical technology assessment, including a cost-benefit analysis. In this context, it is important to consider that even in departments with well-established simulation-based team training programs, as in this study, obstetric teams' clinical performance increased steadily over the 1-year period of video-assisted team debriefings (Figure 2). These findings are considered clinically important, as more timely and accurately executed procedures were involved during the clinical management of PPH. By the end of the year, performance reached 89.5 on a 0–100 scale without reaching saturation, suggesting that further improvement could occur with continued use. This gradual improvement in clinical performance likely reflects the growing

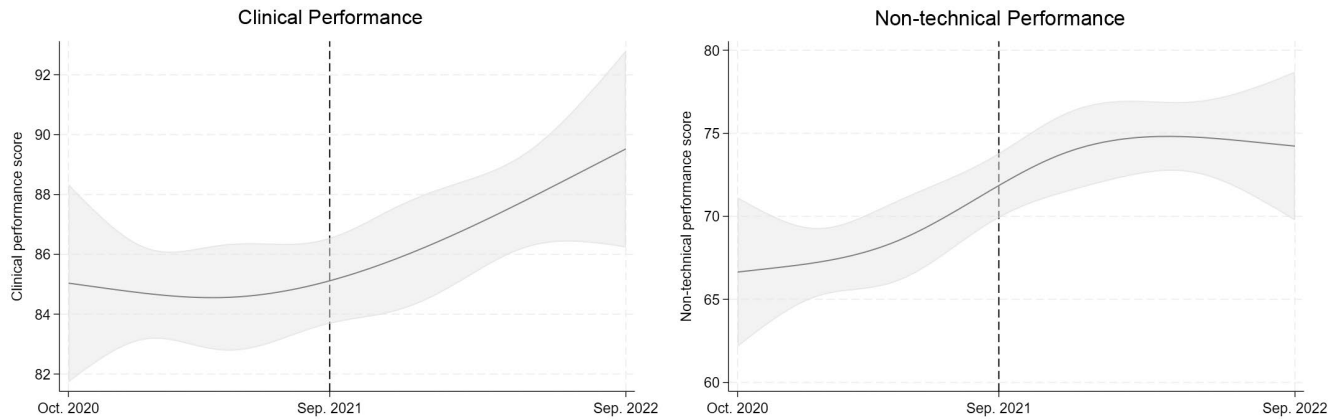


FIGURE 2 Team performance.

TABLE 3 Incidence of major postpartum hemorrhage.

	"Baseline" period January 2020–September 2020	"Assessment-only" period October 2020–September 2021	"Assessment-&-debriefing" period October 2021–September 2022	p-value <sup>a</sup>
<b>All vaginal deliveries</b>	<b>n = 4479</b>	<b>n = 5644</b>	<b>n = 5504</b>	
Blood loss $\geq 1000$ mL, % (95% CI)	7.6 (6.9–8.4)	7.5 (6.8–8.3)	6.7 (6.0–7.4)	0.048
Blood loss $\geq 1500$ mL, % (95% CI)	3.3 (2.8–3.8)	3.0 (2.5–3.6)	3.0 (2.6–3.5)	0.496
Blood loss $\geq 2000$ mL, % (95% CI)	1.5 (1.2–1.8)	1.3 (1.0–1.7)	1.3 (1.0–1.6)	0.664

Abbreviations: CI, confidence interval.

<sup>a</sup>Comparing the "Assessment-&-debriefing" period to the two periods before implementing video-assisted team debriefings, that is the "Baseline" period and the "Assessment-only" periods.

proportion of healthcare professionals who had participated in video-assisted team debriefings.

The increase in clinical performance was not entirely aligned with the increase in non-technical performance,<sup>24,26,27</sup> which includes leadership, teamwork, and communication,<sup>6</sup> likely contributing factors to improved management of PPH (Figure 2). In this study, the mean non-technical performance score significantly increased following the implementation of video-assisted team debriefings, complementing previous findings in neonatal resuscitation.<sup>6,8</sup> However, the non-technical performance score started increasing during the "Assessment-only" period (i.e., before the implementation of video-assisted team debriefings). This might be attributed to the Hawthorne effect,<sup>28</sup> which suggests that individuals modify their behavior when they are aware of being observed. However, the most substantial increase in non-technical performance was observed during the "Assessment-&-debriefing" period.

The reduction in incidence of major PPH  $>1000$  mL observed in our study (from 7.5% to 6.8%) might reflect the impact of the improved clinical and non-technical performance of teams. The decrease is unlikely to be attributed to the "Hawthorne effect," as the incidence remained unchanged between the "Baseline" and "Assessment-only" periods. Notably, the reduction was observed exclusively during the "Assessment-&-debriefing" period. When

evaluating these figures, one must consider that in Denmark, the overall incidence of major PPH  $>1000$  mL has been increasing from 8.4% to 9.1% during the same time period.<sup>29</sup> This is interesting, as the primary outcome measures, clinical and non-technical performance of teams, were already at high levels prior to the intervention. It is likely that the effects of video-assisted team debriefings would be greater in a setting with a lower baseline performance level.

A mean interval of 4 weeks between a major PPH event and video-assisted team debriefing might seem long. However, a shorter interval is unlikely to enhance the effectiveness of the debriefings, as the beneficial effects of video-assisted team debriefing are likely associated with the objective documentation of clinical management aspects. This is particularly valuable when debriefing real-life emergencies, where team members' situation awareness and event recall are often limited.<sup>1</sup> This is evidenced by previous studies describing discrepancies between written documentation in medical records and video documentation of the same event.<sup>5</sup> Video-assisted team debriefings might overcome these limitations,<sup>1</sup> thus providing opportunities for new insights and learning. Although healthcare professionals acknowledge the educational benefits of video-assisted team debriefing, it is rarely used<sup>30</sup> due to legal concerns and technical challenges.<sup>31,32</sup> Therefore, we ensured comprehensive informed consent procedures and addressed healthcare professionals' concerns through interviews.<sup>1</sup> This is important, as the beneficial

effects of video-assisted team debriefing depend on the sense of psychological safety of those being debriefed. The low number of healthcare professionals who declined participation in our study suggests that a strong sense of psychological safety was achieved. Due to legal considerations and to protect healthcare professionals' psychological safety, we did not provide copies of the videos to the few women who requested them. Nor did we share videos or information from the debriefings with colleagues beyond those who participated. However, alternative ways of using the videos might be worth exploring in the future.

Simulation-based team training is widely implemented in labor wards.<sup>33,34</sup> However, despite efforts to create a realistic setup, it remains inherently limited by the fact that participants are acting, and their responses might never fully replicate those in real life.<sup>2,35</sup> Video-assisted team debriefing cannot replace simulation-based team training but can complement it. We argue that real-life video recordings represent the gold standard for assessing team performance, identifying errors and recognizing suboptimal management. Ideally, performance gaps identified through video-assisted team debriefings should be further addressed through simulation-based team training. Although we did not conduct a formal cost-benefit analysis, we estimate that the costs of video-assisted team debriefings are comparable to those of simulation-based team training. Future studies could explore the optimal frequency of video-assisted team debriefings, as it is possible that the number of debriefing sessions could be reduced after 1–2 years of implementation.

## 5 | CONCLUSION

The implementation of video-assisted team debriefing for major PPH was associated with improved clinical and non-technical performance of obstetric teams and a decrease in incidence of major PPH. The results support the importance of video-assisted team debriefing strategies and their potential to enhance obstetric teams' management of PPH.

### AUTHOR CONTRIBUTIONS

All the authors were involved in conceptualizing and developing the study. The research process, video-assisted team debriefings, and data collection were conducted by LR, LB, LH, OK. The formal analysis was conducted by LR, LB, NU, LH, OK and TM. The manuscript was written with contributions from all the authors. All authors gave final approval of this version to be published.

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### CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to report.

### DATA AVAILABILITY STATEMENT

If requested to do so by the Editors, I agree to share the anonymized raw data of my study, either for review during the peer review process, or in the event of any post-publication queries regarding the integrity of the study.

### ORCID

Lena Rosvig  <https://orcid.org/0000-0003-3893-0804>

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#### SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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