# Obstetric Emergency Simulation: A Pre/Post Survey Analysis of High-Fidelity Teamwork Among Emergency Department Physicians

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## INTRODUCTION

Collaboration, efficiency, and communication are critical components of high-fidelity teamwork, which results in safe healthcare systems and improved perinatal outcomes.[1-5] Multiple non-health care industries have shown simulation is an effective tool to promote high-fidelity teamwork, particularly when teams are physically separated and work together rarely.[1-5] Obstetric emergencies can be unpredictable and may require multidisciplinary collaboration, factors that make these cases excellent opportunities for simulation based education.[3,5] We therefore aimed to assess the impact of an obstetric emergency simulation on survey-based measurements of high-fidelity teamwork among emergency department physicians at a quaternary care center without a birthing unit or obstetric providers (maternal-fetal medicine physicians serve as obstetric consultants but are based in another hospital system).

## METHODS

We conducted a pre/post-survey study of emergency department physicians who participated in an obstetric emergency simulation in May 2023. The study was deemed to be minimal risk and was IRB exempt #1966002-1. Five obstetric emergencies – eclampsia, cardiac arrest, post-mortem cesarean section, post-partum hemorrhage, and breech extraction – were selected jointly by emergency and maternal-fetal medicine physicians to serve as simulation cases. Obstetric emergency simulations were led jointly by a maternal-fetal medicine and emergency department physician. The survey was modified from existing high-fidelity teamwork surveys[1-4] composed of Likert-scale items (0=never to 10=always) and was collected one month pre- and one month post-obstetric emergency simulations. Pre/post medians for each survey item were calculated and compared using Wilcoxon rank-sum test. Pre-specified sub-group analyses included physician level of training (i.e., resident versus attending) and self-identified gender (i.e., male or female).

## RESULTS

Pre/post-simulation surveys were completed by 38/46 (83%) and 34/46 (74%) of emergency department physicians respectively. Overall, the emergency department physicians reported higher levels of teamwork related to caring for patient with obstetric emergencies after the simulations than before (**Table 1**). Specifically, the following survey items were higher after simulation: reported ability to execute evidence-based obstetric emergency management (median [interquartile range] 5.5 [3–8] vs 7 [5–8], p=0.04), feeling supported by staff at opposite healthcare system (6 [3–9] vs 8 [7–10], p=0.002), establishment of a care team leader (5 [2–9] vs 8 [6–10], p=0.006), assessment within 15 minutes of presentation to either healthcare system (5 [0–8] vs 7 [5–9], p=0.001), direct and closed-loop communication (6 [4–8] vs 8.5 [6–10], p=0.001), and timely adaption of obstetric emergency management plans (5 [1–9] vs 8 [5–10], p=0.01 **Table 1**) for the clinical scenario.

Sub-group analysis by emergency department physician training level (i.e., post-graduate residents (n=26) and attendings (n=12)) revealed similar improvement in high-fidelity teamwork survey components for the resident trainees. There were no statistically significant differences in high-fidelity teamwork survey components among attending emergency department physicians (**Tables 2a,b**).

However, sub-group analysis by self-identified gender demonstrated differences between groups: self-identified male emergency department physicians (n=20) reported post-simulation that teams were more likely to establish a care team leader (6 [4–9] vs 8 [8–10], p=0.02), have transparent thinking of care leader (5.5 [5–9] vs 8.5 [6–10], p=0.03), utilize direct and closed-loop communication (7 [5-8] vs 9 [8–10] and 6 [5–8] vs 8.5 [8–10], p=0.001 respectively) and have clear establishment of roles (6 [5–9] vs 8.5 [7–9], p=0.04). Conversely, self-identified female emergency department physicians (n=18) reported support from the opposite health care system (5 [4–8] vs 8.5 [8–9], p=0.02) and assessment within 15 minutes of arrival to the emergency department (3 [0–5] vs 8 [8–8], p=0.02) but there were no differences in other high-fidelity teamwork survey components.

## CONCLUSION

Implementation of multidisciplinary obstetric emergency simulations, led by maternal fetal medicine physicians, for emergency physicians at a quaternary care center without obstetricians or a birthing center, resulted in improved survey-based assessments of high-fidelity teamwork among emergency department physicians. These findings are limited by our current inability to measure the decline of knowledge and sustained high-fidelity teamwork assessments over time. However, we intend to conduct ongoing assessments to address this limitation. Future research should examine how obstetric emergency simulations impact perinatal outcomes and high-fidelity teamwork culture across healthcare systems longitudinally.

**Table 1.** Obstetric emergency simulation pre/post survey among all emergency department physicians

| High-fidelity teamwork survey item | Pre- N=38 | Post- N=34 | p-value |
|---|---|---|---|
| How often did you feel confident in your ability to identify an obstetric emergency? | 6 [3–9] | 7 [5–9] | 0.12 |
| How often did you feel confident in your ability to execute evidence-based management? | 5.5 [3–8] | 7 [5–8] | **0.04** |
| How often did your patient require a multidisciplinary care team? | 8 [4–10] | 8 [2–10] | 0.85 |
| How often did you feel supported when you asked for help from hospital 1 staff? | 5 [3–10] | 7 [5–9] | **0.01** |
| How often did you feel supported when you asked for help from hospital 2 staff? | 6 [3–9] | 8 [7–10] | **0.002** |
| In your opinion, how often did the team's overall performance meet the gold standard assessment as a multidisciplinary team within 15 minutes of arrival to the ED? | 5 [0–8] | 7 [5–9] | **0.001** |
| How often was a care team leader established? | 5 [2–9] | 8 [6–10] | **0.006** |
| How often was there transparent thinking by a care team leader? | 5.5 [3–9] | 8 [6–10] | **0.008** |
| How often was there direct communication amongst the team? | 6 [3–9] | 8.5 [6–10] | **0.001** |
| How often was their closed-loop communication amongst the team? | 6 [4–8] | 8 [5–10] | **0.002** |
| How often did other disciplines identify themselves? | 6 [1–9] | 7 [5–10] | **0.02** |
| How often did each team member have a clear role? | 5 [3–9] | 8 [5–10] | **0.02** |
| How often were priorities / order of action clearly delineated among the team? | 5 [3–9] | 8 [5–10] | **0.04** |
| How often were order of action (e.g. airway, breathing, circulation) correct according to the specific obstetric emergency? | 8 [5–10] | 9 [7–10] | 0.10 |
| How often were there disagreements among team members that negatively impacted patient outcomes? | 2 [0–5] | 1.5 [0–5] | 0.59 |
| How often did an individual team member fixate on the less emergent issue excluding other important aspect of care? | 3 [0–5] | 3 [0–5] | 0.96 |
| How often were there inappropriate assumptions of other team members capabilities? | 3.5 [0–5] | 2.5 [0–5] | 0.17 |
| How often were management plans adapted in a timely manner when the clinical situation changed? | 5 [1–9] | 8 [5–10] | **0.04** |

Data median [interquartile range]; p-value calculate using Wilcoxon rank-sum test; responses to individual survey

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**Tables 2a,b.** Multidisciplinary obstetric emergency simulation pre/post survey among emergency department clinicians by resident and attending

| Multidisciplinary high-fidelity survey item – POST-GRADUATE YEARS 1–5 | Pre- N=26 | Post- N=20 | p-value |
|---|---|---|---|
| How often did you feel confident in your ability to identify an obstetric emergency? | 6 [3–8] | 8 [5–9] | **0.04** |
| How often did you feel confident in your ability to execute evidence-based management? | 5 [4–8] | 7 [5–8] | **0.01** |
| How often did your patient require a multidisciplinary care team? | 7.5 [5–10] | 8.5 [7–10] | 0.08 |
| How often did you feel supported when you asked for help from hospital 1 staff? | 5 [3–10] | 8 [5–9] | **0.008** |
| How often did you feel supported when you asked for help from hospital 2 staff? | 6 [4–9] | 8 [8–10] | **0.003** |
| In your opinion, how often did the team's overall performance meet the gold standard assessment as a multidisciplinary team within 15 minutes of arrival to the ED? | 5 [0–7] | 8 [5–9] | **0.01** |
| How often was a care team leader established? | 5 [2–9] | 10 [8–10] | **0.01** |
| How often was there transparent thinking by a care team leader? | 6 [4–9] | 9 [8–10] | **0.002** |
| How often was there direct communication amongst the team? | 6.5 [5–9] | 10 [8–10] | **0.003** |
| How often was their closed-loop communication amongst the team? | 6 [5–8] | 10 [8–10] | **<0.001** |
| How often did other disciplines identify themselves? | 5 [4–9] | 9 [7–10] | **0.007** |
| How often did each team member have a clear role? | 5 [5–9] | 9 [8–10] | **0.01** |
| How often were priorities / order of action clearly delineated among the team? | 5 [5–9] | 8 [8–10] | **0.03** |
| How often were order of action (e.g. airway, breathing, circulation) correct according to the specific obstetric emergency? | 8 [5–10] | 10 [8–10] | **0.02** |
| How often were there disagreements among team members that negatively impacted patient outcomes? | 2 [0–5] | 0 [0–2] | 0.09 |
| How often did an individual team member fixate on the less emergent issue excluding other important aspect of care? | 2 [0–5] | 2 [1–5] | 0.86 |
| How often were there inappropriate assumptions of other team members capabilities? | 3 [0–5] | 2 [0–3] | 0.08 |
| How often were management plans adapted in a timely manner when the clinical situation changed? | 7 [3–9] | 8 [7–10] | **0.04** |

| Multidisciplinary high-fidelity survey item – ATTENDING | Pre- N=12 | Post- N=13 | p-value |
|---|---|---|---|
| How often did you feel confident in your ability to identify an obstetric emergency? | 7.5 [5–9] | 7 [6–9] | 0.93 |
| How often did you feel confident in your ability to execute evidence-based management? | 6.5 [6–8] | 7 [6–8] | 0.88 |
| How often did your patient require a multidisciplinary care team? | 8 [7–9] | 6 [4–8] | 0.14 |
| How often did you feel supported when you asked for help from hospital 1 staff? | 6 [3–7] | 7 [5–8] | 0.34 |
| How often did you feel supported when you asked for help from hospital 2 staff? | 7 [7–8] | 8 [8–8] | 0.56 |
| In your opinion, how often did the team's overall performance meet the gold standard assessment as a multidisciplinary team within 15 minutes of arrival to the ED? | 5 [3–5] | 6 [6–6] | 0.12 |
| How often was a care team leader established? | 4 [3–7] | 7 [7–7] | 0.10 |
| How often was there transparent thinking by a care team leader? | 5 [4–7] | 6 [6–6] | 0.62 |
| How often was there direct communication amongst the team? | 6 [5–6] | 8 [8–8] | 0.09 |
| How often was their closed-loop communication amongst the team? | 5 [5–6] | 7.5 [7–8] | 0.15 |
| How often did other disciplines identify themselves? | 6 [6–6] | 6.5 [6–7] | 0.58 |
| How often did each team member have a clear role? | 5 [5–6] | 6.5 [6–7] | 0.42 |
| How often were priorities / order of action clearly delineated among the team? | 5 [3–6] | 5.5 [5–6] | 0.35 |
| How often were order of action (e.g. airway, breathing, circulation) correct according to the specific obstetric emergency? | 7 [7–7] | 8 [8–8] | 0.69 |
| How often were there disagreements among team members that negatively impacted patient outcomes? | 2.5 [2–3] | 4 [3–5] | 0.46 |
| How often did an individual team member fixate on the less emergent issue excluding other important aspect of care? | 5 [5–5] | 4 [3–5] | 0.97 |
| How often were there inappropriate assumptions of other team members capabilities? | 5 [5–5] | 4 [3–5] | 0.52 |
| How often were management plans adapted in a timely manner when the clinical situation changed? | 5 [5–5] | 6 [6–6] | 0.31 |

Data median [interquartile range]; p-value calculate using Wilcoxon rank-sum test; responses to individual survey items vary