A Guide to Integrating Severe Maternal Morbidity Case Review into Hospital Quality Improvement Committees

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ACRONYMS AND ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologists
CDC	Centers for Disease Control and Prevention
DUA	data use agreement
EMR	electronic medical record
ICU	intensive care unit
IRB	institutional review board
MHQIN	Maternity Hospital Quality Improvement Network
MMRIA	Maternal Mortality Review Information Application
NYC	New York City
OB-GYN	obstetrics and gynecology
QA	quality assurance
QI	quality improvement
SMM	severe maternal morbidity
SOC	Supplemental Online Content

EXECUTIVE SUMMARY

Maternal mortality has decreased in New York City (NYC) since 2001, but unacceptable racial and ethnic disparities remain: During the period 2011–2015, Black non-Latina (Black) women[a] had an eight times greater risk of pregnancy-related death (or maternal death) than did White non-Latina (White) women. Moreover, for each maternal death, approximately 100 women suffer from life-threatening complications—collectively referred to as severe maternal morbidity (SMM)—and the same racial/ethnic disparities are seen there as well, driven by the pervasive stress of racism. With the growing recognition that both clinical and community action were needed to prevent adverse maternal outcomes and reduce the associated racial/ethnic disparities in SMM, in 2017 the NYC Department of Health and Mental Hygiene (NYC Health Department) developed a three-pronged approach to address SMM. In collaboration with the Fund for Public Health in New York City and with funding from Merck for Mothers, NYC Health Department implemented a project to: 1) improve the quality of maternity care at NYC hospitals; 2) learn about mothers' needs and their experiences with SMM; and the ramifications of SMM on their lives, to inform action and further research; and 3) mobilize and inform communities about maternal health.

This guide outlines the work implemented in the first component of the SMM Project: improving the quality of maternity care at hospitals through implementation of facility-level SMM review in hospital quality improvement (QI) committees. This guide describes each step in the process and what NYC Health Department did to address challenges that arose along the way. It also provides examples of contracts and agreements and templates for data collection and reporting as Supplemental Online Content (SOC).

Key lessons and findings from this Project include:

- Using existing processes and resources enabled the development of sustainable SMM review programs at each facility.
- Maintaining communication through regular check-ins was critical to overcoming barriers to success.
- Setting up hospital SMM review programs took more time than had been anticipated. Regulatory processes moved more slowly than expected, particularly gaining institutional review board (IRB) approvals from all regulatory bodies and establishing data use agreements (DUAs) between the jurisdiction and the hospitals.
- After one year of data collection, 89 SMM cases were abstracted for review at the three pilot hospitals. Of these, 50 were reviewed by the multidisciplinary QI committees during the project period. This review showed that hemorrhage was the most common cause of SMM (n=42, 84%).

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[a] The authors acknowledge that not all birthing people identify as women. Throughout this report, the terminology of "women" and "mothers" is used for consistency with the data sources used and the literature cited.

- The facility-based QI committees found that in one-third of the SMM cases they reviewed, there was some chance or a good chance that the complication's severity could have been reduced. Common hospital QI committee recommendations often included improvements in clinical risk assessment and decision-making by providers; adoption of facility-level policies to adhere to gold-standard clinical protocols and care coordination; and earlier patient entry into prenatal care.
- On average, delivery[b] hospitalizations with SMM cost 1.5 times as much as delivery hospitalizations without SMM.
- The cost of implementing SMM review was lowest at the hospital that already had a robust QI program prior to implementation and was highest at the hospital that began with very little QI experience. The single greatest cost of implementation was dedicating staff time to medical record abstraction to prepare cases for review.

OVERVIEW

Maternal health and well-being are critical public health concerns in New York City (NYC). Deaths related to pregnancy and childbirth have fallen in NYC, yet profound inequities remain: During the period 2011–2015, Black non-Latina (Black) women had an eight times greater risk of pregnancy-related death (or maternal death) than did White non-Latina (White) women. Latinas and other women of color were also at much higher risk of maternal death when compared with their White counterparts.[1]

For each maternal death, approximately 100 women will suffer from severe maternal morbidity (SMM)—a life-threatening event during or after childbirth. Examples of SMM include heavy bleeding, blood clots, kidney failure, stroke, or heart attack. SMM increased by 34% in NYC from 2008 to 2014 and affects approximately 2,500 to 3,000 NYC women each year.[2] Black women in NYC are about three times more likely to experience SMM than are White women, exemplifying the inequity and hardship experienced by this community.

Research from a variety of disciplines demonstrates that the pervasive stress of racism (a system of interlocking structures at the societal, institutional, and interpersonal levels that confer privilege or disadvantage)[3] within communities of color, coupled with longstanding and intentional disinvestment in these communities (including redlining,[4] predatory housing policies,[5] and unequal funding for schools[6] and hospitals[7]), are the root causes of these and other health inequities. Activists from the sexual and reproductive justice movement (led by Black women since the 1990s) have pushed the health community to address persistent and profound disparities in maternal health and well-being. Members of the sexual and reproductive justice movement locally have helped to increase public understanding of this issue and have driven the NYC mass media to cover several high-profile maternal deaths.

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[b] The authors acknowledge that it is preferable to use the term "birth" rather than "delivery," as *birth* emphasizes the mothers' experience rather than the hospital procedure. Throughout this report, however, the terminology of "delivery" and "delivery hospitalizations" is used to maintain consistency with the data sources used and the literature cited.

There is a growing recognition that both clinical and community action are needed to prevent maternal complications and deaths.

As part of a broader strategy to address this public health crisis, in 2017 the NYC Department of Health and Mental Hygiene (NYC Health Department), in collaboration with the Fund for Public Health in New York City, received a grant from Merck for Mothers to implement the Severe Maternal Morbidity Project. Between 2017 and 2020, this Project worked directly with clinical and community partners to improve maternal outcomes, promote health equity, and reduce racial/ethnic disparities in SMM in NYC.

To address SMM, the NYC Health Department has a three-pronged strategy to:

- Improve the quality of maternity care at hospitals
- Learn about mothers' needs and their experiences with SMM, and the ramifications of SMM on their lives, to inform action and further research
- Inform and support mobilization of communities around maternal health

This guide outlines the work implemented to improve the quality of maternity care at hospitals, by developing a method and tools for collecting and reviewing data on hospitalizations for SMM at three pilot hospitals and then using these data to inform hospital QI efforts. As the SMM Project progressed, the NYC Health Department leveraged funding from it to successfully advocate for and receive city funding to launch the citywide Maternity Hospital Quality Improvement Network (MHQIN) to reduce racial and ethnic disparities in maternal mortality and SMM. One component of the MHQIN is to scale up this QI approach to 11 new hospitals, bringing the total number of hospitals implementing the QI approach to 14.

This step-by-step guide for implementing facility-level SMM review can be translated to any setting or health care jurisdiction. The first section describes the activities and decisions required to integrate SMM review into existing hospital QI committees. It begins with the essential steps for preparing for SMM case abstraction and review, then illustrates the abstraction and review processes themselves (Figure A, page 7). The second section presents data and insights from NYC's SMM Project, which was implemented at three pilot hospitals in the city. Finally, the SOC provides examples of contracts and agreements and templates for data collection and reporting to support SMM review implementation. This guide is intended to meet the needs of hospitals and state and local health departments that wish to implement a process of abstracting and reviewing SMM cases as part of their internal QI processes.

Figure A. Integrating SMM Case Review into Hospital QI Committees

PROCESS IMPLEMENTATION

I. PREPARATORY OPERATIONS AND PROCEDURES

a. Triggers for SMM Case Review

Hospital review of SMM cases is a strategy to both identify QI opportunities for facilities and inform larger efforts to stem the rising rates of maternal mortality in the United States. The American College of Obstetricians and Gynecologists (ACOG) and the Centers for Disease Control and Prevention (CDC) recommend use of a two-factor system to identify SMM cases for facility-level QI review: intensive care unit (ICU) admission, and/or transfusion of four or more units of any blood product.[8,9]

Although other methods have been used to identify SMM for other purposes (e.g., population-level surveillance, research), this two-factor system is clear, is evidence-based, and can be used in real time. This approach has been demonstrated to identify women with true SMM without also flagging an excessive number of false-positive cases. The CDC and ACOG recommendations include applying these criteria for case review to pregnant and recently pregnant women (through 42 days of the end of a pregnancy of any type).

In NYC, cases were reviewed if they met the criteria of four or more units of blood products transfused and/or ICU admission during the delivery admission only. The decision to restrict case review to those occurring during delivery hospitalizations had an impact on the types of cases that were reviewed. Facilities were asked to count all cases from antepartum through 42 days postpartum but to abstract and review only those that occurred during the delivery hospitalization. This decision was based on projections estimating that the number of SMM cases occurring at all points in time exceeded sites' capacity for abstraction and review. However, this did not preclude an individual facility from reviewing antepartum and postpartum cases for their own QI purposes. Depending on the risk factors of the population served and the resources available to the facility, the triggers for review may be broadened or narrowed.

Although it was not the approach taken in NYC, another method could be to restrict case review criteria to only women who receive four or more units of packed red blood cells, instead of any combination of blood products (such as platelets and fresh frozen plasma). Restricting review to such women would reduce the number of cases to be reviewed but would still identify the most severe cases. Before changing the criteria for review, leadership—at both the facility and the jurisdiction levels—should consider which populations are the most useful to compare and adjust accordingly. Criteria should be applied consistently over time and across sites. For example, if the management of sepsis is of great interest, it may make sense to include cases that occurred during postpartum hospital readmissions.

b. Selecting Partner Facilities

To identify partner facilities, jurisdictions should explore whether to include all birthing hospitals or only a selected few. For this Project, NYC Health Department was interested in a "proof of concept" trial of the SMM review process and did not have the regulatory authority to require participation, so buy-in was prioritized over other considerations. Three hospitals with interested leadership and diverse maternity patient populations from three different NYC boroughs (the Bronx, Brooklyn, and Queens) were selected for inclusion—a large, privately-owned academic medical center (Hospital 1) with more than 5,000 births annually, and two hospitals (one private [Hospital 2] and one public [Hospital 3]) with annual delivery volumes of around 2,000 births each and significant resource constraints.

The hospitals' existing QI processes varied considerably: Hospital 1 had a robust preexisting QI program, with numerous staff members dedicated to supporting QI processes; Hospital 2 had no formalized process for QI activities, including structured case review; and Hospital 3 was somewhere in the middle, with an existing QI process that benefited from having the process and structure strengthened.

BOX 1
Sample Criteria for Hospital Selection

- Volume of deliveries
- Volume of SMM cases
- Demographic diversity
  - Race/ethnicity
  - Socioeconomic status
  - Geography (e.g., rural vs. urban)
- Capacity to address SMM work
  - Data collection
  - Established QI committee
- Buy-in from hospital leadership to commit resources
  - Chief medical officer
  - Obstetric chair
  - Midwifery and nursing leaders
  - Quality management leader

In replication or scale-up, other jurisdictions may wish to consider whether they have the regulatory authority to compel hospitals to participate. If they do, the jurisdiction may still choose not to exercise this authority, but rather to invite all or a few hospitals to partner. Starting with a group of motivated hospitals with a high volume of cases is a feasible initial approach.

Sample factors to consider in the hospital selection process are listed in Box 1. Given the initial investment in start-up, it is reasonable to select institutions with a high volume of births and SMM cases. Knowledge of the demographics of patients at higher risk of SMM or maternal mortality may also be important. Essential to successful implementation is buy-in from hospital leadership; this includes not only the obstetrics chair, but also leadership in hospital administration (the chief medical officer) and the midwifery, nursing, legal, and quality management departments. Enhancing systems for robust QI review of SMM cases takes resources. Partner facilities will need to commit resources for administrative start-up, case

abstraction, provider review, and increased time or number of meetings for QI committees to convene. Resources are also needed to implement new QI initiatives informed by recommendations of the QI committee.

Learning what structures exist for perinatal QI programs in the jurisdiction and building on existing structures may make identification of resources and program implementation more successful. Consider the resources that the jurisdiction has to support hospitals in developing a robust QI program. These include soliciting funding from a jurisdiction (a state or city department of health), utilizing a statewide perinatal system, integrating with an established perinatal quality collaborative, or making use of centralized perinatal QI/quality assurance (QA) programs in large hospital systems.

c. Identifying Abstractors

Each hospital should designate someone as a QI case abstractor. For this Project, the NYC Health Department provided part-time abstractors to the partner facilities. Hospital 1 preferred to use a current employee whose job responsibilities already included supporting QI work within the department, while external abstractors were hired for Hospital 2 and Hospital 3. The ideal abstractor would be a trained health care professional (e.g., a nurse or nurse-midwife) who is familiar with the QI process and, ideally, with documentation practices at the site. The abstractor would support the hospital's QI process by: identifying cases that meet the selection criteria; extracting de-identified data for cases for review; helping to prepare case narratives for hospital committee reviews; supporting case review meetings with additional data from the medical record as needed; and ensuring completion of SMM decision forms (see Box 2). If the hospital is partnering with a third party for SMM reviews, such as a jurisdiction's department of health, then the abstractor should also liaise with and be responsible for sharing de-identified committee review results with the third party through a secure means. It should be noted that hospitals may

BOX 2: Abstractor Scope of Work

- Attend training and meetings at health department
  - Data abstraction training
  - Larger context of maternal health work
- Work with hospital OB-GYN leadership to plan:
  - How SMM cases will be identified
  - How access to medical records will be obtained
- Complete abstraction form and compose case narrative for use in QI committee meeting
- Attend QI committee meeting
  - Present SMM case narratives
  - Answer committee questions
  - Complete committee review form
- Transmit data collection forms using secure data transfer protocol
- Support hospital QI projects

have issues with confidentiality and access to information if external abstractors are used. A sample abstractor job description can be found in the SOC (pp. 1–2).

d. Administrative Start-Up

1. Permissions

The IRB for the NYC Health Department determined that because only de-identified data were collected, this Project was not human subject research. Despite this determination, because the NYC Health Department was an external partner to the hospitals, data were not collected until approvals were obtained from the IRB at each partner hospital. These approvals took more time than originally anticipated, particularly for the public hospital, which used an external IRB that required more documentation than internal hospital IRBs do. In some cases, several months were needed to obtain approval. Likewise, the processes involved with obtaining DUAs with each hospital were also lengthy. As a rule of thumb, regulatory processes move more slowly than expected.

If SMM review is initiated and conducted exclusively by and within a single facility or group of facilities under common ownership, permissions to collect and use data for SMM review may not be needed. However, if case abstraction is conducted by personnel external to the facility or if data are to be aggregated by a third party (e.g., by a state or local health department, or by university researchers), permissions such as contracts, DUAs, and/or IRB approval should be considered. Dedicated administrative and legal staff are essential to the start-up process, especially if external personnel or third-party collaborators are involved.

QI-related data collection that is restricted to de-identified data elements likely does not meet the definition of human subject research contained in the Code of Federal Regulations (45 CFR §46.102). It is advisable, however, to apply for a determination from the relevant IRB prior to commencing case abstraction. A sample study protocol for IRB review may be found in the SOC (pp. 3–13). The DUA (SOC, pp. 14–22) describes the acceptable use of case abstraction and data review by a third-party aggregator. If external personnel conduct case abstraction, contracts with those personnel should include confidentiality agreements (SOC, pp. 23–27).

2. QI Assessment

To identify gaps in a hospital's existing QI processes, it is important to assess the QI program at a hospital against best practices for QI. As described in the Overview section, the NYC Health Department received an infusion of resources during this Project to scale up this QI work to 11 new hospitals, through the MHQIN initiative. Based on experience in the pilot, a QI Assessment Tool was created (SOC, pp. 28–30) and was used subsequently to gauge a hospital's current QI structures, its readiness, and the technical assistance it needed to scale up this work under the MHQIN initiative. Box 3 lists suggested elements that are important to review when assessing the strength of QI processes. During the assessment, it was important to partner with the individual(s) or department responsible for hospital-wide QA, to obtain their input regarding the assessment of their structures and their readiness to implement structured SMM reviews.

BOX 3: Sample Elements of OB-GYN QI Committee Assessment Tool

- Foundation
  - Multidisciplinary membership
  - Meeting frequency
  - Peer review performed
- Process
  - Clinical indictor triggers in place
  - Source of case identification
  - Current case abstractor (title)
  - Case presenter
- Recommendations (including party responsible for)
  - Implementation
  - Dissemination and education
  - Follow-up monitoring

Completing the assessment tool alone and sending it back to the jurisdiction was not sufficient. A phone interview or an onsite visit with the key leaders who know the process (staff in obstetrics, nursing, and quality management) helped to uncover gaps. For example, one hospital in the scale-up cohort reported that a committee existed and met monthly; however, further interaction revealed that the meeting was a departmental business meeting, that QI was not the central goal of the meeting, and that peer review of cases did not take place. The jurisdiction may advise the clinical department to seek guidance from the hospital's quality management department or chief medical officer when a clinical department needs assistance in bolstering their QI process. The intensity of technical assistance needed prior to initiating SMM case reviews varied across the hospitals in the pilot and scale-up. In both the pilot and scale-up phases, the technical assistance provided was heavily informed by a detailed model of QI processes outlined in the ACOG publication *Guidelines for Perinatal Care*, which is an excellent guide to quality management (Box 4, see page 13).[10] One facility required substantial technical assistance prior to initiating SMM case review. The NYC Health

BOX 4: Components of ACOG's Guide to Quality Management

- Development of QI program
- Basic approach to QI
- Measurement
  - QI indicators
  - Performance measures
- Continuous monitoring
  - Peer review process
  - Screening of medical records
  - Record review
- Addressing quality concerns
- Physician involvement and engagement
- Systems improvement

Department project team made multiple in-person visits to present the components of the QI process not just to the obstetric and hospital leaders, but also to the clinicians working at the facility. Technical assistance included recommendations on committee membership, frequency of meetings, buy-in from the administration to protect clinicians' time for meetings, and step-by-step procedures for the peer review process. Between onsite visits, phone check-ins and deadlines for agreed-upon activities were also important at this hospital to move the process forward.

Even at hospitals with robust QI processes, use of a structured QI assessment tool made it possible for the NYC Health Department to identify areas for improvement. A common finding was that QI review was routinely conducted by physicians only, with occasional participation from other disciplines. In some cases, parallel reviews were conducted by physicians and nursing leadership. It is strongly recommended that case reviews involve one multidisciplinary group consisting of physicians, nurses, midwives (if applicable), anesthesiologists, and hospital QI personnel. Representatives from other teams, such as the blood bank or electronic medical record (EMR) teams, should be included as needed.

e. Data Collection Tools

In this Project, the NYC Health Department developed three forms and used them in collaboration with the hospitals to collect data for SMM reviews (SOC, pp. 31–41). The Abstraction Form and Case Narrative Template are completed by the abstractor prior to the committee's case review. The Committee Decision Form is completed as the committee makes its determinations. The contents and purpose of these forms are described later, in the sections on case abstraction and committee review. The NYC Abstraction Form was developed using the form cited by the CDC/ACOG (available at www.safehealthcareforeverywoman.org) and was adapted to include additional information, with a particular focus on the social determinants of health. The Case Narrative and Committee Decision forms were adapted from forms developed by the CDC for the Maternal Mortality Review Information Application (MMRIA, pronounced "Maria"), a data system supporting a common approach to data collection and committee review for maternal deaths.

1. Database

To identify trends and common themes across individual SMM cases, hospitals should maintain a database containing case abstracts and committee decisions, for periodic reporting or ad hoc analysis. The NYC Health Department adapted the CDC-developed data system MMRIA to store data from the Abstraction, Case Narrative, and Committee Decision forms. The adapted database was housed on a secure server, with access restricted to approved project staff only. Data collection forms were transmitted from hospitals to the NYC Health Department using a secure and encrypted cloud-based system. A standard reporting template was developed to report hospital-specific data back to each site, using aggregate data from all sites as the comparison group (SOC, pp. 42–47).

II. SMM CASE ABSTRACTION PROCESS

a. Case Identification

It is important to have a robust method with which to identify cases of SMM. As discussed above, there are several triggers for SMM case identification, based on different definitions. The jurisdiction should decide which triggers to use and during what period in the pregnancy (e.g., we will only review SMM events occurring during the delivery hospitalization, or we will review these and antepartum admission and/or postpartum readmission cases).

Methods for case identification vary by hospital. In general, case identification should be standardized and automated where possible. The use of the EMR to generate standing reports makes it less likely that cases will be missed. Sample sources for case identification are listed in Box 5. The hospital should utilize more than one method and perform double checks to ensure complete case finding. Human reporting is error-prone and should not be used as the primary method of case identification. Even computer-generated reports should be verified prior to case abstraction.

BOX 5: Sample Sources for SMM Case Identification

ELECTRONIC MEDICAL RECORDS

- Customized reports
- Dashboard
- Blood bank
- ICU admission logs
- Delivery logs
- Incident reporting systems

HUMAN REPORTING

- Provider notification
- Supervisor reports
- Warning: error-prone

b. Case Abstraction

The abstractor is responsible for organizing information about the case for committee review and recording the decisions the committee makes during the review. Case abstraction is time-consuming and requires both keen attention to detail and good communication skills. While SMM forms do not contain identifiable information, the abstractors maintained a file at the hospital

(inaccessible to NYC Health Department staff) with the patient name, medical record number, and study identification number for each SMM case that was abstracted, in the event that the abstractor needed to return to the EMR for additional information or verification.

The Abstraction Form (SOC, pp. 31–34) contains information on patient characteristics, prenatal care, obstetric risk factors, SMM event, delivery, ICU admission, hemorrhage, and documented social and environmental information. Data sources include health care records from the hospitalization and prenatal care (if available) and the birth certificate. It is important for the abstractor to know where to find the data elements in the EMR, and it may be helpful to take the time to make note of data locations prior to beginning case abstraction. It is a best practice to use patient-reported demographics, especially designations of race/ethnicity. In this Project, the data were abstracted from the birth certificate worksheet completed by the mother in the hospital, rather than from demographic information recorded by hospital personnel. Detailed procedural information for abstractors about case-finding, form completion, and data submission to a third-party aggregator is available in the Abstraction Process Documentation and Guidance (SOC, pp. 48–64). During the Project, guidance was developed to aid the case abstractors in determining which data points were essential and should be collected; which were helpful but should not require an extensive records search; and which were nonessential but could be recorded if they were noted in the record. Abstractors external to the facility also found it helpful to map the locations in the EMR for data points on the Abstraction Form.

c. Case Narrative and Timeline

The Case Narrative Template (SOC, pp. 35–37) provides a guide for the abstractor in preparing a description of the case for the QI committee review. This includes a summary of the case, information about prenatal care, delivery, and the SMM event(s), and a timeline of these. Such a timeline is critical for high-quality case review. The abstractor prepares the timeline using all available data sources in the health care record, including nursing and medical notes, anesthesia records, laboratory and imaging results, and blood bank records. The QI committee relies on this timeline when determining whether the response to the SMM event met the standard of care.

The abstractor should take care to use person-first language[c] and an equity framework when preparing the case narrative for review. When in doubt, the abstractor should describe details in the medical record in a nonjudgmental way. For example, a case narrative with multiple nursing notes describing a patient with increasing agitation or confusion allows the committee to interpret that information differently than a case narrative reporting “the patient was uncooperative and difficult.”

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[c] Person-first language puts the person before a description of a disability, condition, or behavior. The guiding principle is to use language that describes what a person has or does instead of who a person is. For example, instead of describing a woman as a diabetic, person-first language would describe her as a person with diabetes. This approach resists stigma or labeling that could predispose the review committee to find fault with the patient.

d. Data Quality Control

It may be helpful for a clinical advisor to review the abstraction form against the EMR for accuracy and completeness, particularly when an abstractor is new to their role. This advisor could be from the facility or from the supervising jurisdiction. Case narratives should also be reviewed to ensure that they include an appropriate level of detail to facilitate case review. Data collection forms should be scanned for missing data and inconsistent or implausible values, with the abstractor providing corrections as needed. In addition, data entered into the database should be audited periodically for fidelity to the data collection forms.

III. QI COMMITTEE CASE REVIEWS AND DECISIONS

a. Case Review by the QI Committee

The chair of the QI committee or the hospital QI liaison assigns a QI committee member as the primary peer reviewer for each case that has been identified and abstracted. The primary reviewer is generally an obstetric provider. The primary reviewer may ask for additional or clarifying information from the abstractor. The case narrative is presented to the QI committee, either by the primary reviewer or by the abstractor. Generally, the primary reviewer will offer an opinion as to whether the standard of care was met and if there had been a chance to alter the outcome. A discussion will ensue to identify critical factors that may have contributed to the outcome and to list recommendations to prevent future events. These recommendations should be documented, as guided by the Committee Decision Form (discussed below). The chair is responsible for facilitating the discussion and reaching consensus. At times, the committee may have to vote. In some cases, the committee may table the case and request additional clarifying information, such as an interview by a committee member with the staff who were involved with the case.

Most QI committees will exclude any provider who was involved in the care of the woman from its discussions and decisions. The hospital's risk management department should be involved with establishing the appropriate committee procedure.

b. Committee Decision Form

For every case identified and subsequently reviewed by the hospital's QI committee, a Committee Decision Form (SOC, pp. 38–41) is completed either during or immediately following the review. The jurisdiction should consider providing training for the whole QI committee on the use of the form, to ensure that terms are well-defined, instructions are clear, and forms are completed consistently within and across facilities.

Key components of the SMM Committee Decision Form are:

- The primary cause of the SMM event
- Whether the SMM event could have been prevented and what chances there were to alter the outcome

- Contributing factors to the SMM event at the patient/family, provider, facility, systems, and community levels
- Recommendations to prevent similar events in the future

The abstractor or another designated member should serve as a scribe during the meeting, recording the proceedings on the Committee Decision Form. Completed forms should be given to the case abstractor. Following a debriefing session with committee leadership (see below), the abstractor should enter the data into the local secure SMM database or send the form by secure means to the jurisdiction for entry into the jurisdiction's SMM database.

c. Preventability

Determining whether an event could have been prevented is among the most difficult tasks facing the QI committee. A framework for considering preventability is based on the Committee Decision Form. An SMM event is considered preventable if there was "some chance" that it could have been averted or that the patient did not have to get as sick as she did.

In other words, the ultimate outcome might have been altered if one or more *reasonable* changes had been made to patient, family, provider, system, or community factors. Highlighting the "Chance to Alter Outcome" on the SMM form (i.e., a good chance, some chance, no chance, or unable to determine) prior to determining "preventability" may clarify whether an SMM event was preventable. If there was even "some chance" to alter the outcome, then the event could be considered preventable. It should also be noted that preventability determinations often reflect the committee's composition, as multidisciplinary committees have a greater understanding of opportunities to prevent events. Notetaking during the meeting is crucial if contributing factors are to be appropriately captured and organized and mapped to the recommendations for action.

Alternatively, if a committee is grappling with the question of preventability, it can be helpful to first review Contributing Factors and Recommendations for Action and then answer whether the event was preventable. If contributing factors and recommendations for action are captured, then the SMM event was likely preventable. Inadequate information can make any case determination difficult. It is important, therefore, not to resort to speculation, stay on task, and admit what you do not know about the case. The facilitator may direct the committee to move on, and if the committee is stuck, they can consider voting by a show of hands.

In thinking through preventability, committee members also face the question of "How far back do you go?" Hospital-based committees tend to focus on provider and systems issues directly related to the hospital care. Preventability determinations should not be presumed to rest solely

on the provider or the hospital. Consideration should also be given to contributing factors prior to conception and in the prenatal, intrapartum, postpartum, and interconception periods. It is not unreasonable to consider characteristics of a woman's reproductive history as potential contributing factors to SMM events, such as citing previous cesarean delivery as a contributor to a placental abnormality that predisposed a woman to obstetric hemorrhage.

d. Social Determinants of Health

Addressing medical factors alone will not capture all of the contributors to an SMM event. To broaden the approach, QI committees must document all factors identified as having contributed to the severity of the SMM event and promulgate recommendations to ameliorate those factors, without regard to clinical or nonclinical issues. Multidisciplinary review promotes an understanding not only of provider- and facility-level factors, but also of patient/family-, community-, and system-level factors, as well as the development of actionable recommendations at all levels.

In considering the social determinants of health, reviewing a definition found on the CDC website may be useful to ground the committee. The social determinants of health have been defined as:

"*[T]he conditions in which people are born, grow, live, work and age as well as the complex, interrelated social structures and economic systems that shape these conditions.… Social determinants of health are linked to a lack of opportunity and to a lack of resources to protect, improve, and maintain health, and taken together, these factors are mostly responsible for health inequities—the unfair and avoidable differences in health status seen within and between populations.*"[11]

Health equity is an important component to consider. Equity exists when all people have "the opportunity to 'attain their full health potential' and no one is 'disadvantaged from achieving this potential because of their social position or other socially determined circumstance.'"[12] Neither the social determinants of health nor health equity have traditionally been factors considered within a hospital-based QI program. Data support the argument that these factors contribute heavily to disparities in health care.[13] Maintaining a multidisciplinary, diverse committee with members of various lived experiences and training (e.g., social workers and nurses) may help in identifying community- and system-level contributing factors, as well as in making recommendations to address these concerns.

e. Recommendations

A major goal of a QI review of SMM cases is improving the clinical processes within a hospital. A useful guide to forming recommendations is to ask this question: "If implemented, would this recommendation prevent similar events or alter the severity of the outcome?" Recommendations should be specific and feasible actions. It is not enough to just identify the action (the "what"), but also "who" will be responsible for implementation, as well as "where" and "when" it will be done. The hospital team should develop QI processes to implement those priority recommendations. An example follows: An abstracted case about hemorrhage noted a lack of adherence to the need for risk assessment within the hospital's maternal safety hemorrhage bundle. The recommendation might be: "The perinatal team (nursing, medical doctors, and midwifery leaders **[who]**) will develop and implement a system for universal hemorrhage risk assessment **(what)** for all women admitted to labor and delivery **(where)** by the end of the third quarter of 2020 **(when)**." Documenting hemorrhage risk status both in the EMR and in the labor and delivery census board, as well as including risk discussion on handover rounds, may be components of how the recommendation is implemented.

Recommendations that encompass the social determinants of health are not the sole purview of a hospital-based QI program. Multifaceted initiatives that address such factors as implicit bias and respectful care are needed to move recommendations to action for reducing racial and ethnic disparities in outcome.

f. Postreview Debriefing

A debriefing following a QI committee meeting can be useful for the case abstractor and QI committee leadership. The debriefing session can identify what went well and what should be changed for the next meeting. In addition to evaluating the quality of the review session, the debriefing should address how the case abstraction/narrative contributed to a successful review. This feedback may be helpful for new abstractors. A skilled committee chair or other experienced observer can help the abstractor assess what parts of the narrative were most helpful and what parts either were incomplete or contributed to a meandering review.

PROJECT EVALUATION AND REPORTING

I. PROCESS EVALUATION

Regardless of the scale of the SMM review implementation, it is vital to monitor the process on an ongoing basis. Oversight of a project while it is underway ensures that all steps in the SMM review process are conducted according to plan. Prompt identification of best practices and of barriers to success provides an opportunity to integrate parallel learning and course correction,

when needed. Examples of process evaluation questions are provided in Box 6. A robust system for process evaluation is essential to ensure a sustainable and scalable program of SMM review.

BOX 6: Sample Questions for Process Evaluation

- What steps were taken to implement SMM review? What resources were required?
- What was successful and why?
- What barriers to success were identified, and how were they addressed?
- What is necessary to sustain SMM reviews after the active implementation of a project is over?

In NYC, the SMM review implementation across the three hospitals was staggered to allow lessons learned at the first site to inform the processes at the remaining sites. For example, the initial plan for the transmission of study data proved to be technologically infeasible. Project staff at NYC Health Department worked with the first site to develop a process that both was feasible and maintained the required level of data security. By the time that the second and third hospitals had data to transmit, the process had been finalized and was implemented seamlessly. Over time, the Project team applied lessons learned to improve the time efficiency of the case abstractors. The Abstraction Form was color-coded after discussions with abstractors about the priorities for and challenges of working with complex EMR systems. The information gleaned from SMM review implementation in the pilot work was then translated into more effective procedures during the scale-up for the MHQIN project.

II. PROJECT OUTCOMES

After one year of data collection, 89 SMM cases were abstracted for review at the three pilot hospitals, and an additional 35 cases were identified that had occurred during antepartum and postpartum hospital admissions. Of those cases abstracted, 50 were reviewed by multidisciplinary QI committees during the year. Overall, hemorrhage (n=42, 84%) was the most common intrapartum event noted. The largest number of hemorrhages were due to uterine atony (n=26), followed by placental problems (n=6) and lacerations (n=6). The eight cases not related to hemorrhage were due to cardiovascular conditions, preeclampsia, anesthesia complications, embolism, and infection. For just over half of the cases, the review determined either that they were not preventable or that the severity of the event could not have been prevented (n=28, 56%). Fifteen cases (30%) were considered preventable with some chance to alter the outcome, two (4%) were considered preventable with a good chance to alter the outcome, and for five cases (10%) the potential preventability could not be determined.

Patient and family factors were most commonly identified as contributing to the severity of the morbidity (n=32, 64%), followed by provider factors (n=29, 58%) and systems factors (n=12, 24%). The timing of entry into prenatal care, the number of prenatal visits, and preconception

health were the most common subjects of recommendations targeting patient and family issues. Provider-level recommendations spanned recognition of patient risk, timing and appropriateness of clinical decision-making, and communication with other providers and patients. Systems-related recommendations included access to care, adoption of clinical protocols and practices (such as quantitative measurement of blood loss), and coordination of care. Reviews also identified successful practices that should be reinforced. Rapid response to postpartum hemorrhage, the timely availability of blood products, and surgical skill were commonly identified as factors influencing why these cases did not progress to mortality. Recommendations touching on social determinants of health were made at multiple levels. For example, anemia was frequently cited as a contributing factor to the severity of the morbidity. Committees made recommendations at the patient/family, provider, systems, and community levels to address food insecurity, access to healthful foods, nutritional knowledge among patients and the community, and iron supplementation prior to delivery.

A number of changes were implemented as a direct result of QI committee reviews and their subsequent recommendations: postoperative checks within one hour of the arrival of cesarean patients in the postanesthesia care unit; improved communication about medications received in the operating room; procurement of a fetal pillow for use in cesarean deliveries for arrest of descent; a Grand Rounds presentation on induction protocols; and exploration of tools for reducing the incidence of primary cesareans. Additional changes resulted from including EMR system representatives on QI committees, such as the creation of Best Practice Alerts for providers about patient risks for venous thromboembolism and postpartum hemorrhage.

III. COST CONSIDERATIONS

a. Cost of Hospitalizations with SMM

The SMM Project team undertook a cost analysis to determine the excess hospitalization costs associated with SMM at delivery hospitalization. Using administrative data from 2016 and an established methodology,[14] the Project team modeled the cost of delivery hospitalizations in NYC. Overall, the average cost of all delivery hospitalizations, regardless of SMM status, was $9,938 (95% confidence interval [CI], $8,943–$11,042). After the results were adjusted for age, race and ethnicity, neighborhood poverty, primary payer, single or multiple gestation, method of delivery, and comorbidities, delivery hospitalizations with SMM cost 1.5 times as much as hospitalizations without SMM. Among women with the lowest levels of risk for SMM (i.e., aged 25–29, White non-Latinas, low neighborhood poverty, private insurance, a vaginal delivery, singleton gestation, and no comorbidities), this amounted to an excess cost of $4,822 (95% CI $3,426–$6,616) per delivery hospitalization. The excess costs associated with SMM varied among groups with different demographic and delivery characteristics, with the greatest surpluses associated with cesarean deliveries and multiple gestations.

b. Cost of Implementing SMM Review

The cost associated with implementing a program of SMM review depended upon several factors that were specific to each hospital. Implementation of the SMM Project was most cost-intensive at Hospital 2, the hospital that at the start had no existing QI committee and that used an external case abstractor. Over the course of 16 months, the Hospital 2 abstractor averaged just under 42 hours per month. Initially, she spent most of her billed time training and onboarding at the hospital, learning to navigate the EMR, and working with the technical EMR team to create automated reports for case identification. Once the start-up was completed, she spent the majority of her time on case abstraction (approximately nine hours per case) and split her remaining hours reviewing reports for case identification, preparing for QI committee meetings with committee leadership, attending QI committee meetings, and meeting with the Project team. Using $75/hour as the standard nurse-abstractor rate, the NYC Health Department spent just over $50,000 for the case abstractor's time over 16 months. Additional costs of implementing SMM review at Hospital 2 include administrative time for QI committee leadership, meeting time for the QI committee, and NYC Health Department staff time spent working with Hospital 2 in person and on the phone to develop a robust QI process.

At the other end of the cost spectrum, the costs to implement SMM review at Hospital 1 were much lower, in both the billed time for the internal case abstractor and the in-kind costs of reserving administrative and committee time to conduct case reviews. The internal case abstractor was already an advanced user of the EMR and had case identification methods in place for other clinical indicators that triggered peer review. This abstractor averaged less than 10 hours of billable time per month (approximately three hours per case, inclusive of administrative and QI meeting time). Despite a heavier caseload for abstraction, the NYC Health Department spent less than $12,000 (using the standard rate) for the case abstractor's time over 16 months. At Hospital 1, a multidisciplinary QI committee was already in place and had standardized processes and documentation; implementation of SMM review in their QI process required very little excess administrative time.

At Hospital 3, the cost of implementing SMM review fell between the costs to Hospital 1 and Hospital 2; however, the cost per case abstracted was greater. The external case abstractor billed approximately 26 hours per month over a 13-month period, for a total cost of just over $25,000. About two-thirds of the time billed was for case abstraction, or about 16 hours per case. The remainder was split between time spent supporting hospital QI projects and administrative time spent meeting with hospital and NYC Health Department staff and attending QI meetings. Although this abstractor spent more hours per case than the other two abstractors, this was still consistent with time estimates suggested by the CDC MMRIA implementation team for maternal mortality case abstraction. Variations in time required for abstraction may be
due to several factors, such as the degree to which the abstractor is familiar with the EMR or characteristics of the EMR itself. Hospitals 1 and 2 use Epic® and hospital 3 uses a different vendor.

While the comparatively large investment in personnel time at Hospital 2 may be daunting to a resource-constrained hospital, this investment in organizational QI culture and practice can build the capacity for ongoing QI work that, once established, will require minimal incremental costs to undertake additional QI initiatives. It is important to note that these estimates take real-world challenges for project implementation into account—during the project period, one hospital transitioned to a new EMR system, which required additional training and a second learning curve for the abstractor, and another hospital experienced the turnover of a significant proportion of their attending physicians, including the chair of the QI committee. These situations posed challenges and competing demands on time at these hospitals, but in the current health care environment these are not uncommon circumstances. Patience and perseverance ultimately yielded successful processes at all three hospitals.

LESSONS LEARNED

A standard definition for the identification of SMM cases was integral. In this study, four or more total units of blood products transfused at any time during intrapartum admission or at any ICU admission during the birth hospitalization was the standard. Consensus on a narrow definition of SMM gave clear direction on which cases were to be reviewed.

Consistent communication with hospital-based team members was essential. It helped both the hospital and the jurisdiction to establish and maintain cohesion, common ground, progress, and problem solving. This included biweekly conference calls, bimonthly in-person check-ins, and routine email conversations.

Learning each hospital's systems, processes, resources available, and resources needed was important from the start. Medical records systems were complex and inconsistent across hospitals. (Hospital 1 and Hospital 3 utilized the same system, Epic®; Hospital 2 utilized a different vendor; all hospitals also used paper records for some parts of the chart.) While the process was time-intensive, learning each hospital's data-based structures and reforming them was necessary for providing guidance to abstractors as they searched for data points across EMR systems.

Front-end piloting of forms proved valuable. The pilot phase of this study illuminated that "user guides" are necessary for the data collection forms. User guides allowed the Project team to document decisions and best practices for standardized, high-quality data collection procedures across sites.

Working with hospitals in different stages of QA/QI enabled the sharing of strategies. This facilitated successful implementation across partner hospitals, which led to improved preparation, planning, and problem-solving.

The development of the "nuts and bolts" of the program took longer than anticipated. The initial time investment in setting up an SMM review program by both the jurisdiction and the hospitals was considerable. Onsite visits with key personnel were useful in solving problems quickly.

It is key that each hospital used existing systems and resources when possible rather than introducing a new workflow for the Project. What works at one hospital may not be the best method at another.

Abstractor meetings across hospitals strengthened the shared goal of reducing SMM and promoted idea-sharing and learning among partnering hospitals. Abstractors frequently identified the glitches in the process and developed strategies to overcome them. Peer-to-peer learning across partner hospitals was helpful.

CONCLUSION

The SMM Project used a three-pronged approach to address rising numbers of and racial disparities in life-threatening complications related to pregnancy and childbirth in NYC. This guide describes the first component of the SMM Project: implementing facility-level SMM case reviews into hospital QI committees to improve the quality of maternity care at three pilot hospitals. This strategy represents the clinically focused piece of the overall SMM Project; it was complemented by initiatives to better understand the experiences of women who have suffered SMM and to engage communities around the issue of maternal health.

This step-by-step guide describes how the NYC Health Department partnered with three local hospitals with vastly different preexisting QI programs and institutional resources to implement standardized SMM review tailored to each setting. The SMM Project demonstrated the viability of this approach by maintaining consistent communication, adapting processes to preexisting systems and resources, and fostering collaboration and sharing best practices across performance sites. Hospitals and state and local health departments are encouraged to build on the experience of the NYC Health Department to translate this approach to building QI capacity to any setting or health care jurisdiction.

A Guide to Integrating Sever Maternal Morbidity Case Review into Hospital Quality Improvement Committees Supplemental Online Content (SOC) can be found at www1.nyc.gov/site/doh/data/data-sets/severe-maternal-morbidity-surveillance.page and consists of the following materials:

- *Sample Abstractor Job Description*
- *Sample Study Protocol*
- *Sample Data Use Agreement*
- *SMM Abstractor Confidentiality Agreement*
- *QI Committee Assessment Tool*
- *SMM Abstraction Form*
- *Case Narrative Template*
- *Committee Decision Form*
- *Standard Reporting Template*
- *Abstraction Process Documentation and Guidance*

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