Recent Canadian studies indicate a severe maternal morbidity (SMM) rate of 16.1 per 1,000 deliveries for the period of 2012-16 and a maternal death rate of 8-9 maternal deaths per 100,000 for 1990 to 2013 (Ray et al. 2018; Dzakoasu et al., 2019). Both outcome categories are associated with clinical causes that are largely preventable. System-level programs such as early warning and trigger tools combined with evidence-based rapid response protocols are promising interventions to both reduce maternal mortality and morbidity in the hospital setting.

**Case Study 1**

G1P1 pregnant person experienced a severe postpartum hemorrhage in the postpartum unit following a C-Section. A decision was made by the most responsible physician (MRP) to perform an emergency hysterectomy during which the postpartum person arrested and sustained permanent brain injury. Expert review of the case was not supportive of the nursing care and the protocols in place in the PACU with respect to the frequency and thoroughness of monitoring during the first four hours following the C-section. The experts acknowledged that the nurses had communicated their concerns (borderline and abnormal vitals) to the physician but failed to advise on the extent of the blood loss occurring over the preceding three hours. The experts also questioned why the nurses failed to escalate their care concerns despite disagreeing with the MRP’s care plan as well as the team’s decision to discharge the patient from PACU to the postpartum unit in the presence of abnormal vital signs consistent with a post-operative bleed. Expert review was not supportive of the management and planning once the severity of the bleeding was suspected (e.g., delays ordering repeat bloods, calling a code, administering vasopressors, calling anesthesia).

**Case Study 2**

A G3P2 pregnant person was admitted to hospital following spontaneous onset of labour. Three hours after admission, the pregnant person was found to be unresponsive. An emergency C-Section was performed. In the postpartum period the person was ultimately diagnosed with an intracerebral hemorrhage and disseminated intravascular coagulation (DIC). Expert review was not supportive of the intrapartum care. The experts were critical of the fact that vitals were never performed on the pregnant person upon arrival and only infrequently throughout the admission. As a result, the team missed the opportunity to identify and respond to severe hypertension in a person with known preeclampsia as well as a large body size.

**Common Claim Themes**

Knowledge and clinical judgement

- Inadequate, inconsistent and/or infrequent monitoring and documentation of vital signs, level of consciousness and blood loss for the pregnant persons.
- Decreased vigilance following admission to the maternal/newborn unit especially for patients that have had C-section or assisted vaginal delivery with or without shoulder dystocia.
- Unwarranted assumption in the Emergency Department (ED) that presenting signs and symptoms are not pregnancy-related.
- Lapse in clinical situational awareness, contributing to delayed recognition of and response to insidious and rapid clinical deterioration of the pregnant person.
- Overreliance on the visual estimation of intra partum and postpartum blood loss resulting in underestimation of total blood loss.

Canadian Case Examples
Failure to Identify and Manage Postpartum Hemorrhages and Hemorrhagic Shock

**COMMON CLAIM THEMES, cont’d**

- Inappropriate discharge:
  - Pregnant persons from the ED without obstetrical consult (e.g., erroneous assumption that complaints were not pregnancy-related);
  - From Post Anesthesia Care Unit (PACU) to postpartum unit (e.g., transfer without confirmation of current vitals, level of consciousness and blood loss).
- Lack of sufficient team familiarity with pregnancy-related events such as, intracerebral hemorrhage, severe postpartum hemorrhage (PPH) and hemorrhagic shock, resulting in sub-optimal care due to ad hoc, frenzied or chaotic response and poor team communication.

**Communication**

- Failure to escalate care concerns and/or in a timely way (e.g., seek physician attendance or orders).
- Delayed physician attendance following notification or report.
- Delayed physician or most responsible practitioner notification or consultation for:
  - Concerning vitals, level of consciousness and blood loss;
  - Retained placenta;
  - Perineal wound dehiscence.

**Readiness to respond to a postpartum emergency**

- Inadequate and out-of-date:
  - ED policies for non-pregnancy related complaints and symptoms;
  - Severe preeclampsia assessment, monitoring and acute management guidelines;
  - Post anesthetic and surgery recovery monitoring guidelines.
- Lack of and delayed access to monitoring equipment (e.g., blood pressure cuff) for pregnant persons with larger body mass indexes and habitus.
- Delayed access to:
  - Serial laboratory monitoring;
  - Blood and blood products.
- Massive transfusion protocols (MTP):
  - Inadequately designed and implemented (e.g., cumbersome, wordy, out-of-date);
  - Lack of staff awareness (blood bank, laboratory, labour and delivery, postpartum and surgical programs) of the protocol.

**Documentation**

- Risks associated with PPH not documented in care management plans.
- Inconsistent and poor documentation of:
  - Intrapartum and postpartum vitals and other assessments;
  - Perineal tear repair;
  - Placenta assessment;
  - Postpartum fundus height and tone;
  - Maternal blood loss;
  - Informed consent and choice surrounding expectant versus active management of the third stage of labour;
  - Discussions with the person in the postpartum period regarding blood loss and PPH.
Failure to Identify and Manage Postpartum Hemorrhages and Hemorrhagic Shock

MITIGATION STRATEGIES

**Reliable Care Processes**

- Pilot and/or implement a maternal/modified obstetrical early warning system (paper based or electronic) to assist in the prompt recognition of at-risk/deteriorating pregnant persons.

- Adopt a standardized and concise evidence-based protocol or care management pathway or safety bundle for the prevention, identification and management of non-emergent and severe hypertension, that includes (but is not limited to):
  - Standardized order set(s);
  - The frequency of pregnant person surveillance, vitals and/or assessments during the intrapartum and immediate postpartum period;
  - Who to notify and when signs and symptoms that require timely communication to the MRP;
  - A systematic approach to interventions;
  - A ‘rapid response’ checklist or protocol(s) for hypertensive emergencies and eclampsia;
  - A formal contingency plan for weekends, holidays and afterhours.

- Implement a standardized and concise evidence-based MTP to respond to hemorrhagic shock, that includes (but is not limited to):
  - Standardized order sets;
  - Who and how the protocol is activated, including activation of the emergency release protocol;
  - How to contact the blood bank;
  - Mechanisms for the initial and ongoing communications (lab, blood back, transport team, unit, etc.);
  - How the blood will be delivered to unit;
  - How additional blood products and platelets will be obtained;
  - Mechanisms for obtaining ongoing laboratory testing (to achieve transfusion targets);
  - A formal contingency plan for weekends, holidays and afterhours.
### Equipment and Supplies

- Implement formal strategies to ensure all intrapartum, postpartum, C-Section and surgical recovery areas as well as EDs are consistently stocked with:
  - Monitoring equipment (e.g., blood pressure cuff) for pregnant persons with larger body sizes;
  - Standardized and stage-based PPH and hemorrhagic and emergency equipment trays, kits and carts.

### Patient and Family Centered Care

- Ensure parent training, handouts, and checklists include signs, symptoms and specific instructions for suspected:
  - PPH and hemorrhagic shock;
  - Persistent or new onset hypertension and eclampsia.

### Education

- Implement formal multifaceted strategies to support and enhance teams clinical knowledge skills surrounding prevention, recognition and response to PPH, hemorrhage shock, severe and emergent hypertension including (but not limited to) scheduled interprofessional and cross-departmental (e.g., postpartum unit, PACU, laboratory services, blood bank, etc.) postpartum hemorrhage and massive blood transfusion skill drills and simulations.

### Documentation and Communication

- Adopt a standardized gross placenta template or dictation tool to trigger the recording of the bedside placenta evaluation including (but not limited to):
  - Time placenta example performed;
  - Placenta’s completeness (including estimated amount missing), intactness, size, consistency, shape and maternal and fetal surfaces;
  - Umbilical cord’s length, thickness, knots and number of vessels;
  - Studies ordered (e.g., placenta to pathology);
  - Placenta’s disposal.

### Monitoring and Measurement

- Adopt a standardized maternal hemorrhage ‘resuscitation’ flowsheet or record that includes (but is not limited to):
  - Amount, colour, consistency and pattern of bleeding;
  - Blood samples sent to the laboratory including time sent and results received;
  - Type, volume and timing for fluids;
  - Vital signs and time of the assessment;
  - Type, dose, timing and sequence for prophylactic and emergency medications and the maternal response;
  - Who (team member names) and when assistance was called, and arrival times.

- Adopt a standardized process and/or protocol for reviewing morbidity and mortality incidents involving pregnant, labouring and postpartum persons (e.g., screening tool to detect maternal morbidity for review, what incidents are to be reviewed, composition of the review committee, when and how the reviews should take place).

- Implement formal strategies to monitor and measure the effectiveness and efficiency of, and adherence to monitoring guidelines, protocols, algorithms, pathways and early warning tools for pregnant, laboring and postpartum persons, including (but is not limited to):
  - Adoption of formal process, outcome and balancing indicators to measure pregnancy associated (consider also and
non-pregnancy associated) mortality and morbidity incidents (e.g., % pregnant persons with vaginal delivery who had PPH; % of unplanned return to the operating room (OR) during the same admission; % of patients assessed for PPH throughout labour).

- Learnings from maternal near-miss and harm incidents (e.g., chart audits, trigger tools, incident reports, team debriefs, critical incident and quality of care committee reviews, data from provincial birth and perinatal registries as well as maternal and perinatal networks, medical legal claims, coroner reports).

- Implement formal strategies to monitor and measure the complete and timely documentation of:
  - The management plan in the presence of known and/or foreseeable risks for a postpartum hemorrhage and emergent hypertension;
  - The pregnant person’s vital signs and assessments throughout the intrapartum and postpartum periods in all care areas (triage, postpartum, PACU, etc.);
  - The actions taken in response to abnormal vitals, level of consciousness and assessments as well as blood loss;
  - Comprehensive informed consent and/or shared decision making discussions surrounding the management of the third of labour (‘wants expectant management’ or ‘declined oxytocin’ is not sufficient).
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