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Severe Maternal Morbidity: Screening and Review

ABSTRACT: This document builds upon recommendations from peer organizations and outlines a process for identifying maternal cases that should be reviewed. Severe maternal morbidity is associated with a high rate of preventability, similar to that of maternal mortality. It also can be considered a near miss for maternal mortality because without identification and treatment, in some cases, these conditions would lead to maternal death. Identifying severe morbidity is, therefore, important for preventing such injuries that lead to mortality and for highlighting opportunities to avoid repeat injuries. The two-step screen and review process described in this document is intended to efficiently detect severe maternal morbidity in women and to ensure that each case undergoes a review to determine whether there were opportunities for improvement in care. Like cases of maternal mortality, cases of severe maternal morbidity merit quality review. In the absence of consensus on a comprehensive list of conditions that represent severe maternal morbidity, institutions and systems should either adopt an existing screening criteria or create their own list of outcomes that merit review.

Introduction

This document builds upon recommendations from peer organizations and outlines a process for identifying maternal cases that should be reviewed. Different groups have offered different definitions of severe morbidity (1–4) and proposed lists of conditions and complications that constitute severe morbidity (4, 5). These definitions share the concept that severe maternal morbidity can be thought of as unintended outcomes of the process of labor and delivery that result in significant short-term or long-term consequences to a woman's health. The American College of Obstetricians and Gynecologists (the College) and the Society for Maternal–Fetal Medicine (SMFM) have not yet created or endorsed a single, comprehensive definition of severe maternal morbidity. Creating a consensus definition of severe maternal morbidity is beyond the scope of this document and may be the focus of future work. In the interval, however, using this recommended process to identify potential cases of severe maternal morbidity for further review, with a focus on outcomes and complications, is an important step toward promoting safe obstetric care. Like cases of maternal mortality, cases of severe maternal morbidity merit quality review. The purpose of identifying and evaluating these cases is to facilitate opportunities for improvement in care. However, neither intensive care unit (ICU) admission or transfusion of 4 or more units of blood should be used as quality metrics because some cases of morbidity reflect the underlying health of a woman or her pregnancy and, thus, are unavoidable.

Background

Like maternal mortality, severe maternal morbidity is increasing in the United States (3, 6, 7). Severe maternal morbidity is associated with a high rate of preventability, similar to that of maternal mortality (7). It also can be considered a near miss for maternal mortality because without identification and treatment, in some cases, these conditions would lead to maternal death. Identifying severe morbidity is, therefore, important for preventing such injuries that lead to mortality and for highlighting opportunities to avoid repeat injuries. Responding to these concepts, multidisciplinary expert groups have called for all obstetric hospitals to review their cases of severe maternal morbidity to look for opportunities for improvement in care that could lead to improved maternal outcomes and fewer maternal deaths (8, 9). These calls are supported by the College; SMFM; the Association of Women's Health, Obstetric and Neonatal Nurses; the American College of Nurse–Midwives; and other groups.

Clinical Considerations and Management

What is severe maternal morbidity?

Severe maternal morbidity can be thought of as unintended outcomes of the process of labor and delivery that result in significant short-term or long-term consequences to a woman's health. To date, there is not complete consensus among systems and professional organizations as to what conditions should represent severe maternal morbidity. Developing such a list in the future has clear utility. In the absence of consensus on a comprehensive list of conditions that represent severe maternal morbidity, institutions and systems should either adopt an existing screening criteria or create their own list of outcomes that merit review. Such lists may be based on the institutions' evaluations of which adverse outcomes are consequential to their population. Table 1 presents an example of a list of conditions that represent severe maternal morbidity. In some cases, however, an identified morbidity actually may not prove to be severe morbidity after chart review (10). For example, if a parturient with complex congenital heart disease has a planned ICU admission to receive safe intrapartum care and does not ultimately require any significant intervention aside from observation, she would not be categorized as a patient with a severe morbidity. In contrast, a woman who develops acute heart failure requiring ICU admission and significant interventions to manage her heart failure would be considered a patient with a severe maternal morbidity. Identifying an outcome as a severe maternal morbidity does not suggest blame, nor does it mean that there will always be an opportunity for improvement. Reviewing such cases in detail to determine whether the morbidity may have been avoidable and whether it should prompt changes in systems for care provision is, however, a necessary and important step in efforts to ensure quality obstetric care. For example, although amniotic fluid embolisms are "unpredictable and unavoidable" (11), reviewing all such cases to evaluate responses to these unexpected life-threatening emergencies potentially can improve future responses.

What process can be used to identify cases with potential severe maternal morbidity that merit review?

Quality improvement efforts are predicated in part on identifying cases with potential severe maternal morbidity that merit review (10). Identifying such cases, however, is more complicated than reviewing maternal mortality, which is clearly defined and readily captured in death certificates and other reporting. Severe maternal morbidity, in contrast, is not always reported and may not be well coded in, or otherwise readily extracted from, record systems. Definitions of severe maternal morbidity that rely on diagnosis codes, such as the Centers for Disease Control and Prevention's definition, may miss cases, have a relatively low positive predictive value (0.40) and, at a practical level, may be difficult for facilities to operationalize (10). Facilities should have a screening process in place to detect cases of severe maternal morbidity for review. The College and SMFM recommend using two criteria to screen for severe maternal morbidity: 1) transfusion of 4 or more units of blood and 2) admission of a pregnant or postpartum woman to an ICU. Investigators have demonstrated that these criteria have high sensitivity and specificity for identifying women with severe morbidity and a high positive predictive value (0.85) for identifying severe maternal morbidity (10, 12, 13).

Facilities should review all cases that meet at least one of these screening criteria to determine whether the case is truly a severe maternal morbidity; to characterize the events, diagnoses, and outcomes involved; and to determine if an identified morbidity is judged to have been potentially avoidable and, thus, present opportunities for system change and improved future performance. Not all cases that meet criteria for review will represent preventable severe morbidity; some cases of morbidity reflect the underlying health of a woman or her pregnancy and are thus unavoidable. The concept that not all cases meeting screening criteria will be true cases of severe maternal morbidity underscores the importance of reviewing each "screen-positive" case to identify those with true morbidity and, especially, those that may be deemed upon review to have been potentially avoidable.

When does severe maternal morbidity represent a sentinel event?

The Joint Commission defines a *sentinel event* as "a patient safety event (not primarily related to the natural course of the patient's illness or underlying condition) that reaches a patient and results in any of the following: death, permanent harm, or temporary harm." Simply screening positive for one of the two recommended screening criteria does not constitute a sentinel event. Instead, the Joint Commission noted that upon review of any case,

Table 1. Example List of Diagnoses and Complications Constituting Severe Maternal Morbidity*

Severe Maternal Morbidity	Not Severe Morbidity (insufficient evidence if this is the only criteria)
Hemorrhage	
Obstetric hemorrhage with ≥4 units of red blood cells transfused	Obstetric hemorrhage with 2–3 units of red blood cells transfused ALONE
Obstetric hemorrhage with 2 units of red blood cells and 2 units of fresh frozen plasma transfused (without other procedures or complications) if not judged to be overexuberant transfusion	Obstetric hemorrhage with 2 units of red blood cells and 2 units of fresh frozen plasma transfused AND judged to be "overexuberant"
Obstetric hemorrhage with <4 units of blood products transfused and evidence of pulmonary congestion that requires >1 dose of furosemide	Obstetric hemorrhage with <4 units of blood products transfused and evidence of pulmonary edema requiring only 1 dose of furosemide
Obstetric hemorrhage with return to operating room for any major procedure (excludes dilation)	
Any emergency/unplanned peripartum hysterectomy, regardless of number of units transfused (includes all placenta accretas)	Planned peripartum hysterectomy for cancer/neoplasia
Obstetric hemorrhage with uterine artery embolization, regardless of number of units transfused	
Obstetric hemorrhage with uterine balloon or uterine compression suture placed and 2–3 units of blood products transfused	Obstetric hemorrhage with uterine balloon or uterine compression suture placed and ≤1 unit of blood products transfused
Obstetric hemorrhage admitted to intensive care unit for invasive monitoring or treatment (either medication or procedure; not just observed overnight)	Any obstetric hemorrhage that went to the intensive care unit for observation only without further treatment
Hypertension/Neurologic	
Eclamptic seizure(s) or epileptic seizures that were "status"	
Continuous infusion (intravenous drip) of an antihypertensive medication	
Nonresponsiveness or loss of vision, permanent or temporary (but not momentary), documented in physician's progress notes	
Stroke, coma, intracranial hemorrhage	
Preeclampsia with difficult-to-control severe hypertension (>160 systolic blood pressure or >110 diastolic blood pressure) that requires multiple intravenous doses, persistent ≥48 hours after delivery, or both	Chronic hypertension that drifts up to severe range and needs postoperative medication dose alteration: preeclampsia blood pressure control with oral medications ≥48 hours after delivery
Liver or subcapsular hematoma or severe liver injury admitted to the intensive care unit (bilirubin >6 or liver enzymes >600)	Abnormal liver function requiring extra prolonged postpartum length of stay but not in the intensive care unit
Multiple coagulation abnormalities or severe hemolysis, elevated liver enzymes, and low platelet count (HELLP) syndrome	Severe thrombocytopenia (<50,000) alone that does not require a transfusion or intensive care unit admission
Renal	
Diagnosis of acute tubular necrosis or treatment with renal dialysis	Oliguria treated with intravenous fluids (no intensive care unit admission)
Oliguria treated with multiple doses of Lasix	Oliguria treated with 1 dose of intravenous fluids (no intensive care unit admission)
Creatinine ≥2.0 in a woman without preexisting renal disease OR a doubling of the baseline creatinine in a woman with preexisting renal disease	

(continued)

Table 1. Example List of Diagnoses and Complications Constituting Severe Maternal Morbidity* *(continued)*

Severe Maternal Morbidity	Not Severe Morbidity (insufficient evidence if this is the only criteria)
Sepsis	
Infection with hypotension with multiple liters of intravenous fluid or pressors used (septic shock)	Fever >38.5°C with elevated lactate alone without hypotension
Infection with pulmonary complications such as pulmonary edema or acute respiratory distress syndrome	Fever >38.5°C with presumed choriometritis/endometritis with elevated pulse but no other cardiovascular signs and normal lactate
	Positive blood culture without other evidence of significant systemic illness
Pulmonary	
Diagnosis of acute respiratory distress syndrome, pulmonary edema, or postoperative pneumonia	Administration of oxygen without a pulmonary diagnosis
Use of a ventilator (with either intubation or noninvasive technique)	
Deep vein thrombosis or pulmonary embolism	
Cardiac	
Preexisting cardiac disease (congenital or acquired) with intensive care unit admission for treatment	Preexisting cardiac disease (congenital or acquired) with intensive care unit admission for observation only
Peripartum cardiomyopathy	Preexisting cardiac disease (congenital or acquired) without intensive care unit admission for observation only
Arrhythmia requiring >1 dose of intravenous medication but not intensive care unit admission	Arrhythmia requiring 1 dose of intravenous medication but no intensive care unit admission
Arrhythmia that requires intensive care unit with further treatments	Arrhythmia that requires intensive care unit observation but no extra treatments
Intensive Care Unit/Invasive Monitoring	
Any intensive care unit admission that includes treatment or diagnostic or therapeutic procedure	Intensive care unit admission for observation of hypertension that does NOT require intravenous medications
Central line or pulmonary catheter used to monitor a complication	Intensive care unit admission for observation after general anesthesia
Surgical, Bladder, and Bowel Complications	
Bowel or bladder injury during surgery beyond minor serosal tear	
Small-bowel obstruction, with or without surgery during pregnancy/postpartum period	
Prolonged ileus for ≥4 days	Postoperative ileus that resolved without surgery in ≤3 days
Anesthesia Complications	
Total spinal anesthesia	Failed spinal anesthesia that requires general anesthesia
Aspiration pneumonia	Spinal headache treated with a blood patch
Epidural hematoma	

Abbreviation: HELLP, hemolysis, elevated liver enzymes, and low platelet count.

*This list provides a series of examples that may help facilities and health care providers as they evaluate cases to determine if they represent severe maternal morbidity. The College and SMFM have not created or endorsed a single, comprehensive definition of severe maternal morbidity.

Reprinted from Main EK, Abreo A, McNulty J, Gilbert W, McNally C, Poeltler D, et al. Measuring severe maternal morbidity: validation of potential measures. Am J Obstet Gynecol 2016;214:643.e1–10.

the ultimate assessment may be that the case is not a sentinel event (14). For example, hemorrhage due to placenta previa would not qualify as a sentinel event because bleeding in this context is part of the natural course of the illness. As such, screen-positive cases or individual outcomes and diagnoses should not automatically be considered sentinel events. Context determined from detailed review is needed to determine if an individual case and

outcome was correctly classified as a sentinel event. Just as the rate of ICU admission and transfusion of 4 or more units of blood should not automatically be labeled as sentinel events, their rates of occurrence should not be used as a quality metric. These screening criteria are the minimum recommended criteria and institutions may choose to incorporate additional screening criteria to highlight cases for detailed review at their own discretion.

Conclusions

Screening for and detection of severe maternal morbidity is an important step toward promoting safe obstetric care. The two-step screen and review process described in this document is intended to efficiently detect severe maternal morbidity in women and to ensure that each case undergoes a review to determine whether there were opportunities for improvement in care.

Recommendations

- Like in cases of maternal mortality, cases of severe maternal morbidity merit quality review. (1C)
- Facilities should have a screening process in place to detect cases of severe maternal morbidity for review. (1C)
  - The College and SMFM recommend using two criteria to screen for severe maternal morbidity: 1) transfusion of 4 or more units of blood and 2) admission of a pregnant or postpartum woman to an ICU. (1B)
  - Institutions may choose to incorporate additional screening criteria to highlight cases for detailed review. (1C)
- Facilities should review all cases that meet at least one of these screening criteria to determine whether the case is truly a severe maternal morbidity; to characterize the events, diagnoses, and outcomes involved; and to determine if an identified morbidity is judged to have been potentially avoidable and, thus, present opportunities for system change and improved future performance. (1C)
- Not all cases that meet criteria for review will represent preventable severe morbidity; some cases of morbidity reflect the underlying health of a woman or her pregnancy and are thus unavoidable. Therefore, simply screening positive for one of the two recommended screening criteria does not constitute a sentinel event, and the rates of occurrence of either criterion (ICU admission and transfusion of 4 or more units of blood) should not be used as a quality metric. (1C)

For More Information

The American College of Obstetricians and Gynecologists and SMFM have identified additional resources on topics related to this document that may be helpful for ob-gyns, other health care providers, and patients. You may view these resources at www.acog.org/more-info/SevereMaternalMorbidity.

These resources are for information only and are not meant to be comprehensive. Referral to these resources does not imply the American College of Obstetricians and Gynecologists' endorsement of the organization, the organization's web site, or the content of the resource. The resources may change without notice.

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Society for Maternal–Fetal Medicine Grading System: Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Recommendations

Obstetric Care Consensus documents will use the Society for Maternal–Fetal Medicine's grading approach: http://www.ajog.org/article/S0002-9378%2813%2900744-8/fulltext. Recommendations are classified as either strong (Grade 1) or weak (Grade 2), and quality of evidence is classified as high (Grade A), moderate (Grade B), and low (Grade C)*. Thus, the recommendations can be one of the following six possibilities: 1A, 1B, 1C, 2A, 2B, 2C.

Grade of Recommendation	Clarity of Risk and Benefit	Quality of Supporting Evidence	Implications
1A. Strong recommendation, high-quality evidence	Benefits clearly outweigh risk and burdens, or vice versa.	Consistent evidence from well-performed randomized controlled trials or overwhelming evidence of some other form. Further research is unlikely to change confidence in the estimate of benefit and risk.	Strong recommendations, can apply to most patients in most circumstances without reservation. Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.
1B. Strong recommendation, moderate-quality evidence	Benefits clearly outweigh risk and burdens, or vice versa.	Evidence from randomized controlled trials with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence of some other research design. Further research (if performed) is likely to have an impact on confidence in the estimate of benefit and risk and may change the estimate.	Strong recommendation, and applies to most patients. Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.
1C. Strong recommendation, low-quality evidence	Benefits appear to outweigh risk and burdens, or vice versa.	Evidence from observational studies, unsystematic clinical experience, or from randomized controlled trials with serious flaws. Any estimate of effect is uncertain.	Strong recommendation, and applies to most patients. Some of the evidence base supporting the recommendation is, however, of low quality.
2A. Weak recommendation, high-quality evidence	Benefits closely balanced with risks and burdens.	Consistent evidence from well-performed randomized controlled trials or overwhelming evidence of some other form. Further research is unlikely to change confidence in the estimate of benefit and risk.	Weak recommendation, best action may differ depending on circumstances or patients or societal values.
2B. Weak recommendation, moderate-quality evidence	Benefits closely balanced with risks and burdens; some uncertainty in the estimates of benefits, risks, and burdens.	Evidence from randomized controlled trials with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence of some other research design. Further research (if performed) is likely to have an effect on confidence in the estimate of benefit and risk and may change the estimate.	Weak recommendation, alternative approaches likely to be better for some patients under some circumstances.
2C. Weak recommendation, low-quality evidence	Uncertainty in the estimates of benefits, risks, and burdens; benefits may be closely balanced with risks and burdens.	Evidence from observational studies, unsystematic clinical experience, or from randomized controlled trials with serious flaws. Any estimate of effect is uncertain.	Very weak recommendation, other alternatives may be equally reasonable.
Best practice	Recommendation in which either (i) there is enormous amount of indirect evidence that clearly justifies strong recommendation (direct evidence would be challenging, and inefficient use of time and resources, to bring together and carefully summarize), or (ii) recommendation to contrary would be unethical.		

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