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ORIGINAL RESEARCH ARTICLE

Video analysis of real-life shoulder dystocia to assess technical and non-technical performance

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Abstract

Introduction: Managing obstetric shoulder dystocia requires swift action using correct maneuvers. However, knowledge of obstetric teams' performance during management of real-life shoulder dystocia is limited, and the impact of non-technical skills has not been adequately evaluated. We aimed to analyze videos of teams managing real-life shoulder dystocia to identify clinical challenges associated with correct management and particular non-technical skills correlated with high technical performance.

Material and Methods: We included 17 videos depicting teams managing shoulder dystocia in two Danish delivery wards, where deliveries were initially handled by midwives, and consultants were available for complications. Delivery rooms contained two or three cameras activated by Bluetooth upon obstetrician entry. Videos were captured 5 min before and after activation. Two obstetricians assessed the videos; technical performances were scored as low (0–59), average (60–84), or high (85–100). Two other assessors evaluated non-technical skills using the Global Assessment of Team Performance checklist, scoring 6 (poor) to 30 (excellent). We used a spline regression model to explore associations between these two score sets. Inter-rater agreement was assessed using interclass correlation coefficients.

Results: Interclass correlation coefficients were 0.71 (95% confidence interval 0.23–0.89) and 0.82 (95% confidence interval 0.52–0.94) for clinical and non-technical performances, respectively. Two teams had low technical performance scores; four teams achieved high scores. Teams adhered well to guidelines, demonstrating limited head traction, McRoberts maneuver, and internal rotation maneuvers. Several clinical skills posed challenges, notably recognizing shoulder impaction, applying suprapubic pressure, and discouraging women from pushing.

Two non-technical skills were associated with high technical performance: effective patient communication, with teams calming the mother and guiding her collaboration during internal rotational maneuvers, and situation awareness, where teams promptly

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mobilized all essential personnel (senior midwife, consultant, pediatric team). Team communication, stress management, and task management skills were not associated with high technical performance.

Conclusions: Videos capturing teams managing real-life shoulder dystocia are an effective tool to reveal challenges with certain technical and non-technical skills. Teams with high technical performance are associated with effective patient communication and situational awareness. Future training should include technical skills and non-technical skills, patient communication, and situation awareness.

KEYWORDS

checklist, communication, emergency treatment, obstetric labor complications, obstetrics, shoulder dystocia, situation awareness, video recording

1 | INTRODUCTION

Shoulder dystocia is a rare and unpredictable event[1] associated with a serious risk of long-term morbidity for mothers and babies.[2,3] Risk factors for shoulder dystocia are known, but their predictive value is limited. As shoulder dystocia cannot be prevented, its management depends on the prompt recognition and correct application of maneuvers.[3,4]

Despite previous initiatives with simulation training, shoulder dystocia is still a high-risk situation with increased perinatal morbidity.[5] Shoulder dystocia is the second most common litigated birth complication in the USA.[6] England's National Health Service Litigation Authority has paid over £100 million in legal compensation for over a decade due to injuries associated with shoulder dystocia, which could have been prevented.[7]

Research on the actual management of shoulder dystocia has so far been conducted by reviewing medical reports.[8] However, this information may be misleading, as recalling the management after an emergency is difficult, and studies have found that written documentation in the patient files is limited compared to videos.[9,10] Video reviews are effective when analyzing rare emergencies, as the videos can be reviewed several times to scrutinize actual performance, identify challenges associated with poor management, and analyze the teams' non-technical performance.[11] Despite the theoretical benefits of video reviews, systematic video analysis of shoulder dystocia is still lacking. A reason for this might be the legal and ethical approval challenges and litigation risk. We recently developed a method that balances the ethical and legal requirements for filming high-risk deliveries.[12] We hope to fill the knowledge gap by conducting video analyses of teams managing real-life deliveries complicated by shoulder dystocia.

We analyzed videos of shoulder dystocia incidents to identify (1) the challenges associated with correct management and (2) the particular non-technical skills that correlate with high technical performance.

Key Message

Video analyses of obstetric teams' management of shoulder dystocia are an effective tool to reveal challenges with non-technical skills and identify typical pitfalls. Teams with high technical performance were associated with effective patient communication and situation awareness.

2 | MATERIAL AND METHODS

2.1 | Study design and setting

Real-life video recordings of women in labor who experienced shoulder dystocia were obtained from two Danish hospitals between December 2014 and September 2016. The hospitals had different sizes and maternity care levels: Aarhus University Hospital, with a level 3 maternity care unit and 5000 annual deliveries, and Horsens Regional Hospital, with a level 2 maternity care unit and 2000 yearly deliveries. In Danish delivery and birthing units, midwives manage uncomplicated births, and consultants are called only in cases of non-reassuring findings. The labor ward team typically comprises a registrar, a consultant, and several midwives. Shoulder dystocia is diagnosed when deliveries necessitate maneuvers beyond gentle downward traction on the fetal head to facilitate delivery, with an incidence rate of 1%. All personnel train annually in teams, with a focus on both technical and non-technical skills.

All delivery rooms at the two hospitals were equipped with two to three mini dome surveillance cameras (Hikvision Mini Dome, 4 MP, China) and one microphone (Monacor ECM, 10/WS, Denmark) placed in the center of the ceiling. The cameras provide an oblique view of the entire room. We designed a video system that was

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activated using Bluetooth on the on-call obstetrician's phone to minimize the recordings of normal deliveries. The cameras recorded continuously in loops of 5 min. When the obstetrician entered the room, the Bluetooth signal activated the video recording system, thereby saving the preceding 5 min and all subsequent time spent in the delivery room. Videos were only included if all participants (women, partners, and all healthcare providers) provided consent within 48 h; otherwise, videos were automatically deleted from the server. The inclusion criteria were women in labor experiencing shoulder dystocia and the presence and arrival of the consultant. The exclusion criteria were technical errors and missing consent. Notably, during outpatient visits, all women planning to give birth at one of the two hospitals were informed about the study during pregnancy (gestational age: 18–28 weeks). The medical records noted whether the women consented to participate in the study. If shoulder dystocia developed during labor, the woman was asked to reconfirm or decline her consent for participation after delivery.

2.2 | Video analysis: description of patient cases

At study completion, all videos were reviewed. The video recordings from the different positions were played simultaneously, side by side, with the ability to zoom whenever needed. The following characteristics were registered: event date and time, number of healthcare providers present in the room during the event, whether the delivery was a spontaneous vaginal or vacuum-assisted delivery, number of shifts between different healthcare providers actively engaged in the internal rotational maneuvers, and the duration of shoulder dystocia before being resolved (starting after the head was delivered and ending when the body was delivered).

2.3 | Video analysis: non-technical performance of obstetric teams

We used the validated Global Assessment of Team Performance checklist to assess the obstetric teams' non-technical performance.[13,14] Two physicians (LB and KRH) with experience using the Global Assessment of Team Performance tool[15,16] independently evaluated the teams' non-technical performance. The raters were blinded to each other's ratings and the teams' technical performance (described below). The checklist comprised six items, each rated on a Likert scale between 1 and 5 (1 = poor and 5 = excellent), resulting in a total score ranging between 6 and 30. Excellent performance (score of 5) for each item was defined as follows:

1. Patient communication: "Calm guidance and information ensuring collaboration with the mother; active and continuous information sharing and involvement of patient/partner in care decisions; sensitivity to changing patient/partner needs; effective intervention to avoid or dispel patient/partner's disruptive response to changing clinical situation."[14]
2. Task management: "Urgency of the clinical situation is recognized; goals are set and communicated with team members; team members adapt to changing situation; resources are effectively utilized; team is verbally stating that they are experiencing shoulder dystocia and verbally stating each step of the procedure."[14]
3. Leadership: "Trust and respect are demonstrated among team members; team members monitor each other's performance and provide feedback; the leader identifies and encourages participation and identifies opportunities for improvement."[14]
4. Situation awareness: "Early recognition and rapid response to critical situations; extra personnel summoned in a timely fashion; preemptive actions are taken; team members remain vigilant and alert to the clinical situation."[14]
5. Communication with team members: "Focused communication with clear questions/instructions directed to a specific person; receiver acknowledges receipt of message; team members question each other to ensure that what is being asked of them contributes to effective patient management."[14]
6. Management of stress: "Dialogue is focused on the clinical situation; interruption/disruption is dealt with efficiently to regain focus on the clinical situation; demeanor is controlled, and voices remain calm and focused on the clinical situation."[14]

2.4 | Video analysis: technical performance of obstetric teams

We used a checklist reflecting the guidelines for shoulder dystocia management to assess obstetric teams' clinical management of shoulder dystocia (technical performance).[17] Two obstetricians (LH and NU) independently reviewed all videos and evaluated each team's technical performance by applying the checklist. The raters were blinded to each other's ratings and the teams' non-technical performance (described above). The checklist comprised 10 items, each representing a crucial step in shoulder dystocia management (Table S1). The items were labeled as follows:

1. Preparation (four items): 1–1 Recognition of shoulder dystocia, 1–2 Call for sufficient help, 1–3 Discourage pushing, and 1–4 Mother's position.
2. General tasks (three items): 2–1 McRoberts maneuver, 2–2 Suprapubic pressure, and 2–3 Internal rotational maneuvers or posterior arm delivery.
3. When the above tasks fail, then consider (four items): 3–1 All-four position or repeat all general tasks, 3–2 Consider the Zavanelli maneuver, and 4–1 The following procedures should be avoided (fundal pressure and downward traction on the fetal head).

Each of these 10 items were evaluated on a predefined form[12] by ticking one of the five available checkboxes (Table S1). "Not indicated" was used if the item was not applicable (e.g., item 1–2 was not indicated if appropriate staff were already present). "Cannot be assessed" was used when a task was indicated but could not be

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assessed (e.g., item 2–2 could not be assessed if the assessors could not clearly see the management due to several midwives standing around the woman and hindering a direct view of the management). "Done correctly and in a timely manner" (2 points), "Done incorrectly or done correctly with delay" (1 point), and "Not done" (0 point) were used to assess the task. Because time is a crucial factor in management, a task done correctly but with significant delay was assigned the same score as a task done incorrectly. Whether a task was done in a timely or delayed manner was evaluated using the PROMPT instructions and the assessor's knowledge.[17]

The item score was calculated as a percentage of the possible total score, with a minimum score of 0% and a maximum score of 100%. The assessors then assessed the patient safety score, which represented the assessors' subjective global rating of the management and provided an opportunity to evaluate aspects of performance that were not captured by the checklist items (e.g., if a maneuver was conducted incorrectly and risked harming the neonate, such as using excessive downwards traction to deliver the shoulders). The patient safety score ranged from 0% to 100% (100% equaled optimal performance with maximal patient safety). The technical performance score was calculated as follows: (items score + patient safety score)/2. This final step is important as research in performance assessment has demonstrated that the objective checklist and the subjective global score of patient safety complement each other, and this step ensures optimal assessment. Hence, universities today use both a structured objective assessment and the global score in OSCE examinations.[18]

After the video analysis, all videos were ranked based on technical performance. While blinded to the final technical performance score of each team, raters (NU and LH) reviewed all videos chronologically to determine the passing level and the level of performance, thus defining performance levels as follows: low (0–59), average (60–84), and high (85–100).

2.5 | Statistical analyses

The agreement between raters was evaluated using interclass correlation and Bland–Altman analysis. The association between non-technical performance (exposure) and technical performance (outcome) was described using the spline regression analysis for total and item scores. Statistical analyses were conducted using the Stata software (version 17.0, StataCorp LLC, College Station TX, USA).

3 | RESULTS

3.1 | Included cases

Twenty cases of shoulder dystocia met the inclusion criteria, and 17 were included, while three cases were excluded due to logistic or technical reasons. The median duration of shoulder dystocia was 3.5 min (range 1–8 min). One case was resolved using the McRoberts maneuver alone, and the remaining 16 cases were resolved after proceeding to internal maneuvers. In 88% of cases, we observed one to three shifts for a new midwife or obstetrician to proceed or repeat the maneuvers. The cases were equally distributed across day, evening, and night shifts (Table 1).

TABLE 1 Description of patient cases.

Characteristics, *n* = 17	
Case distribution, *n*	
Horsens Regional Hospital	4
Aarhus University Hospital	13
Vacuum extraction, *n* (%)	
Yes	5 (29)
No	12 (71)
Head delivered before video start, *n* (%)	
Yes	5 (29)
No	12 (71)
Shift of hands/staff[a], *n* (%)	
0	2 (12)
1	3 (18)
2	9 (53)
3	3 (18)
Episiotomy, *n* (%)	
Yes	5 (29)
No	12 (71)
Time of day, *n* (%)	
Day	6 (35)
Evening	6 (35)
Night	5 (29)
Duration of video (min)[b], median (range)	3.5 (1–8)

[a]Shifting between healthcare providers actively engaged in the internal rotational maneuvers.
[b]Head to body interval.

3.2 | Inter-rater agreement

The interclass correlation coefficients (ICC) were 0.82 (95% CI 0.52–0.94) for the non-technical performance and 0.71 (95% CI 0.23–0.89) for the technical performance score. The agreement was acceptable visualized using Bland–Altman plots and limits of agreement (Figure S1).

3.3 | Technical performance

The overall performance scores (Table 2) were categorized as low ($n = 2$), average ($n = 11$), or high ($n = 4$). The majority of teams achieved maximum scores for gentle downward traction, McRoberts maneuver, and internal rotational maneuvers, while less

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TABLE 2 Technical performance groups (low, average, high) and specific technical skills.

Teams/procedures, *n* (%)	All (*n* = 17)	Low performance teams (*n* = 2)	Average performance teams (*n* = 11)	High performance teams (*n* = 4)	*p*-value
Recognize[a]					
Not done	3 (18.6)	0 (0.0)	3 (30.0)	0 (0)	0.56
Done later than expected	11 (68.8)	2 (100.0)	6 (60.0)	3 (75.0)	
Done correctly	2 (12.5)	0 (0.0)	1 (10.0)	1 (25.0)	
Call for help					
Not done	0 (0)	0 (0)	0 (0)	0 (0)	0.22
Done later than expected	8 (47.1)	2 (100.0)	5 (45.5)	1 (25.0)	
Done correctly	9 (52.9)	0 (0)	6 (54.6)	3 (75.0)	
No push					
Not done	4 (23.5)	1 (50.0)	3 (27.3)	0 (0.0)	0.43
Done partially	6 (35.3)	1 (50.0)	4 (36.4)	1 (25.0)	
Done correctly	7 (41.2)	0 (0)	4 (36.4)	3 (75.0)	
Position of the mother					
Not done	1 (5.9)	0 (0)	1 (9.1)	0 (0.0)	0.91
Done partially	5 (29.4)	1 (50.0)	3 (27.3)	1 (25.0)	
Done correctly	11 (64.7)	1 (50.0)	7 (63.6)	3 (75.0)	
Mc Roberts					
Not done	0 (0.0)	0 (0)	0 (0.0)	0 (0.0)	0.13
Done partially	6 (35.3)	2 (100.0)	3 (27.3)	1 (25.0)	
Done correctly	11 (64.7)	0 (0)	8 (72.7)	3 (75.0)	
Suprapubic pressure[a]					
Not done	8 (50.0)	2 (100.0)	6 (54.6)	0 (0.0)	0.02
Done partially	6 (37.5)	0 (0)	5 (45.5)	1 (33.3)	
Done correctly	2 (12.5)	0 (0)	0 (0.0)	2 (66.7)	
Internal maneuvers[b]					
Not done	0 (0.0)	0 (0)	0 (0.0)	0 (0.0)	0.79
Done partially	1 (6.3)	0 (0)	1 (9.1)	0 (0.0)	
Done correctly	15 (93.8)	2 (100.0)	10 (90.9)	3 (100.0)	
Gaskin (All-four position)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Zavanelli	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Avoid fundal pressure[c]					
Not done	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.16
Done partially	2 (25.0)	1 (100.0)	1 (20.0)	0 (0.0)	
Done correctly	6 (75.0)	0 (0.0)	4 (80.0)	2 (100.0)	

Note: If an item is "non applicable," it means that the view was too limited to assess this item.

[a]Non applicable, *n* = 1.

[b]Internal rotational maneuverers Rubin' maneuvers, woods´ screw, delivery of the posterior arm.

[c]Non applicable/, *n* = 9.

than 50% achieved maximum scores for recognizing and making a verbal statement of shoulder impaction (12%), applying suprapubic pressure (13%), and discouraging women from pushing (41%). Six teams "partially" performed the McRoberts maneuver with difficulties in ensuring fully flexed hips without outbound rotation. Some procedures were not attempted by any team, including the rotation of the patient onto all fours (i.e., the Gaskin maneuver) and the Zavanelli maneuver.

3.4 | Non-technical performance

Non-technical items were significantly correlated with technical performance, with a mean technical performance score difference of 14.6 (95% confidence interval [CI]: 5.4–23.9) for teams with a non-technical performance of 15 vs 25 (Figure 1). The greatest contribution to the positive association was "Communication with the patient," defined as calm guidance and information that ensured

FIGURE 1 Technical performance (shoulder dystocia checklist, score 0%–100%) and non-technical performance (Global Assessment of Team Performance checklist, total score 5–25).

collaboration with the mother, and "Situation awareness," defined as the early identification of shoulder dystocia and being able to call for help early, effectively, and correctly (Figure 2).

Teams with low technical performance showed difficulties communicating with the mother, missed calling the consultant or the pediatric team, and worked with confusion and stress. Teams with low technical performance had a mean score of 1.0 in "situation awareness," as compared with a score of 3.5 in teams with high technical performance. Similar results were obtained for "communication with the patient," with a mean score of 1.5 vs 3.8. The non-technical skills concerning team communication, stress management, and task management were not significantly associated with high technical performance (Figure 2). All teams had average or excellent performance regarding leadership, and the possible adverse effects of poor leadership could not be assessed.

4 | DISCUSSION

We performed video analysis of 17 real-life cases of shoulder dystocia. The technical challenges were recognizing shoulder dystocia, applying suprapubic pressure, and discouraging women from pushing. The two non-technical skills underpinning high technical performance were promptly recognizing the shoulder dystocia and mobilizing all essential personnel, and patient communication.

The vast majority of cases were severe; internal maneuvers were applied in 94% of cases, and in 80% of cases, doctors and midwifes took turns applying internal maneuvers with 1–3 shifts, revealing difficulties with releasing the shoulders (Table 1). In the study period 0.75% of all births were coded as shoulder dystocia with internal maneuvers applied corresponding to approximate 50 cases annually. From our data, we know that about 10 cases annually would be managed with the presents of a doctor, the remaining 40 cases would be managed by midwifes alone. These number underlines the unique data presented in this article.

While the teams' overall technical performance exhibited commendable proficiency, our video review also revealed challenges with certain skills. Concerning the recognition and verbalization of shoulder dystocia, guidelines assert that the diagnosis is confirmed after a single failed attempt to deliver the shoulders.[1,19] This recommendation is generated from retrospective register studies, suggesting that non-compliance increases neonatal morbidity.[20–22] Although the median duration of shoulder dystocia in our study was only 3.5 min, the upper range extended to 8 min, potentially reaching a critical timeframe.[19] All teams demonstrated high technical skills in applying the McRoberts maneuver; nevertheless, most teams encountered difficulties correctly applying suprapubic pressure, with 50% not using suprapubic pressure at all. The reasons for these difficulties with suprapubic pressure were not revealed in the video, suggesting that the maneuver was either forgotten or not prioritized, even though guidelines categorize this as one of the primary maneuvers alongside the McRoberts maneuver.[23] In our study, the Gaskin maneuver was not performed, even in cases where the neonates were stuck for more than 5 min. Whether or not the Gaskin maneuver should be prioritized sooner is unknown, as a recent review revealed conflicting evidence regarding the effectiveness of the maneuver.[24] However, it is recommended to employ different maneuvers at least every 30 s to reduce the risk of neonatal brachial plexus injuries, and Gaskin is an option with a gentle approach.[20,25,26]

Non-technical skills underpin the teams' technical performance, and emerging evidence suggests that the importance of specific behavioral skills vary across different emergencies.[27] In this study, effective patient communication, calming the mother, and guiding her to collaborate during internal rotational maneuvers were associated with high clinical performance although we cannot prove causality. However, it is remarkable that the video analysis of 99 teams managing postpartum hemorrhage found no association with patient communication and high technical performance.[15] This is a rather surprising finding, as the non-technical checklist evaluates the communication delivered from the team to the mother, and not whether the teams' attempts actually calm the mother. The second non-technical skill associated with high technical performance was promptly recognizing the emergency and mobilizing all essential

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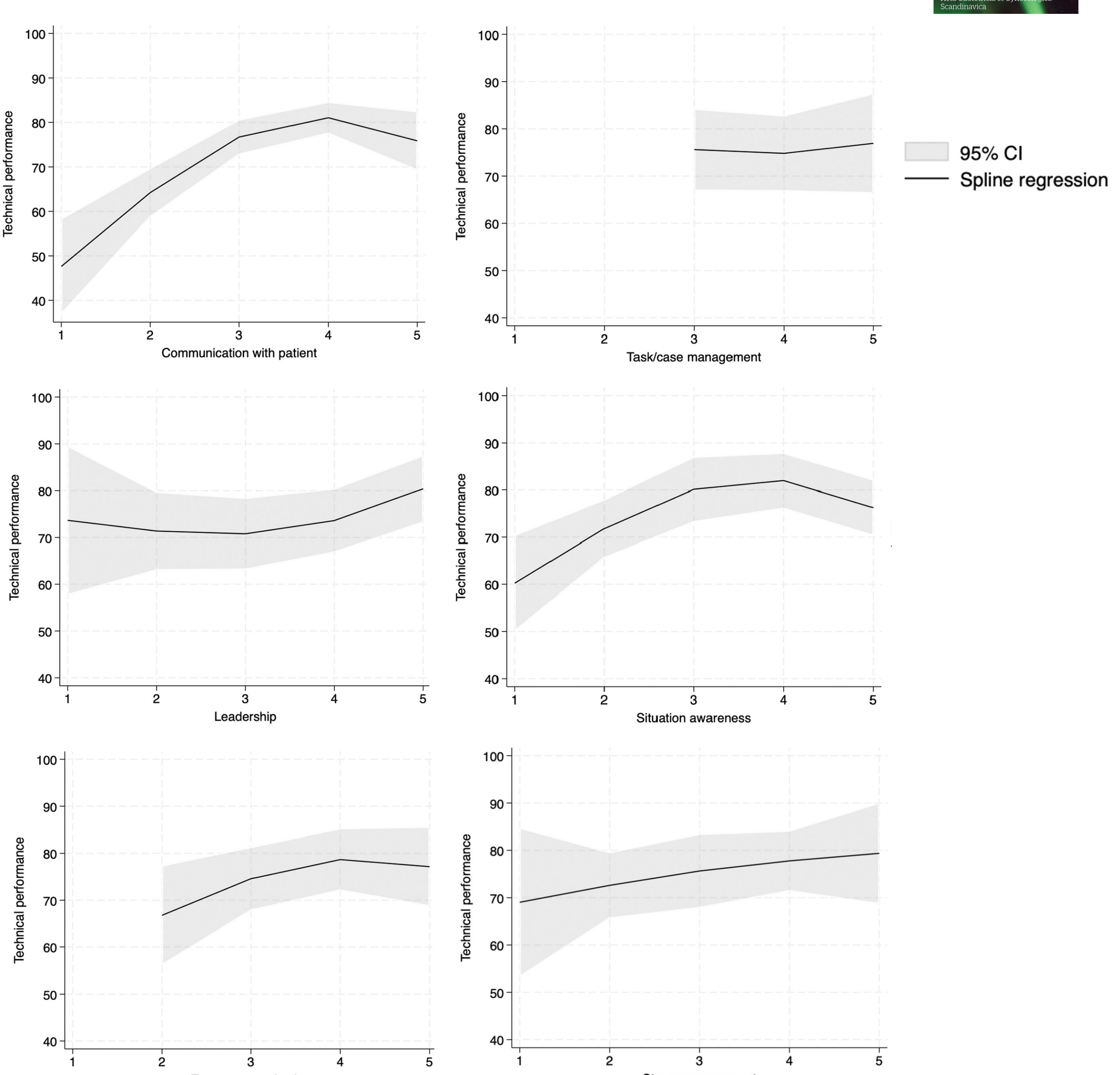

FIGURE 2 Technical performance (shoulder dystocia checklist, score 0%–100%) and specific non-technical skills (Global Assessment of Team Performance checklist, Likert scale 1–5).

personnel, which was closely related to the technical skill of diagnosing shoulder dystocia, before verbalizing the problem and calling for extra help.

Addressing non-technical skills in training is a key factor to improve team performance and patient safety.[28] Extensive research has demonstrated that improving safety is not just about enhancing knowledge or technical skills, but also concerns the non-technical skills that can lead to suboptimal performance.[29] The importance of non-technical skills was identified in the 1970s as research in high-risk industries identified human error as the most common reason for devastating accidents, and found errors in communication, teamwork, leadership, and situational awareness to cause suboptimal performance.[30] Since the beginning of the 21st century, healthcare systems have adopted training designed to reduce human error and have improved clinical performance and patient safety by enhancing teams' non-technical skills.[31] A review of adverse outcomes in obstetrics highlighted poor communication or a lack of situational awareness as a main cause of adverse advents,[22] however, there are still barriers to implementing annually simulation-based training as it is costly and time consuming.

Shoulder dystocia remains a significant concern for laboring mothers, their families, healthcare staff, and the healthcare system.[5] Despite previous initiatives, shoulder dystocia is still an unpredictable, high-risk event with increased perinatal morbidity and

mortality.[3] Shoulder dystocia is the second most common litigated birth complication in the USA,[6] and a survey of over 850 healthcare providers in Michigan reported that the risk of malpractice litigation was the most frequent reason for leaving the obstetrics department.[32] The American Journal of Obstetrics and Gynecology[2] and societies such as the Royal College of Obstetricians and Gynaecologists[1] and the Danish Society of Obstetrics and Gynecology[33] emphasize the importance of regular training for shoulder dystocia to establish the technical skills and maneuvers required, and this training has been proven to reduce the risk of adverse outcomes.[34] Simulation training in shoulder dystocia management has improved our performance in the last decades; however, we still have not fully solved the issue of shoulder dystocia management, and studies scrutinizing our actual performance are still lacking.[11] Examining videos of teams managing real-life shoulder dystocia can be an effective method for identifying crucial technical and non-technical skills, and this study is an important step toward a more in-depth understanding of the team's actual performance. Based on our study, we advocate to include both technical and non-technical skills in training the management of shoulder dystocia. The training in our facility has so far included technical skills and the ability to verbalize the shoulder dystocia diagnosis and call for help. Additionally, we recommend training the communication with the mother to calm and guide her to collaborate during maneuvers.

The external validity of our findings is robust regarding departments where staff undergo training through simulations. In particular, the significance of patient communication and situation awareness training is likely universal. Nevertheless, all departments could benefit from implementing a video system similar to that used in our study, because the technical and non-technical items requiring additional focus during simulations and debriefings may vary based on the specific setting. Moreover, additional video-based research on real-life shoulder dystocia is needed to evaluate the efficiency of maneuvers and the effect of different training modalities and to further explore the impact of non-technical skills on technical performance.

The main strength of this study was the automated filming of teams managing real-life shoulder dystocia. In addition, no videos were excluded due to missing consent.[35] Furthermore, the technical and non-technical performance was assessed by two pairs of raters using predefined checklists for systematic assessment, and the inter-rater agreement was high.[36] The risk of selection bias was low, as we included 17 out of 20 cases where the obstetrician entered the delivery room.[33] However, our study was limited by the observational design, as the associations identified were not proof of causality. In some instances, the view was obscured by working personnel, and we were not able to differentiate between or evaluate the quality of the internal maneuvers. Furthermore, the design could be improved with extended video options, such as using body cameras, accessing patient charts, and reporting neonatal outcomes.[37]

5 | CONCLUSION

Videos capturing teams managing real-life shoulder dystocia are an effective tool to reveal challenges with technical and non-technical skills. This study specifically reveals that excellent patient communication and situation awareness are associated with high technical performance. Based on these findings, we advocate for future simulation training programs to enhance their emphasis on the specific non-technical skills: promptly recognizing the emergency and mobilizing all essential personnel, and effective patient communication, calming the mother and guiding her to collaborate during internal rotational maneuvers.

AUTHOR CONTRIBUTIONS

Lise Brogaard and Ole Kierkegaard collected data. Lone Hvidman, Niels Uldbjerg, Kristiane Roed Hjorth-Hansen, Lise Brogaard conducted the video analysis. Lena Rosvig conducted the statistical analysis. Kristiane Roed Hjorth-Hansen and Lise Brogaard drafted the manuscript. Niels Uldbjerg, Lone Hvidman, Ole Kierkegaard, Lena Rosvig and Tanja Manser edited and revised the manuscript. All the authors approved the final version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors report no conflicts of interest.

ETHICS STATEMENT

This study protocol was accepted legally and ethically in May 8, 2014, by the Central Denmark Region, Danish Data Protection Agency (2012-58-006) and the Research Foundation of Central Denmark (Record No. 1-16-02-257-14). Informed consent was obtained as regulated by the Danish penal code §264.

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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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