

OBSTETRICS

Preventability of severe acute maternal morbidity

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OBJECTIVE: We sought to assess potential preventability of severe acute maternal morbidity (SAMM) cases admitted to intensive-care units (ICUs) or high-dependency units (HDUs).

STUDY DESIGN: Inclusion criteria were admissions to ICUs or HDUs of women who were pregnant or within 42 days of delivery in 4 District Health Board areas (accounting for a third of annual births in New Zealand) during a 17-month period. Cases were reviewed by external multidisciplinary panels using a validated model for assessing preventability.

RESULTS: In all, 98 SAMM cases were assessed; 38 (38.8%) cases were deemed potentially preventable, 36 (36.7%) not preventable but improvement in care was needed, and 24 (24.5%) not preventable.

The most frequent preventable factors were clinician related: delay or failure in diagnosis or recognition of high-risk status (51%); and delay or inappropriate treatment (70%). The most common causes of preventable severe morbidity were blood loss and septicemia.

CONCLUSION: The majority of SAMM cases were potentially preventable or required improvement in care. Themes around substandard care related to delay in diagnosis and treatment for postpartum hemorrhage and septicemia. These findings can inform clinical educational programs and policies to improve maternal outcomes. This study has now been expanded to a national New Zealand audit of all SAMM cases admitted to an ICU/HDU.

Key words: maternal morbidity, preventability

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Severe acute maternal morbidity (SAMM) is defined as “a very ill pregnant or recently delivered woman who would have died had it not been that luck or good care was on her side.”¹ Assessment of SAMM cases is increasingly used to complement maternal mortality review in developed countries and analysis of morbidity has become a main topic in quality of care issues in maternity care.^{2,3} The prevalence of SAMM in developed countries has been reported as between 3.8-13.8 per 1000 deliveries.^{3,4} In depth review of severe

morbidity can identify preventable factors that can, if addressed, improve patient outcomes. Definitions of SAMM vary,⁵ but maternal admission to an intensive-care unit (ICU) is a sensitive and specific indicator of severe maternal morbidity,⁶ represents approximately one third of SAMM events,^{7,8} and is a readily identifiable endpoint for audit.

Preventability of maternal mortality is widely discussed in the literature and in developed countries up to 50% of cases are considered potentially preventable.⁹⁻¹¹ Although there are many descriptive

studies of maternal morbidity, few examine preventability using external expert review. Geller et al¹² conducted a multidisciplinary review of near-miss/severe morbidity cases (n = 134) to examine preventability by provider, system, and patient factors. They found that provider factors were the most common preventable factors and that the more severe the morbidity the more likely there were to be preventable provider factors involved. The Scottish national audit of morbidity involved a detailed self-assessment pro forma completed by local hospital coordinators for 2 specific morbidities (major obstetric hemorrhage and eclampsia) and compared them to best practice guidelines to assess substandard care. The latest Scottish report details deficiencies in clinicians' ability to recognize high risk and manage postpartum hemorrhage (PPH).¹³ A 2010 study from the Netherlands by van Dillen et al¹⁴ examined 67 cases of SAMM with a multidisciplinary review team and found that 79% had substandard care. A recent New Zealand study of potentially preventable SAMM in 1 District Health Board (DHB) area found that 48% were potentially

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avoidable.¹⁵ Many of these studies were conducted through internal review.

Internal audit of adverse outcome in maternity care has become more common globally as part of quality assurance activities to improve clinical practice. While it has been shown that audit and feedback can improve health practitioner behavior,¹⁶ using internal review alone may lead to underestimation of identifiable preventable factors related to clinician decision making and judgment, resulting in substandard care and poor maternal outcomes.¹⁷ Kilpatrick et al¹⁸ noted that secondary external review of cases (after initial internal review) increased the number of cases deemed potentially preventable by 36%. They urged that detailed external review should be considered for maternal mortality and morbidity audit. A recent large population-based study called for more research investigating specific provider and system issues as many of the risk factors found for SAMM were unlikely to be modifiable (age, race, parity, multiple birth, and prior cesarean section).¹⁹ The aims of this study therefore were to assess potential preventability of SAMM cases through external multidisciplinary audit and test the feasibility of this process with the future goal of expanding to national audit.

MATERIALS AND METHODS

SAMM cases admitted from March 2011 through August 2012 to ICUs or high-dependency units (HDUs) in 4 New Zealand DHBs were reviewed by 2 expert panels. The 4 DHBs selected, of a possible 20 nationally, included 3 urban tertiary centers and 1 rural tertiary center responsible for 21,000 deliveries per annum—approximately one third of all annual deliveries in New Zealand. Inclusion criteria were women who were pregnant or within 42 days of delivery, who were admitted to an ICU or HDU. Cases were identified by a designated ICU/HDU nurse in each DHB and a copy of deidentified patient clinical notes was obtained and summarized by the research team. Sample size for the study was dictated by the number of SAMM cases available for review over the study period.

Sociodemographic and clinical characteristics were collected on each woman including age, smoking status, gravidity, parity, and body mass index (BMI). Ethnicity and socioeconomic deprivation index were collected for each case from the Ministry of Health Information Services using the National Health Index number—a unique identifier that links to centrally held ethnicity and deprivation index information (New Zealand Deprivation index).²⁰ The New Zealand Deprivation index gives a range of socioeconomic status ranging from decile 1 (least deprived) to decile 10 (most deprived) and is often reported in quintiles.²¹ Clinical data collection included antenatal care history, gestation at admission, previous pregnancies and outcomes, known pregnancy-related illness, preexisting medical conditions, and complications and outcome of delivery.

Preventability was assessed using the modified Geller model in the New Zealand environment and was defined as “any action or inaction on the part of the health care provider, system, patient, or a combination of these factors that may have caused progression to more severe morbidity.”^{22,23} For example, an initial hemorrhage itself may have not been preventable, but the severity of the progression of hemorrhage may have been (ie, hypovolemic shock). The criteria for assessing preventability are related to the continuum of care for morbidity from point of entry to maternity care to discharge from care. This model has shown reproducibility and concordance.²³

The model lists 12 broad criteria of preventable factors subdivided to describe in detail the nature of the preventable event. For example, “treatment (provider related)” is subdivided into: (a) delay in treatment; (b) inappropriate treatment; and (c) failure to treat. “Management hierarchy (provider related)” is subdivided into: (a) failure to check on junior’s work and (b) failure to consult superior. The adaptation of the Geller model included adding a section on “patient factors”: (a) failure to seek care; (b) inadequate antenatal care; (c) noncompliance with treatment; (d)

smoker (if related to outcome); (e) alcohol abuse; (f) other drug abuse; (g) belief systems; (h) failure to use seat belt; (i) violence; and (j) other; and a section on “delay/timeliness” of: (a) transport; (b) laboratory; or (c) other.

In addition, the criteria define whether the factor refers to provider (clinician), system, or patient. Each case was systematically marked for each of the factors (present or absent), given an overall assessment of whether the SAMM case was potentially preventable or not, and assigned to 1 of 3 groups: (1) potentially preventable, (2) not preventable but improvement in care needed, or (3) not preventable. In addition, key themes were identified by the panel relating to each case, which could be highlighted in educational programs.

Two external multidisciplinary panels of 40 experts in obstetrics, anesthetics, midwifery, and intensive care took part in a 1-day training session on the review process. Review meetings were held quarterly. Each deidentified case was presented by a panel member who also reviewed the complete clinical notes. A full discussion was held on all cases and consensus reached in assessing potential preventability. Themes of substandard care were also identified by the panels.

The panels did not review a case that had been through their own hospital and cases were blinded with respect to ethnicity to minimize potential bias during the panel review. National ethical approval was obtained from the Multi-regional Ethics Committee (MEC/11/EXP/035) and Protected Quality Assurance Status obtained from the Ministry of Health under the Health Practitioners Act 2003 gazetted in September 2011 (SR2011/305:3895).

Sociodemographic and clinical data were entered into a database (Access; Microsoft, Redmond, WA), along with the consensus classifications on preventability from the review panels. Reasons for admission to an ICU/HDU were coded using the criteria adapted from Bewley.²⁴ We summarized sociodemographic and clinical characteristics of the SAMM cases with univariate descriptive statistics. Data analysis of case preventability was conducted using software (R, 2.15.1; R

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