



Maternal and Perinatal Health Standards Committee

2020 Annual Report

Includes completed case reviews of 2016



Table of Contents

Acknowledgements	2
Forward and Editorial Comments from the Medical Consultant	3
MPHSC Executive Summary	5
MPHSC in 2019	8
Definitions	10
Case Reviews	
Modus Operandi	13
I. Preventable, Theoretically Preventable, Avoidable	
A. Maternal Mortality	14
B. Maternal Morbidity	17
C. Perinatal Mortality	20
D. Perinatal Morbidity	28
II. Non-Preventable and Unavoidable	
A. Maternal Mortality	33
B. Maternal Morbidity	35
C. Perinatal Mortality	39
D. Perinatal Morbidity	45
III. Unclassifiable Cases	51
Statistical Summary	
• Causes of Stillbirth	53
• Causes Neonatal Mortality	54
• Categories of Neonatal Morbidity	55
• Categories of Maternal Morbidity	56
• Total Deliveries and Caesarean Sections in Manitoba	57
Appendix	
• Perinatal Review Data Sheet	59
MPHSC Committee Members	61

Acknowledgements

The Maternal and Perinatal Health Standards Committee (MPHSC) is pleased to present the 40th Annual Report for the calendar year 2016.

The MPHSC wishes to acknowledge the support of the following organizations, committees, and individuals:

- Manitoba Health and the Manitoba Health Information Management Branch.
- Health Records Departments at institutions participating in the audit process.
- Office of the Chief Medical Examiner.
- The College of Midwives of Manitoba.
- The College of Registered Nurses of Manitoba.
- Standards Committees of the Women and Child Programs, Emergency Medicine Programs, Internal Medicine Programs, Surgery Medicine Programs at the two tertiary centres in Winnipeg and all other Manitoba rural hospitals which provide women and child health.
- Independent reviewers whose expert opinions have been sought by the MPHSC.
- All physicians and health care workers whose cooperation in providing information was essential to the review process.

The Committee is grateful to Manitoba Health for providing financial support.

The Committee is also grateful and appreciative for the tireless administrative support of Mr. Jason Martin of The College of Physicians and Surgeons of Manitoba.

Forward and Editorial Comments from the Medical Consultant

It was my pleasure to have led the production of this annual report of the Maternal and Perinatal Health Standards Committee (MPHSC) of the College of Physicians of Surgeons of Manitoba for the calendar year of **2016**.

While this report summarizes completed reviews of cases from 2016, and to keep everyone up to date of recent developments of the MPHSC, I have included a synopsis of such developments that have occurred in the past year of **2019**.

Bringing case reviews from a certain calendar year to closure takes time. Following case reviews by the hospital standards committees and rural standards committees, the reports of which are sent to the MPHSC, the medical consultant reviews these reports again. Such secondary review at the level of the College may precipitate the need for further information, review, and re-classification of cases. Cases that are deemed by the medical consultant to have been controversial are then raised to the committee members of the MPHSC for further discussion or consent. The committee, through its medical consultant, ensures that educational activities take place when such activities are needed to prevent a recurrence of such cases.

Currently we are working hard to bring to closure case reviews from the year 2017. The summary of these cases and the subsequent deliberations will be presented in the upcoming report to be released in 2021.

This report is organized in a format to reflect the work of the MPHSC whose objectives and goals are:

- Maintain and improve quality of maternal and perinatal care through education.
- Contribute to monitoring and improvement of the quality of obstetrical and neonatal care in Manitoba.
- Determine factors responsible for all perinatal deaths (stillbirth and early and late neonatal deaths) and specified maternal, perinatal and late neonatal morbidity at the family, community and medical care levels.
- Maintain a constant database for the ongoing monitoring of maternal mortality, perinatal and late neonatal mortality and specified morbidity to allow for meaningful interpretation.
- Provide analysis, education and recommendations related to prevention.

The case summaries are again divided in this report into three broad categories:

- I. Those that are deemed “Preventable, or Theoretically Preventable” with causative factors pertaining to physician error in judgement or technique, in hospital error in management, patient error in judgement, inadequate or absent documentation, errors in communication, or problems precipitated by resource issues.
- II. Those that are deemed “Non-preventable and Unavoidable”.

- III. Those that could not be classified by the MPHSC primarily due to absent or missing documentation.

The cases in each of the above broad categories are sub-classified into those pertaining to maternal mortality, maternal morbidity, perinatal and late neonatal mortality, and perinatal and neonatal morbidity.

We aimed to include all summaries of cases that were judged to be preventable or theoretically preventable and a select number of cases that were non-preventable and unavoidable. Action taken by the MPHSC and/or local hospital standards committees and rural area standards committees, particularly those of educational nature, or administrative nature are described for each case that has been deemed preventable or theoretically preventable.

In the executive summary we have included a non-exhaustive list of areas where improvements are possible based on the cases reviewed and presented in this report. Addressing issues in those particular areas may reduce future preventable mortalities and morbidities.

Definitions of terms used for the purpose of this report are included. Particular statistics that may give perspective to the case summaries have been included. For the interested reader of a more comprehensive vital statistics report, the reader is directed to visit the Manitoba Health website at <http://www.gov.mb.ca/health>

We hope the contents of this report will be of educational value to the readers. For any feedback, please send comments to Mr. Jason Martin, Administrative Assistant to the Maternal and Perinatal Health Standards Committee, at jmartin@cpsm.mb.ca.

Respectfully submitted,



Michael Helewa, MD, FRCSC
Medical Consultant,
Maternal and Perinatal Health Standards Committee

MPHSC Executive Summary

The Perinatal Mortality rate, according to the Vital Statistics Agency of Manitoba 2017 Annual Report was 11.7 per 1000 births in 2016 which is a decrease from the rate of 12.8 in 2015. Statistics Canada reports a Perinatal Mortality rate of 7.6 in 2016 which is a decrease from the rate of 8.8 in 2015. The two agencies use different definitions for calculating perinatal mortality; The Vital Statistics Agency of Manitoba's definition includes stillbirths ≥ 500 grams or born of ≥ 20 weeks gestation, plus neonatal deaths up to 7 days of life. Statistics Canada includes stillbirths of ≥ 28 weeks plus neonatal deaths up to 7 days of life.

There were three maternal deaths reported to the MPHSC in 2016. The MPHSC continues to review all pregnancy related direct and indirect maternal deaths that occurred up to 6 months post-partum as this allows the MPHSC to capture most cases of maternal deaths related to suicide as a result of post-partum depression, embolism, delayed onset of infections, etc. The MPHSC started this process in 2014.

Of the three cases of maternal death included in this report, one was classified as theoretically preventable due to substance abuse with patient error in judgement. One case was classified as theoretically preventable with in hospital error in management and occurred months after a caesarean section due to sepsis and cardiomyopathy following a complicated caesarean section with bowel perforation. The third case was due to an unfortunate pulmonary embolism in the postpartum period and was classified as non-preventable and unavoidable. All three are presented in this report.

There were 29 cases of maternal morbidity that were reviewed by the MPHSC. Three were classified as preventable. Five were classified as theoretically preventable. Two cases were unclassifiable. The remaining 19 were classified as non-preventable and unavoidable. We present 8 cases in this report.

There were 80 stillbirths reported to the MPHSC in 2016. One-third of the stillbirths occurred without identifiable cause. Eleven cases were classified as theoretically preventable. One case was unclassifiable. The remaining 62 cases were classified as non-preventable and unavoidable. We present 16 cases in this report.

In addition, there were 67 cases of early and late neonatal deaths reported to the College. Of those cases, two were classified as theoretically preventable. One due to in hospital error in management, and one due to physician error in judgement. One case was unclassifiable. We present 6 cases in this report.

There were 209 cases of neonatal morbidities reported to the MPHSC in 2016. All of these cases were reviewed by the medical consultant and many were reviewed by the MPHSC. There were six cases classified as preventable. Eleven cases classified as theoretically preventable. The remaining 192 cases were classified as non-preventable and unavoidable. We present 17 cases in this report.

In all the above preventable and theoretically preventable cases, educational letters and educational activities took place for the health care workers involved.

Root cause analysis for the preventable or theoretically preventable mortalities and morbidities identified several areas where improvements may alter outcomes in the future.

The reader is encouraged to review the cases listed in association with each cause as these cases are of educational value.

1. Communication, documentation and judgement in management that has been associated with a maternal death (I. A.2).
2. Resource issues that caused delays in delivery of appropriate care resulting in perinatal morbidity or mortality:
 - a. Stillbirths due to a delay in induction of labour at a tertiary centre (I. C.1).
 - b. Stillbirths due to a delay in assessment of a patient in labour, due to overcrowding at Triage in a tertiary center with placental insufficiency (I. C.3).
 - c. Stillbirths associated with a delayed appointment >22 weeks for a routine screening ultrasound resulting in missing an incompetent cervix (I. C.4).
 - d. Neonatal morbidity that could have been prevented by presence of a dedicated 24-hour physician to the Labour Unit at a busy secondary centre (I. D.3).
 - e. Neonatal mortality due to a delay in proceeding with a caesarean section due to inability to differentiate maternal from fetal bradycardia which may have been prevented by availability of a handheld or portable ultrasound machine at a tertiary centre (I. C.2).
3. Resource issue that was associated with a maternal mortality in the postpartum period in a rural setting. Opportune transport by helicopter to a tertiary centre was not available (II. A.1)
4. Errors in judgement or management by physicians or hospital staff associated with preventable or theoretically preventable perinatal morbidity or mortality:
 - a. Error in interpretation and management of fetal bradycardia in labour resulting in intrapartum death (I. C.2, I. C.7), and neonatal acidosis (I. D.4).
 - b. Inappropriate fetal monitoring (intermittent auscultation), and misinterpretation of a nonstress test leading to intrapartum stillbirth (I. C.5, I. C.2).
 - c. Lack of fetal monitoring leading to severe acidosis during a prolonged regional anesthesia for a caesarean section (I. D.2).
 - d. Error in judgement by a physician to leave the bedside of a labouring patient with an abnormal fetal heart pattern to go to an elective surgery, without the presence of a backup to the care of the patient (I. D.3).
 - e. Error in judgement by physician in not seeking a referral to a tertiary centre of a patient with a problematic obstetrical history (I. C.6).

- f. Error in management of shoulder dystocia in an out-of-hospital birthing (water birth) resulting in Hypoxic Ischemic Encephalopathy (I. D.5).
 - g. Communication error by staff to an attending physician resulting in an intrapartum death (I. C.5).
 - h. Surgical error by missing a sponge resulting in maternal morbidity (I. B.1).
5. Patient error in judgement or patient non-compliance with care or health advice leading to maternal death, perinatal death or severe neonatal morbidity.
- a. Substance abuse that may have been associated with system failure in the provision of mental health and socio-economic support (I. A.1, I. C.8).
 - b. Lack of prenatal care (I. C.9).
 - c. Non-compliance with recommended presentation to hospital leading to neonatal death (I. D.6).

Other cases demonstrated the unforeseen perils of out-of-hospital births (II. B.2, I. D.5), perils of caesarean sections (II. B.1, II. B.3), perils of co-sleeping resulting in SIDS (II. C.2), perils of missing FGR in morbid obesity resulting in stillbirth (II. C.10).

MPHSC in 2019

The MPHSC met on three occasions in 2019, reviewing and classifying a total of 62 cases. Significant fact seeking and educational correspondence ensued from these meetings.

In 2019, the MPHSC and CPSM created a working group to update the Manitoba Prenatal Record. This record was initially created in 2000. The working group is multi-disciplinary with input from infectious diseases, perinatology, midwifery, rural family practice, and obstetrical nursing. The update to the record is in the final stages and should be made available to the province in early 2021. Prior to release, this updated form will be shared with the College of Midwives of Manitoba, the College of Nurses of Manitoba, SharedHealth, and Manitoba Health.

We continued to receive a broader network of reports from the majority of rural centres throughout the province compared to previous years from the following centres:

- St. Boniface General Hospital
- Health Sciences Centre
- Boundary Trails Health Centre
- Brandon General Hospital
- Bethesda Hospital
- Ste. Anne Hospital
- Selkirk and District General Hospital
- Portage and District General Hospital
- St. Anthony's General Hospital / The Pas Health Complex

We are still striving to obtain reviews from all other rural hospitals in Manitoba in order for the reviews of the MPHSC to be more inclusive.

The MPHSC faces difficulty when information received at the College is incomplete or essential documents are missing. This causes delays in reviewing and classifying of cases and on occasion, the MPHSC cannot classify cases and labeling them unclassifiable as to preventability.

The MPHSC wrote four items for the College newsletter in 2019:

- "Estimation of Fetal Growth During Prenatal Care for Patients with a Higher BMI"
- "Optimizing Conditions for Abdominal Delivery of a Pregnancy with Placenta Previa and Placenta Accreta"
- "The Importance of Reviewing Previous Stillbirth Workup During the Care of a Subsequent Pregnancy"
- "Management of Patients Who Present for Assessment Because of Perceived Decreased Fetal Movements"

With the cooperation of the Chief Medical Examiner of Manitoba, the MPHSC continues to be able to review all maternal deaths during pregnancy and up to 6 months postpartum which were directly or indirectly related to pregnancy and which were not captured before. Such deaths may have occurred after discharge from a facility or did not occur in a facility. Examples of such cases include

suicides secondary to postpartum depression or due to medical illnesses that may have been exacerbated by pregnancy. Such reviews tend to be multidisciplinary in nature.

Definitions

Births, Gestational Age and Birth Weight

Live birth: The complete expulsion or extraction from the mother irrespective of the duration of pregnancy, of a product of conception in which, after such expulsion or extraction, there is breathing, beating of the heart, pulsation of the umbilical cord, or unmistakable movement of voluntary muscle, whether or not the umbilical cord has been cut or the placenta attached. (Taken from *the Vital Statistics Act*)

The data in this report are limited to births where the birth weight was 500 grams or greater.

Gestational Age: The duration of gestation measured from the first day of the last normal menstrual period. Gestational age is expressed in completed days or completed weeks. If the date of the last menstrual period is uncertain or unknown, an age estimate based on the ultrasound will be recorded as the gestational age:

- **preterm:** less than 37 weeks of gestation (<259 full days)
- **term:** between 37 and 41 weeks of gestation (between 259 and 286 full days)
- **post term:** more than 41 completed weeks of gestation (>286 full days)

Low Birth Weight: Deliveries (live or stillborn) weighing less than 2500 grams at birth.

Delivery: For the purposes of this report, a delivery refers to the completion of a pregnancy, regardless of how many fetuses are involved (i.e. a multiple birth is considered one delivery).

Perinatal Mortality

Stillbirth (Fetal Death): The birth of a fetus weighing 500 grams or more and/or having a gestational age of ≥ 20 weeks from last normal menstrual period (LNMP), who shows no sign of life after birth.

Neonatal Death: The death of a live born infant occurring less than 28 full days after birth:

- **early:** before the 7th full day of life
- **late:** between the 8th and 28th full day of life

Perinatal Death: All stillbirths (fetal deaths) and early neonatal deaths.

Maternal Mortality

Maternal Death: The death of a woman known to be pregnant or within 42 days of delivery or termination of the pregnancy, irrespective of the duration of or site of the pregnancy:

- **direct obstetric:** resulting from complications of pregnancy, childbirth, or the puerperium (e.g. exsanguination from rupture of the uterus)

- **indirect obstetric:** a non-obstetric medical or surgical condition which either antedated pregnancy or was aggravated by physiological adaptations to pregnancy (e.g. mitral stenosis)
- **non-obstetric:** resulting from accidental or incidental causes in no way related to pregnancy (e.g. automobile accident)

Mortality Rates

Unless otherwise specified, overall rates are computed on the basis of births and deaths of infants weighing 500 grams or more, or were at ≥ 20 weeks gestation from last menstrual period. These rates do not include births and deaths where the weight is unknown.

Stillbirth Rate (fetal death rate): The number of stillbirths per 1,000 total births.

Neonatal Mortality Rate: The number of neonatal deaths per 1,000 live births:

- **early:** before the 7th full day of life
- **late:** between the 8th and 28th full day of life

Perinatal Mortality Rate: The total number of stillbirths and early neonatal deaths per 1,000 total births (live births and stillbirths).

Levels of Facility Service

Level 0 – No organized elective obstetrics. (Unintended deliveries may occur)

Level I – Primary Care Centre: An obstetrical facility for mothers and newborns that have no detectable major risks in the prenatal period.

- Provides peripartum care for normal pregnancies.
- Ideally performs 25 or more deliveries per year.
- Ideally has the capacity to perform Caesarean section or have Caesarean section services available within 30 minutes from the determination of the need to do so.

Level II – Intermediate Care Referral Centre: A facility which has additional obstetrical and neonatal resources to a Level I hospital, and can provide treatment of mothers and newborns who present a risk.

- Meets all Level I requirements.
- Meets all considerations of the delivery of the normal to intermediate/high risk pregnancy and care of the neonate.
- Ideally performs 250 deliveries per year.
- Functionally organized to accept referred patients to a defined level of care.

Level III – Tertiary Care Referral Centre: In addition to Level I, and Level II services, supplemental technical services are available for dealing with high-risk pregnancies and for providing specialized perinatal care.

- Meets all Level I, and Level II requirements.

- Provides all associated maternal and neonatal surgical and medical services including high-risk obstetrical and neonatal services.
- Accepts transfers of infants and mothers from facility Levels I, and II.

Case Reviews

Modus Operandi

The following are case summaries of the cases reviewed by hospital Standards Committees, regional Standards Committees, and by the Maternal and Perinatal Health Standards Committee (MPHSC). Cases are identified for review based on abstraction criteria developed by the MPHSC (see appendix). All cases reviewed by standards committees at urban and rural centres are referred to the Medical Consultant of the MPHSC, who in turn reviews the cases again. Many cases are referred to the MPHSC for further review or consent.

Standards committees classify the cases according to preventability of poor outcomes and may identify errors in management, technique, documentation, or resources. In most cases the Medical Consultant would agree with the classification by the hospital standards committees; however, if there is disagreement or there are issues that have been identified by the Medical Consultant as being problematic and not addressed by the hospital standards committee, then letters of correspondence would ensue between the Medical Consultant of the MPHSC and the Chair of the hospital standards committee. The final classification of the case is further validated by members of the MPHSC at their regular quarterly meetings.

For cases that have been identified as being “preventable and avoidable” or “theoretically preventable and avoidable” and where errors in judgement, management, technique, or documentation have been identified, the local standards committee or alternately the MPHSC will send letters of education and recommendation to the parties involved in these cases.

This may involve:

- Recommending alternate routes of management in similar future cases.
- Recommending educational programs.
- Request that protocols be developed to deal with similar scenarios in the future.
- Request referral to other regulatory bodies such as the College of Midwives of Manitoba.
- In extreme cases referral to the Registrar of the College of Physicians and Surgeons of Manitoba may be undertaken.
- In cases where resource issues have been identified, the Winnipeg Regional Health Authority as well as Manitoba Health are also informed.

The following cases summaries are divided into three major categories:

- I. Cases classified as “preventable and avoidable” or “theoretically preventable and avoidable”.
- II. Cases classified as “non-preventable and unavoidable”.
- III. Cases classified as “unclassifiable”.

Further, the cases in the above three categories are subdivided into cases of:

- A. Maternal Mortality
- B. Maternal Morbidity
- C. Perinatal Mortality
- D. Perinatal Morbidity

The following summaries are not intended to be inclusive of all cases reviewed by the MPHSC that occurred in 2016. We have included all cases where outcomes are deemed preventable and select cases where outcomes were deemed to be non-preventable and unavoidable.

I. Preventable, Theoretically Preventable, Avoidable: A. Maternal Mortality

I. A.1

This case was reviewed for a maternal death. A 25-year-old G4P3 lady had a pulseless cardiac arrest while at a party and was resuscitated for 20 minutes before cardiac activity was recovered. The patient had been using illicit substances including cocaine and opioids. The patient was initially transferred to a community hospital where she was diagnosed to be pregnant at approximately 25 weeks gestation. A fetal heart rate was detected.

Given the live fetus, the patient was then rushed to a tertiary centre for consideration of a perimortem caesarean section. On arrival to the tertiary centre, the maternal status was found to be critical. She had fixed pupils and evidence of anoxic brain injury and significant cerebral edema. On ultrasound there was evidence of fetal cardiac activity but no fetal movements at all. It was felt that this also represented anoxic brain damage to the fetus consistent with a prolonged maternal anoxia and unsuccessful resuscitation. A decision was made not to perform a caesarean section, given the expected poor fetal prognosis. The patient was admitted to the intensive care unit; however, her clinical condition deteriorated quickly and she died.

The MPHSC reviewed the proceedings of this maternal death and it was felt that this was a non-obstetrical death. Given the cardiac arrest was likely provoked by substance abuse, it was felt that the maternal death would have been theoretically preventable at the level of the patient with patient error in judgement. The MPHSC was uncertain if this lady had a drug dependency issue or had used drugs casually. If she had a dependency substance abuse issue, then this may reflect on a system failure in the provision of mental health.

I. A.2

This case was reviewed for a maternal death secondary to long-term complications following an elective caesarean section.

A 32-year-old G3P2 lady had a relatively poor obstetrical history in that her first pregnancy ended with a stillborn for unexplained reasons, while her second baby was delivered prematurely at 36 weeks gestation by elective caesarean section for unknown reasons. She also had a previous ovarian cystectomy in her home country.

She had a smooth prenatal course in this index pregnancy and was booked for an elective repeat caesarean section at 38 weeks gestation. This caesarean section was complicated by a failed spinal anesthetic followed by general anesthesia. Upon entry into the abdomen, the uterus and bladder were quite adherent to the anterior abdominal wall, leading to difficulties in performing the caesarean section. At the time of the caesarean section there was no documented dissection of the bowel away from the uterus; however, on post-operative Day 2, she was noted to be having some abdominal distention, maternal tachycardia with no fever. She was worked up for a possible pulmonary embolism, but that proved to be negative.

On Day 3, abdominal distension worsened and was treated as an ileus pending abdominal x-ray. The first x-ray was reported as an ileus with a lot of free air within peritoneal cavity which was thought to be the result of her laparotomy. She was not improving so a second x-ray was done late in the evening of Day 3. The results were not reported until the next morning and the report expressed concern of a possible perforated viscus given the amount of free air seen. Of note, the attending who ordered the second x-ray was not informed of this concern.

On the morning of post-operative Day 4, general surgery was consulted and she was rushed to the operating room for an open laparotomy because of a perforated viscus. On entry to the peritoneal cavity, pus and free fluid was noted with a large abdominal abscess. Surgery consisted of small bowel resection. The mid-ileum was firmly adherent to the lateral anterior abdominal wall. Loops of bowel were freed, and it was discovered that there was a transection of the bowel.

Following surgery, she had a very complicated course in the Intensive Care Unit, during which time she had repeated laparotomies because of recurrent abscesses in the abdomen. Within 4 weeks, she developed a dilated cardiomyopathy following these surgeries and demonstrated septicemia. Shortly she became short of breath with cardiac failure. She had to be managed on extracorporeal oxygenation (ECMO). She subsequently had seizures and strokes and finally had a massive intracranial hemorrhage following which she was switched to palliative care. She died when care was withdrawn.

It was felt that there was a delay in diagnosing her perforated viscus and definitive intervention was not undertaken until post-operative Day 4 when she was spiking in fever. This is unfortunate given that she had persistent maternal tachycardia since Day 2 that never abated with hydration. She was also considered to have been hemoconcentrated given the hemoglobin of 152 g/L. During the first four days post-partum, she was requiring a large amount of hydromorphone.

There were three other concerns. The attending who performed the caesarean section did not see the patient until post-operative Day 4 when she was noted to be deteriorating. The attending who ordered the radiologic assessments on Day 3 did not follow up on the reports. Another concern is that the radiologist who saw the CT scan on Day 3 did not express his fears of a possible perforated ileus to the attending involved.

The committee felt that there were enough warning signs that the radiologic assessment should have been performed earlier. There were communication errors which may have contributed to a delayed intervention on Day 4. There was some discussion with regards to the fact that two radiologists gave different impressions of the x-rays; however, it is not uncommon that physicians do disagree on findings.

The MPHSC reviewed this case in great detail and felt that this mortality was theoretically preventable at the level of obstetrical care with in-hospital error in management and physician error in judgement.

Following cases of this nature, both tertiary centres have introduced programs that will help hospital staff physicians identify the early signals of sepsis so that management will not be delayed.

I. Preventable, Theoretically Preventable, Avoidable: B. Maternal Morbidity

I. B.1

This case was reviewed for a delayed maternal morbidity. A 31-year-old lady, G8P6, with a previous caesarean section followed by a successful vaginal delivery presented to the Labour Floor with spontaneous rupture of membranes for which oxytocin augmentation was initiated. Soon after transfer to the Labour Unit, she developed onset of antepartum hemorrhage with loss of the fetal heart rate. Her cervix was only 6 cm dilated, so she was rushed for an emergency caesarean section. Apparently, the preparation for the surgery was somewhat chaotic because of the loss of the fetal heart rate. The patient did recover and was sent home.

She presented two years later to the Emergency Department with acute onset of right lower quadrant pain and signs of sepsis. A CT of her abdomen revealed a thick-walled fluid collection of 7 cm with a centrally located foreign object. The patient was immediately started on antibiotics and she underwent a laparoscopic removal of the surgical sponge and release of adhesions.

The sponge count process was reviewed for the caesarean section two years earlier. This showed that the sponge count reported at the end of the surgery was correct; however, upon review of the sponge count sheets, a source of error was discovered. When the packs of sponges were added in preparation in the emergency surgery, one of the sponge packs was recorded as containing 4 sponges instead of the usual 5. One postulates that indeed that pack had 5 sponges, not 4, and for some reason at the time of counting them prior to initiation of surgery, the scrub nurse counted 4 sponges instead of 5 in error.

The MPHSC in its review of this case felt that this morbidity was preventable at the level of obstetrical care with in hospital error in management, particularly related to the counting of sponges. Educational efforts to the surgical nurses took place by the nursing educator.

I. B.2

This case was reviewed for respiratory maternal morbidity. A 41-year-old G6P5 lady presented to a secondary centre in a rural setting at 27 ½ weeks gestation. She presented in respiratory distress and influenza-like illness. She received supplemental oxygenation, vasopressors, broad spectrum antibiotics and Tamiflu. The patient was subsequently transferred to a tertiary centre in the city. The patient's course in the adult intensive care unit was uncomplicated and brief for less than 24 hours; however, nasopharyngeal swabs demonstrated influenza A infection. The Tamiflu was continued while antibiotics were stopped. It was confirmed that this patient did not receive the seasonal recommended influenza immunizations during or prior to her pregnancy.

The MPHSC determined that the obstetrical care was appropriate. The maternal morbidity was theoretically preventable at the level of family/patient with patient error in judgement. Had the patient received her seasonal influenza immunization as recommended by public health, her morbidity could

have been avoided. Of note is that this patient subsequently received her influenza vaccines in subsequent influenza seasons.

In 2016, another similar case occurred. A pregnant lady was at 29 weeks gestation when she presented with respiratory distress secondary to Influenza A infection. She too did not take the recommended Influenza A flu vaccine.

I. B.3

This case was reviewed for a patient's admittance to the intensive care unit with peripartum stroke. A 33-year-old G1P0 was under the care of a midwife. Her recorded blood pressure at her first visit was 90/60 mmHg. Her pregnancy was otherwise uneventful. At 41 ½ weeks gestation, she presented with spontaneous rupture of membranes. Fifteen hours later, she was transferred to a tertiary centre for possible augmentation as her cervical dilatation failed to progress beyond 4 centimeters.

On arrival to the tertiary centre, the patient was found to be 8 centimeters dilated. Her first recorded blood pressure at the tertiary centre was 159/89 mmHg. It was recorded that the nurse contacted the resident who did not initiate any antihypertensive agents on the assumption that the hypertension could be secondary to maternal pain. There was no other blood pressure taken until 3 hours later. The patient entered the second stage of labour nearly 2 hours later and had a vacuum assisted vaginal delivery. During the second stage, blood pressure recordings were in the hypertensive range, ranging between 170/90 mmHg to 167/119 mmHg.

In the immediate postpartum period, the patient demonstrated abnormal mentation, weakness of the left hand, and difficulty with speech. A code 25 was called and the patient underwent an emergency CT, which demonstrated a left frontal lobe intracranial hemorrhage with a 5-millimeter midline shift. The patient was admitted to the medicine ward by the neurology service and labetalol was initiated to lower the systolic blood pressure to less than 150 mmHg. During her admission, an MRI angiogram was done demonstrating a hematoma. The patient was maintained on antiepileptic medications (Keppra).

It took several weeks until imaging showed stable intracranial findings and the patient was subsequently admitted to a rehabilitation hospital. The patient was finally discharged from the rehabilitation hospital with residual speech impairment and decreased unilateral hand strength and dexterity. She ultimately went on to have five seizures in the subsequent year. The neurology team identified this lady's condition as Reversible Cardiovascular Constrictions Syndrome.

Of concern is that the patient demonstrated elevated systolic blood pressures of more than 155 mmHg for several hours, during which no antihypertensive agent was administered. There was also a lack of escalation in the frequency of blood pressure measurements in response to an elevated blood pressure on admission to the tertiary centre. Further review also documented that no notification of the blood pressure recordings was given to the attending physician by the resident involved.

The MPHSC classified this serious morbidity as theoretically preventable at the level of obstetrical care with in hospital error in management, error in documentation, and error in communication.

As a result of this case, the hospital initiated a review of the local policy on the frequency of blood pressure monitoring in the face of a hypertensive reading for patients in labour. A change in policy was also implemented on the importance of escalating abnormal blood pressure findings to the attending staff. Educational activity for the staff took place at the tertiary centre.

I. Preventable, Theoretically Preventable, Avoidable: C. Perinatal Mortality

I. C.1

This case was reviewed for a stillbirth. A 29-year-old G8P5 lady with 5 normal vaginal deliveries and 2 spontaneous abortions presented to the Emergency Room with alcohol intoxication. She was noted to be pregnant at that time having had no prenatal care. A fetal assessment showed that the pregnancy was approximately 36 weeks gestation. The sonographer perceived that there may be coarctation of the aorta and given that she was in a rural setting, she was transferred to Winnipeg for a fetal assessment.

At the fetal assessment unit at the tertiary centre, the fetal cardiac anomaly was confirmed. Arrangements for a delivery in the city by induction of labour were arranged and accommodations were provided for her.

Unfortunately, she returned to the rural on her own volition. On the scheduled date of her induction she received a call from the tertiary centre that she could not be accommodated at that day as the Labour Floor was busy. The plan was to have her return to the city in a day or two and initiate the induction then.

A day later she presented to the Emergency Room in the rural area with decreased fetal movements and intrauterine fetal death was confirmed. She stayed at the rural setting and after counselling and emotional support, the induction was organized and carried out there. It took three days to have her induced as the cervix was not favourable. At full dilation, she did complain of a sharp pain on her right side.

She delivered a stillborn baby weighing 2,700 grams. Following the delivery of the placenta, she continued to have persistent bleeding. She was taken for an examination under anesthesia, it was noted that she had a vaginal tear that extended superiorly into the right broad ligament and there was also a posterior wall perforation. She underwent a laparotomy that involved two gynecologists and a general surgeon and a urologist. A stent was placed in the right ureter preoperatively.

The management of her postpartum hemorrhage included primary closure of the posterior wall perforation and the application of B-Lynch sutures. This did not alleviate the persistent bleeding, so she underwent a hysterectomy. During the process of the hysterectomy, she was given a total of 13 units of red blood cells and 3 units of fresh frozen plasma. She was then admitted to the ICU for a day.

There was some concern that she would abscond from the hospital, so the stent was removed after 48 hours; however, a CT scan showed some leakage from the right ureter so a stent was reinserted. She was given an appointment to have the stent removed in 6 weeks time, but she failed to show up for her appointment.

Two months later after these events, she was brought in by ambulance to the Emergency Room with alcohol intoxication. It was at that time that the stent was removed.

The MPHSC felt that the stillbirth was theoretically preventable with errors in patient behavior, and the system of care. It was felt that had this non-compliant patient been induced on the day that she was scheduled to have the induction, this stillbirth may not have occurred.

The postpartum hemorrhage was felt to be non-preventable and unavoidable. The MPHSC felt that resource issues at the tertiary centre in the provision of an induction of labour in a timely manner in a patient with alcohol abuse and non-compliance contributed to the occurrence of this stillbirth. The committee also identified a system failure in the provision of mental health and socio-economic support for this patient as contributing factors.

This case was raised with the leadership at the tertiary centre where this patient was scheduled for induction as well as with the Winnipeg Region Head of the Women's Health Program to re-examine resource needs to the under-privileged and the appropriate prioritization of inductions of labour.

I. C.2

This case was reviewed for intrapartum death. A G7P5 lady with one previous caesarean section followed by three subsequent vaginal births (VRACs) presented at 25 weeks in a Northern rural setting with cramping and spotting. She was hence transferred to a tertiary centre where there was evidence of oligohydramnios and rupture of membranes. The baby appeared to be appropriate for gestation age but was in a complete breech presentation. She was admitted to the antepartum ward for observation and was given antibiotics and was treated with steroids.

On Day 1 she started to have abdominal cramping so she was sent from the antepartum ward to the Labour Unit where her contractions settled. At the Labour Unit, the fetal heart rate was normal with good variability. The cervix was closed. She was then sent back to the antepartum ward after several hours of observation. Shortly after, the fetal heart rate increased to 160 bpm, so she was reassessed and was sent back to the triage unit where she had a fetal heart rate tracing showing a fetal heart rate of 160 with variability. She was then sent back to the antepartum ward, but significant tachycardia developed at a rate of 180 bpm and she was transferred back to the Labour Unit once again. On the Labour Unit, fetal tachycardia was confirmed and it was decided to observe her somewhat with a view to having a caesarean section done. She was observed over a two hour period at which time the fetal heart rate settled at 160 bpm, but there were occasional non-severe variable decelerations. Suddenly, the baseline dropped to 120 bpm but variability remained preserved. A bedside scan was done showing the baby to be in a transverse lie back down. Shortly thereafter, there was a loss of the fetal heart rate signal thought to be a technical artifact of the fetal monitor, but eventually, the fetal heart rate was re-established. A sudden bradycardia occurred which was severe and unrelenting. Once again it was felt that the acute bradycardia was an artifact of the fetal monitor. After a while, the caesarean section was ordered. The baby was stillborn.

Reviewing the timeline, it appeared that moving the patient to the operating room took more than 22 minutes, and the spinal anesthetic took another 11 minutes, and the baby was not born until 43 minutes after the onset of bradycardia. The MPHSC felt that there was a sense of non-urgency in dealing with the fetal bradycardia and assumed that this bradycardia was a technical problem rather than a true ominous fetal issue. The preparation to have a caesarean section was very slow.

This case was classified as theoretically preventable at several levels:

- Obstetrical care with physician error in judgement in assessing the terminal bradycardia and attributing the terminal bradycardia as a technical problem with the fetal monitoring machine.
- In hospital error in management in that the preparation for the caesarean section was slow and sluggish and compounded by resource issues. The staff at the institution had been demanding a handheld ultrasound machine on the labour unit. It was felt that should the Labour Floor have a handheld ultrasound machine, then it would have provided for an opportunity to check the fetal heart rate and confirm that this was a terminal bradycardia rather than assume a technical problem with the fetal monitoring machine. This was not provided to the Labour Floor in an expedited manner based on resource financial issues.

I. C.3

This case was reviewed for an intrapartum stillbirth. A 23-year-old G1P0 lady had a relatively smooth pregnancy presented at 36 weeks gestation with contractions and a small amount of bleeding. She had a BMI of 40. She reported adequate fetal movements, but then there was a delay in her initial assessment for 1 ½ hours, after which no cardiac activity could be found and fetal demise was confirmed. At that time she was noted to have mild hypertension and her uric acid was elevated. Her labour was induced and she delivered a stillborn baby weighing 1,717 grams (i.e. the birth weight corresponded to less than the 1st percentile for gestational age).

The stillbirth workup demonstrated a placenta that was quite small. The antiphospholipid antibodies were negative. All her serology was also negative and there was no evidence of diabetes. The patient declined an autopsy. The baby died of clinically undiagnosed placental insufficiency. While the height of fundus appeared to be appropriate for gestational age until the time of her presentation, it is very likely that the small size of the baby was masked by her high BMI.

Of issue is the delay in her assessment upon presentation to the triage area. Further review of the conditions of the triage at that time found that unit was extremely busy. Since this event occurred, the issue of expediency of assessments in Triage was discussed with the medical and nursing leadership of the department. As a result, the practice changed to ensure that any patient presenting to the triage will have an initial recording of the fetal heart rate by an handheld electronic fetal monitor immediately upon registering. The fundamental problem at the triage unit the patient presented to is the lack of an appropriate number of beds when the volume of patient is excessive. Discussions with the health region have been ongoing for several years to approve funding for development of a physically larger triage area. To date this has not occurred.

This case was classified as theoretically preventable at the level of obstetrical care precipitated by resource issues.

I. C.4

This case was reviewed for a neonatal death. The patient was a G5 P0 SA4 lady. In the current pregnancy she was seen by a family physician who appropriately ordered a routine ultrasound for an anatomic assessment at around 16 weeks gestation, but that was not scheduled by the ultrasound department. The mother presented at 22 weeks gestation with vaginal bleeding and was found to have

bulging membranes. At the time of assessment, no cervix could be palpated. She subsequently went on to deliver an extremely premature baby that died in the neonatal period. The presentation was consistent with cervical incompetence.

On further review of the proceedings of this case, the MPHSC was concerned that this lady's routine second trimester anatomic ultrasound was not performed, despite a request from the family physician. The standard of care would have all pregnant women have an ultrasound performed between 18 and 22 weeks gestation, according to national guidelines. It was felt that should an ultrasound have been performed at the appropriate time, a shortened and/or an open cervix or a funneling would have been detected and the opportunity for a rescue cerclage would have presented itself.

A letter was written at the hospital Standards Committee to the Head of Ultrasound Diagnostic Services in the Winnipeg region to ask them to investigate why this ultrasound was not performed. The committee also noted that there has instances when anatomy ultrasounds were requested appropriately but appointments given were beyond the recommended gestational age window. This case illustrate where harm can occur as a result.

Correspondence also occurred between the MPHSC and the Head of Ultrasound who concurred with the opinion of the committee and steps are underway to correct the problem at the system level. The MPHSC classified this case as theoretically preventable with system error in the provision of care.

I. C.5

This case was reviewed for a stillbirth. A 34-year-old lady, primigravida, had spontaneous rupture of membranes at 22 weeks and 5 days. She was managed in hospital at a tertiary centre for a whole month where she was monitored daily. She received antibiotics and steroids and was followed by the fetal assessment unit as well as neonatology. The plan was to have the fetus undergo full resuscitation should things evolve after 24 weeks gestation. At 26 weeks gestation, she had a non-stress test which documented a baseline of 160 bpm with 5 recurrent decelerations. These appeared to be variable decelerations; however, it was felt by the attending at the time that this did not warrant delivery and so she was sent to the ward for clinical monitoring and a repeat of the non-stress test six hours later. Three hours after the non-stress test the nurses noted that the fetal heart rate had escalated to 180 bpm. She was then taken for another non-stress test which showed a baseline of 160 bpm, but two decelerations were also observed. The attending decided once again that no intervention was needed, but asked for an increased frequency in auscultation of the fetal heart rate. Six hours later, the fetal heart rate was found to be at 170 bpm and house staff was called in. The fetal heart rate was noted to range between 150-170 bpm with several decelerations down to 80 bpm. These findings were not escalated to the attending on call. The house staff gave directive for the nurses to continue monitoring on the ward with auscultation only.

Four hours later, the fetal heart rate was noted to be at 136 bpm and again two decelerations were heard. The house staff was called again, except this time, no fetal heart rate could be heard. Fetal demise was confirmed by an ultrasound. The labour was induced with misoprostol and she had a stillborn female weighing 716 grams.

The MPHSC had concerns with the management of this lady over the 48 hours prior to fetal demise. The first non-stress test should have prompted delivery given the frequency of variable

decelerations. There was also thick yellowish vaginal discharge during that time. With the second non-stress test, there was another opportunity for intervention, but the decision to monitor this lady on the ward through auscultation was felt to be inappropriate and does not meet standards. There was also a concern that when the house staff was called hours prior to the fetal demise, the findings of the recurrent decelerations with fetal tachycardia were not escalated to the attending on call.

The MPHSC classified this case as theoretically preventable at the level of obstetrical care with both physician error in judgement and in hospital error in management. Educational activity took place with the physician involved as well as with the in-house staff and nurses.

I. C.6

This case was reviewed for a stillbirth. A 36-year-old G7P4 lady initiated prenatal care at 19 weeks gestation and had two prenatal visits. This lady had a previous stillbirth in the late second trimester. She also had two preterm births at 30 weeks and 34 weeks. She presented at 23 weeks gestation with active labour and spontaneous delivery of a baby weighing 429 grams with no signs of life. She is a smoker of half-a-pack per day. The stillbirth workup on this baby was essentially negative except for *Bacteroides fragilis* colonization of the placenta.

The MPHSC felt that given her past obstetrical history and risk factors, it would have been prudent to have her family physician refer her to a tertiary centre for a full assessment, review of past stillbirth assessment and check for of cervical competency.

This case was classified as theoretically preventable with physician error in judgement and error in documentation and communication. A letter of education was sent to the family physician involved.

I. C.7

This case was reviewed for an intrapartum stillbirth. A 30-year-old primigravida presented at 40 weeks and 4 days with contractions. The pregnancy was uneventful. At initial assessment, the cervix was posterior and electronic fetal monitoring was started in the triage area, some 17 minutes after presentation to the triage desk. The fetal heart rate from the start was atypical. She was observed for 32 minutes on the monitor when an acute bradycardia occurred. At 2 minutes of bradycardia she was taken to a labour room where it was noted that the bradycardia was still persistent, and she was then transferred to an operating theatre where once again, the bradycardia was still observed.

The time interval from the onset of bradycardia to actually getting into the case room was 17 minutes. A crash caesarean section was then initiated and the baby was delivered at 31 minutes after the onset of bradycardia. On entry into the uterine cavity, there was absolute oligohydramnios and thick meconium was noted. The baby had no signs of life and Apgar scores were 0 and 0 at 1 and 5 minutes. Resuscitation was initiated but was unsuccessful. The arterial cord pH was 6.95, and the base deficit was 19 and a lactate of 16.6. The autopsy showed meconium aspiration and hypoxic ischemic brain damage.

On review, it was evident that the response to the atypical tracing and subsequent acute bradycardia was tardy and sluggish. Moving the patient from the Triage area to a delivery room took at

least 10 minutes. Given persistent bradycardia, she was then moved to the operating room. The baby was not delivered until 31 minutes of the onset of bradycardia. It is likely that this fetus was already acidotic when she walked into the hospital given that the fetal heart tracing was atypical at that time; however, the delay to deliver this baby and the time wasted in transferring the patient to a labour room instead of directly to the case room reflected a systemic issue and a judgement error. A patient whose fetus demonstrated acute bradycardia that does not resolve within 10 minutes should be rushed to an operating room for delivery. Management of acute bradycardia was presented at rounds to the faculty and was presented to department attendings with stress placed on being vigilant in transferring the patient directly to a case room if acute bradycardia occurs in a Triage area. Educational activity took place with the physicians, house staff, as well as with the nursing team.

This case was classified as theoretically preventable at the level of obstetrical care with in hospital error in management.

I. C.8

This case was reviewed for a stillbirth. A 28-year-old G5P4 lady presented at 29 weeks gestation with spontaneous rupture of membranes. She had a previous caesarean section and two VBACs. She was a victim of substance abuse and she discharged herself against medical advice from the tertiary centre.

While she was out of the hospital, she developed abdominal pain and called EMS. She was brought to a second tertiary centre because of high risk diversion and admitted to having using crystal meth and cocaine within 24 hours preceding her admission. Fetal demise was confirmed. The patient was febrile and tachycardic. Given her history of intravenous substance abuse she was suspected to have infective endocarditis and was treated aggressively with vancomycin and PIP-TAZO. There was no evidence of abruption at the time of delivery. She developed hypertension and was transferred to the ICU where her blood cultures grew E.coli and a chest x-ray was suspicious for pneumonia.

In the stillbirth workup, placental pathology confirmed chorioamnionitis. The MPHSC felt that this stillbirth and maternal morbidity were theoretically preventable with patient error in judgment compounded by possible failure of the system in the provision of mental health and socioeconomic support.

I. C.9

This case was reviewed for a stillbirth. A 28-year-old G8P7 lady presented at 36 weeks gestation to a rural hospital with decreased fetal movements and abdominal pain. A non-stress test was carried out showing a non-reactive NST with decreased variability and no accelerations nor fetal movement. This lady was known to have gestational diabetes in previous pregnancies but on this occasion did not have any prenatal care at the time of her presentation. She suffered from morbid obesity with a BMI of 54 and as such she was transferred to a tertiary centre where she arrived 3 ½ hours later, at which time fetal death was confirmed.

She was induced and had a vaginal delivery complicated by shoulder dystocia. The baby weighed 4,353 grams. Her hemoglobin A1C was 9.2%.

This case was classified as theoretically preventable with patient error in judgement due to not seeking prenatal care during her pregnancy.

I. C.10

This case was reviewed for a neonatal death. A 31-year-old G3P2 lady with a past history of two previous growth restricted babies born at term, was at 27 weeks in this gestation when she was followed up by fetal assessment for fetal growth. The fetal assessment showed abnormal doppler studies and there was absent end diastolic flow in the umbilical artery with evidence of increased middle cerebral artery flow. A few days later, there was reversed end diastolic flow in the umbilical artery. She was hence given steroids and was delivered by caesarean section.

The baby weighed 554 grams and in the very beginning did quite well on CPAP. The umbilical arterial pH was 7.26. Subsequently, a day later, the baby required a dose of BLES (surfactant) because of increasing oxygen requirements. The baby was then placed back on CPAP, but the oxygen requirements remained quite high. It was decided to intubate the baby, but during the first attempt at intubation, profound bradycardia occurred, and the baby did not recover from that bradycardia. The intubation was successful on the third attempt by using transillumination. It was noted that there was a right pneumothorax. This was managed with a chest tube on the right side. The baby required chest compressions as well as epinephrine but eventually died after an hour of resuscitation. The baby proved to have subsequently bilateral pneumothoraces on the left and right sides.

The process of resuscitation was reviewed by the committee and it was felt that there was no documentation of a chest x-ray and there was no attempt at needle decompression of the left pneumothorax. The pneumothorax may have contributed to the death of this baby and non-response to resuscitation. The MPHSC also wondered if the endotracheal tube was placed properly or misplaced. The case was classified as theoretically preventable at the level of pediatric care with physician error in judgement. Educational activity by neonatology took place.

I. C.11

This case was reviewed for intrapartum fetal death. A 28-year-old G2P0 was at 40 weeks gestation. She presented in spontaneous labour to a birthing centre. Her progress was slow and at 7 centimeters dilation she was transferred to a tertiary centre for an epidural anesthetic. She was known to be group B strep positive and had received penicillin. She also had spontaneous rupture of membranes during labour with evidence of meconium. She arrived to the tertiary centre where a fetal heart rate was auscultated upon arrival and again 30 minutes later. Unfortunately, the patient was not placed on a continuous fetal monitor. She received an epidural anesthetic approximately 45 minutes after arrival, after which a fetal heart rate could not be auscultated. A scalp clip was then applied, and this produced a poor signal with possible bradycardia. She was rushed to the case room for an emergency caesarean section approximately 21 minutes after receiving the epidural anesthetic. Unfortunately, the intravenous catheter that she had become interstitial as the anesthetic was being

infused, so a second intravenous was established, hence delaying the caesarean section for another 17 minutes, and the baby was born just 2 minutes after that. The baby had Apgar scores of 0 and 0 at 1 and 5 minutes and could not be resuscitated.

This committee felt that this patient should have been placed on continuous monitoring upon arrival to the tertiary centre given that the labour was complicated by delayed progress and the presence of thick meconium. The EFM may have demonstrated some issues with the fetal heart rate and would have precipitated an early caesarean section.

This intrapartum death was classified as theoretically preventable with in hospital error in management in that a continuous fetal monitoring was not implemented immediately upon arrival to the tertiary centre and prior to receiving the epidural. Educational letters were sent to the physician and nursing staff at the tertiary centre.

I. Preventable, Theoretically Preventable, Avoidable: D. Perinatal Morbidity

I. D.1

This case was reviewed for hypoxic ischemic encephalopathy and admission to the neonatal intensive care unit. A G2P1 had a previous caesarean section and planned to have a trial of labour. She presented at 39 weeks gestation in spontaneous labour and progressed quickly and had a normal vaginal birth; however, the patient refused to have continuous electronic fetal monitoring for the final half hour of her second stage. She was quite combative with the staff with regards to the need for continuous EFM. The baby at birth had Apgar scores of 1, 2 and 4. The umbilical venous pH was 7.20. The baby suffered moderate hypoxic ischemic encephalopathy and was treated with cooling protocol.

The MPHSC reviewed this case and felt that the neonatal outcome of hypoxic ischemic encephalopathy was theoretically preventable at the level of family/patient with family/patient error in judgement. The committee felt that should monitoring have been continued in the latter part of labour and need for intervention identified, the outcome may have been prevented

I. D.2

This case was reviewed for baby's to NICU with hypoxic ischemic encephalopathy and multisystem organ failure. This 28-year-old G3P2 lady was at 39 weeks. She presented in early labour with decreased fetal movements. The fetal heart rate tracing had reduced variability. She was clicking for fetal movement but there were no accelerations. She was monitored for three hours in triage. Over this time there were no accelerations. Biophysical score was performed and found the baby to have normal amniotic fluid but with a score of 2 out of 10. She was taken to the operating room for a caesarean section. Her cervix was not dilated and she was not in active labour.

In the operating room, there was some difficulty with obtaining regional anesthesia. Her BMI was 40.9. The spinal space could not be accessed and so the attempt at spinal anesthetic was abandoned and a caesarean under general anesthetic would be performed. Once she was positioned for the caesarean section, the fetal heart could not be heard. An ultrasound machine was in the room and a quick scan showed there barely was any signs of normal contractility of the myocardium. On review, some forty minutes had elapsed during the attempt to have a spinal anesthetic. The fetus was unmonitored during this time.

A crash caesarean section was done as she was already in the operating room and anesthesia was already prepared for general anesthetic. The baby was born flat. The Apgars were 0, 1, 4, 4 and 7. Cord artery pH was 7.11 with a base excess of -13. The baby had a full resuscitation followed by a 17 day stay in the NICU. The baby had multisystem organ failure but recovered. There were neonatal seizures observed.

It was concluded that this fetus entered the operating room with subacute acidosis as reflected by the cord gas but then undoubtedly must have suffered a terminal bradycardia while the mother was sitting for her spinal and the fetus was unmonitored.

The MPHSC classified this case as theoretically preventable at the level of obstetric care due to in-hospital error in management. The fact that this baby was not monitored while the lady was sitting up during the attempt to have a spinal anesthetic does not meet standards. As a result of this case, a critical incident review took place at the hospital and a regional guideline was developed that advises continuous monitoring of the fetal heart rate while patients are in transit to the operating room or during prolonged attempts at a spinal anesthetic or while awaiting a general anesthetic.

I. D.3

This case was reviewed for low Apgar scores. This primigravida presented at 40 weeks gestation in active labour. In the first stage of labour her membranes ruptured. In the second stage of labour the fetal heart rate tracing showed variable decelerations of late onset and of a complex nature. The patient was on oxytocin and the physician involved was summoned and advised to lower the oxytocin dose. Thereafter there was some difficulty with the external continuous monitoring of the fetal heart rate so a scalp electrode was placed; however, the fetal heart rate was noted to be getting worse with wider and deeper variable decelerations of late onset.

The physician was again summoned and on arrival, the patient was fully dilated and pushing. This physician had another patient in the Operating Room and had to leave the bedside of this patient who was pushing and so the baby was delivered by a midwife. The physician was summoned but was busy in the operating room and arrived in the case room about five minutes after the baby was born.

The baby had Apgar scores of 2 and 6 at 1 and 5 minutes and needed neonatal resuscitation; however, a pediatrician was not summoned during the late second stage of labour so no pediatrician was available at the time of the birth of the baby.

The MPHSC reviewed the electronic fetal heart rate monitoring tracings and felt that the fetal heart tracings were quite concerning for a minimum of one hour prior to birth. This should have prompted the physician involved to stay with the patient during the second stage of labour in preparation for a possible abdominal delivery versus an assisted vaginal delivery. There was also concern that a pediatrician was not summoned to the delivery given the concerning fetal heart rate tracing.

The MPHSC classified this case as theoretically preventable at the level of obstetrical care with physician error in judgement and in hospital error in management. It was also felt that should there have been a dedicated 24-hour obstetrician for this Labour Unit at this secondary centre who would have taken over the care of this patient while the primary attending was in the Operating Room, this perinatal outcome could have been avoided.

As a result the MPHSC raised a letter to the Deputy Registrar to discuss the issue with Manitoba Health to promote the idea of creating the position of a 24-hour obstetrician to cover the Labour Floor.

It should be noted that this centre in 2020 remains without 24-hour in house coverage by a dedicated obstetrician.

I. D.4

This case was reviewed for low Apgar scores and meconium aspiration. A 32-year-old G2P1 lady was admitted for induction of labour at 41 weeks gestation. This was carried out by artificial rupture of membranes and oxytocin. Towards the end of the first stage of labour there were severe variable decelerations with tachysystole. While the nurses wanted to decrease the oxytocin or discontinue it, the physician advised the nurses to increase the oxytocin to promote a more rapid delivery.

The baby weighed 3.6 kg and the Apgars were 2 and 6 at 1 and 5 minutes. The umbilical venous pH was 7.28. It was felt there was an error in judgement and management by the physician ordering an increase in oxytocin in the context of an abnormal fetal heart rate. It would have been prudent to reduce oxytocin significantly or stop it to allow the tachysystole to resolve and give the baby more time to recover in between contractions and improve oxygenation. Educational activity took place with the physician involved.

If the patient is on oxytocin either during induction of labour or augmentation of labour, it is prudent that when tachysystole occurs that oxytocin be slowed down or stopped. The baby does require 90 seconds to recover to its original oxygenation and pH status in between contractions. As such, the inter-contraction duration should ideally be no less than 2-3 minutes.

I. D.5

This case was reviewed for low Apgar scores and neonatal seizures. A 38-year-old G2P1 lady sought midwifery care as she was interested in home birth. As she was from a rural setting, it was decided for her to move to the city and have her baby at one of the hotels in town.

At term, she had spontaneous rupture of membranes, and she was started on penicillin as she was colonized by group B streptococcus. The fetal heart rate was normal during the first stage of labour. She wished to deliver her baby in the bathtub, so in the second stage of labour, the baby's head delivered, but there was no further spontaneous delivery of the rest of the baby. Four minutes later the patient was moved on to the bed and the midwife faced shoulder dystocia. Both the arms of the baby were across the baby's face.

The baby was delivered with Apgar scores of 0 and 2 at 1 and 5 minutes. The baby had to be intubated in the hotel room and 911 was called. EMS arrived immediately and the baby was rushed to the hospital and arrived in 12 minutes, after which a pediatrician took over the management of the baby. The baby weighed 3.4 kg and stayed in the intensive care unit where seizures occurred and the baby was placed on phenobarbital.

The MPHSC initially wondered whether midwives had a guideline to guide midwives in their attempts to deliver a baby when the mother is immersed in water. The committee was particularly interested in finding whether midwives are given guidance in identifying shoulder dystocia while the parturient is immersed in water and guidance regarding the duration to initiate intervention should the baby's body not expel after the delivery of the head. As such, this case was raised to the Central Standards Committee of the College of Physicians and Surgeons of Manitoba who raised it to the Registrar of the College. The Registrar asked the College of Midwives of Manitoba to review the

proceedings of this case and request a copy of the College of Midwives of Manitoba guideline on water births and documentation requirements.

The College of Midwives of Manitoba did respond to this request and provided a guideline on water labour and birth. This guideline was reviewed by the MPHSC. There was a concern that this guideline falls short in giving guidance to midwives on the signs of shoulder dystocia when the mother is giving birth underwater, and does not give any guidance with regards to a duration for initiation of intervention should the baby's head deliver without the rest of the body to follow. It was also felt that the standards on documentation and record keeping appear to be of a general nature and does not give guidance to the midwives with regards to specific documentation regarding steps undertaken to manage shoulder dystocia, particularly when this occurs in an attempted water birth.

The concerns of the MPHSC were once again raised to the Central Standards Committee and the Registrar of the College of Physicians and Surgeons of Manitoba forwarded these concerns to the College of Midwives of Manitoba for their attention and management.

This neonatal morbidity was classified as preventable with error in management and documentation.

I. D.6

This case was reviewed for low Apgar scores and neonatal seizures. A 30-year-old G3P0 was under the care of midwifery and had a smooth pregnancy. At 39 ½ weeks gestation she had spontaneous rupture of membranes with meconium. She called her midwife who advised her to go to the hospital immediately; however, the patient did not arrive until 3 hours later at which time, upon her presentation, there was evidence of a cord prolapse. She was immediately rushed to the case room for a crash caesarean section under general anesthetic. The intubation was quite difficult and four attempts at intubation took place. The anesthesiologist during that time summoned help from a colleague anesthesiologist and it took approximately 30 minutes for this lady to be put to sleep.

The baby was born less than 2 minutes later with Apgar scores of 0, 0, and 0 at 1, 5 and 10 minutes. The cord pH was 6.5. The baby had a full resuscitation and a fetal heart rate was established after 14 minutes. The baby was intubated and cooling protocol was employed; however, the baby had severe HIE and had recurrent episodes of seizures. An MRI done on Day 5 showed severe anoxic brain injury. Phenobarbital was discontinued on Day 7 and the baby was extubated, but did not have a gag reflex. A gastric tube was placed on Day 26 and the baby was discharged home on Day 29 for out-patient follow up.

Upon review of the case, concern was expressed that the patient's arrival to hospital was quite delayed. It took approximately 3 hours for the patient to arrive to the triage unit. The patient did claim that she noted a cord prolapsing at home, but was not aware of its significance and did not mention it to the midwife. It was unfortunate that there was further delay in this baby's delivery given the very difficult intubation and the time it took to intubate the patient.

The MPHSC felt that this severe neonatal morbidity was preventable at the level of the patient with patient error in judgement. The patient did not present to hospital when instructed to do so by her midwife. It is unfortunate that the patient did not recognize the critical importance of the cord

prolapse. Equally, it was unfortunate that the intubation was quite difficult due to a very difficult airway, which may have contributed to the delay in delivery, but this could not be avoided.

II. Non-Preventable and Unavoidable:

A. Maternal Mortality

II. A.1

This case was reviewed for a maternal mortality. A 30-year-old G1P0 lady had a smooth pregnancy and presented at 38 6/7 weeks gestation in active labour with spontaneous rupture of membranes and delivered four hours later of a live male baby with Apgars of 9 and 9 at 1 and 5 minutes. Her past medical history included a history of polycystic ovary syndrome and atrial ventricular conduction cardiac block. She had no history of venous thrombosis or phlebitis. She had a pacemaker that was placed two years earlier and was checked nine months prior to her delivery. With the pacemaker, her pre-existing bradycardia resolved and she was in sinus rhythm. She was given metformin at 500 mg BID to help achieve conception in the context of polycystic ovary syndrome. She was also on low-dose aspirin of 81 mg. Her diabetic screen proved negative with a 50 gram challenge test in the second trimester.

Following her delivery and in the immediate post-partum period, she remained in a good, stable condition and was discharged home within 24 hours. She was soon started on a progestin contraceptive agent. Three weeks following her delivery, she had tachycardia and shortness of breath. At that time, she had a right calf pain and had an appointment to see her family physician three days later. Unfortunately, her shortness of breath worsened and she immediately went to the Emergency Room in a rural setting. An EKG showed evidence of an ST depression. A troponin was elevated and she was started on enoxaparin. The emergency staff had difficulty with establishing an intravenous access and efforts were undertaken to transfer this patient immediately to a tertiary centre in the city. Unfortunately, the helicopter for transfer (STARS) was not available and given the emergency situation, there was some attempt to transfer this patient to a secondary centre in the rural area. The tertiary centre accepted the patient and advised immediate transfer where a cardiologist at that site was placed on alert. The patient was sent by ambulance with a nurse, but during her transfer she became unresponsive, so the ambulance returned back to the rural hospital where CPR was started in the ambulance by the nurse and continued in the hospital. The patient was noted to have ventricular fibrillation and received 8 electric shocks and multiple rounds of epinephrine and anti-arrhythmic medications. All these resuscitation efforts unfortunately failed.

The MPHSC reviewed the proceedings of the above case, focusing on preventable risk factors for embolism and, if so, whether this patient should have been on anticoagulation therapy throughout her pregnancy. This lady gave no history of deep venous thrombosis. She was overweight with a BMI of 33. The guideline for anticoagulation does not mandate anticoagulation in the absence of a history of venous thrombosis or documented thrombophilia. The presence of a pacemaker for atrial ventricular conduction issues was felt not to be an indication for anticoagulation. The progestin agent used for contraception was not felt to have been a contributory risk factor for pulmonary embolism given the low dose of progestin.

There was some concern by the MPHSC on the unavailability of the STARS rescue team at the time of need; however, it was felt that the local resuscitation efforts were heroic and there were frequent phone calls to tertiary centres in arranging transfer of the patient as well as to obtain advice. The MPHSC felt that the care provided to the patient was efficient and expedited. The MPHSC did not identify any errors in the antenatal period, labour, or post-partum management.

This maternal death was secondary to non-preventable pulmonary embolism exacerbated by the maternal physiologic changes with increased risk for venous thrombosis due to the changes in the coagulation milieu during the peripartum period. The MPHSC classified this case as non-preventable and unavoidable.

II. Non-Preventable and Unavoidable: B. Maternal Morbidity

II. B.1

This case was reviewed for maternal intra-peritoneal hemorrhage post-caesarean section. A 30-year-old G2P0 presented at 41 weeks gestation in active labour. Her prenatal care was uneventful. She was diagnosed with failure to progress and cephalo-pelvic disproportion, so an emergency caesarean section was carried out. The caesarean section was performed without event and the baby was 3.4 kg with Apgar scores of 8 and 9 at 1 and 5 minutes.

In the recovery room she was noted to develop tachycardia and hypotension. Abdominal bleeding was suspected and hence she was taken back to the operating room where a laparotomy showed bleeding from the left pelvic wall likely related to a branch of the uterine artery. Control of bleeding was then attempted with sutures. A B-Lynch suture was also done in the hope of reducing uterine atony and reduce the amount of maternal blood loss. After the laparotomy she was noted to have very low post-op hemoglobin and remained tachycardic. A CT angiogram was done and confirmed a continuous slow appearing blood plume from the left pelvic wall. Given that this case was in a rural setting, she was transferred immediately to a tertiary centre for uterine artery embolization, and the bleeding was finally controlled. She recovered quite well.

The MPHSC felt that bleeding and hemorrhaging are a known complication of caesarean sections and the management was appropriate. This case was classified as non-preventable and unavoidable.

II. B.2

This case was reviewed for maternal admission to the intensive care unit following massive post-partum hemorrhage.

A 23-year-old G1P1 lady delivered at home under the care of a midwife. She was noted to have severe postpartum hemorrhage four hours after delivery and was transferred by ambulance to a community hospital. It was noted that the uterus was severely hypotonic. Clots were evacuated from the uterine cavity followed by aggressive administration of uterine tonics including oxytocin, misoprostol, and prostaglandin F2 α . She was also noted to have a high vaginal tear which was also bleeding, so she was taken to the operating room where the tear was repaired. A CT scan was also performed to rule out any occult abdominal bleeding. She was subsequently transfused with packed cells. There were no signs for disseminated intravascular coagulopathy and five days later she was discharged with a hemoglobin of 108 g/L.

The MPHSC reviewed the details of the case in detail, particularly to what transpired following the home delivery. The committee questioned whether prophylactic oxytocin was administered in the home environment and whether there was an appropriate exploration for any perineal or vaginal tears. The records of her home delivery were reviewed and it was evident that the patient did receive prophylactic oxytocin and appropriate initial measures to improve uterine tone were undertaken immediately post-delivery. Given that the tear was quite high in the vagina and difficult to see and that

aggressive PV bleeding was noted 2-3 hours post-delivery, the MPHSC classified this case as non-preventable and unavoidable.

This case was also referred to the College of Midwives of Manitoba for their internal review.

II. B.3

This case was reviewed for massive post-partum hemorrhage following a caesarean section, resulting in two subsequent laparotomies. A 29-year-old G3P0 lady had a smooth pregnancy and presented at 38 weeks gestation in labour. Her labour was augmented in the second stage of labour, but there was failure to progress. It was noted that the baby was presenting as an occiput posterior with deflexed neck and so a caesarian section was done.

Following the caesarean section, postpartum hemorrhage occurred attributed to hypotonia. She was treated with oxytocin, ergometrine, carboprost and even had a Bakri balloon inserted in the uterine cavity. Her vitals became unstable and she was taken back to the operating room for examination under anesthesia. The cervix was explored under direct vision without finding a source of the bleeding. She then underwent a laparotomy, and the uterus was massaged and medications were administered again without effect in controlling uterine hypotonia. It was decided then to have her undergo a subtotal hysterectomy after which her blood loss by then was estimated to be more than 5 liters and she was already transfused more than 8 units of red cells, 1 unit of platelets, and 5 units of plasma. She was then admitted to the intensive care unit for recovery.

In the intensive care unit, she was transfused multiple times but her hemoglobin continued to decline. She was then taken for interventional radiology and the uterine artery was embolized. Bleeding continued and her hemoglobin declined further. She was hence taken to the operating room for the third time and at laparotomy it was noted that there was active bleeding from the cervical stump arising from the cervical branch of the left uterine artery. This was ligated, after which the bleeding stopped. In total, this patient received 13 units of blood, and spent 2 days in the intensive care unit.

The MPHSC reviewed the proceedings of the case and felt that the management of the lady once the hemorrhage was noted was appropriate and timely, although unfortunately she required two laparotomy procedures post-caesarean section to control her bleeding. The case was classified as non-preventable and unavoidable.

II. B.4

This case was reviewed for maternal admission to the ICU with sepsis. A 20-year-old G2P0 lady was transferred to a tertiary centre at 19 weeks gestation with spontaneous rupture of membranes. The patient was counselled at length with options of management. The consequences of the spontaneous rupture of membranes at this early gestational age were discussed with her at length and she was offered termination of pregnancy, versus expectant management. The patient and family chose expectant management. There were no signs of infection at that time; however, no antibiotics were provided and no steroids were administered, given that the gestational age was removed from viability.

An appropriate plan was made for the patient to see an obstetrician in a secondary hospital in a centre closer to the patient's home. Discussion regarding the signs and symptoms to watch for were discussed with the patient and she was given an upcoming appointment.

Following discharge from the tertiary centre, the patient unfortunately did not follow up with her scheduled appointment and presented two weeks later with fever and hypotension. Intrauterine fetal death was diagnosed and the patient was transferred as an emergency to a tertiary centre for dilation and evacuation. The patient required fluid and norepinephrine to support her blood pressure. Antibiotics with vancomycin and pip-tazo were administered. Blood cultures grew E.coli. Following the dilation and the evacuation of the uterine cavity, the patient stayed overnight in the intensive care unit and was discharged well on Day 6.

The committee felt that the evacuation of the uterus at the time of diagnosis of premature rupture of membranes would have prevented the outcome of sepsis; however, this would have meant termination of the pregnancy and expectant management was in keeping with the patient's wishes. The patient had the right to choose expectant management. The committee agreed that neither the steroids nor the antibiotics would have been of benefit in this case as the prognosis was extremely guarded for the baby. The fact that the patient did not attend for a follow up with the new obstetrician in a hospital closer to the patient's home may have been the result of her not receiving her appointment with clarity or there may have been some mitigating factors that may have prevented her from having that visit.

The MPHSC classified this morbidity as non-preventable and unavoidable.

II. B.5

This case was reviewed for admission to the intensive care unit for severe pre-eclampsia, PPH, and placenta accreta. A 35-year-old G9P4 lady who had a previous caesarean section for a breech presenting fetus complicated by a cord prolapse, presented in this index pregnancy at 37 ½ weeks gestation to a rural maternity hospital. At the first encounter, she was thought to be pre-eclamptic, given a blood pressure of 160/85 mmHg, proteinuria with a Protein Creatinine Ratio of 700 and hemoglobin of 74 g/L. The patient was immediately transferred to a tertiary centre in the city.

Upon arrival a fetal assessment was done. It showed an abnormal placentation with increased vascularization and venous lakes at the anterior uterine wall. There was with no evidence of placenta previa. An emergency caesarean section was recommended and this was undertaken the same night.

During the caesarean section and upon entering the abdomen an invasive placenta was diagnosed. There was no site that the operator could enter the uterine cavity without breaching the placenta. Upon entry, massive intraperitoneal blood loss over a short time occurred for an estimated volume of 4 liters. A massive transfusion protocol was initiated. The patient was transfused with six units of packed red blood cells, 5 units of platelets, and 1 liter of fresh frozen plasma. A subtotal hysterectomy was performed. Immediately in the recovery room she became hypotensive with a blood pressure of 60/30 mmHg and a hemoglobin of 39 g/L.

She was then taken back to the operating room at two hours post-caesarean section. No single source of bleeding was identified but there was diffuse oozing from all serosal surfaces. Hemostasis was supported by the use of surface coagulating agents before the abdomen was closed.

At the intensive care unit, she received an additional 4 units of packed red blood cells and one liter of fresh frozen plasma. She required vasopressor support and other blood products. Because of the massive hemorrhagic shock, she sustained acute kidney injury, but she was discharged from the intensive care unit on Day 2 and stayed in the hospital until Day 9, during which her blood pressure was managed with alpha-beta blockers and calcium channel blockers. She had a superficial wound dehiscence that was treated with antibiotics.

The MPHSC felt that with patient not having sought prenatal care until term intensified the complexity of this patient's morbidity; however, it is known that even under ideal management of an invasive placenta, blood product administration and post-operative admission to an intensive care unit is the norm and this is unavoidable. Fibrinogen was administered as a blood product with a massive transfusion protocol in this patient's management. It was felt that fibrinogen may have ameliorated the blood loss. Fibrinogen is usually not provided with the Massive Transfusion Protocol. Anesthesiologists feel strongly that Fibrinogen should be included in the massive transfusion package. Early use may prevent potential disseminated intravascular coagulopathy.

This case was classified as non-preventable and unavoidable for the morbidities encountered. A letter was raised to the Deputy Registrar of the College of Physicians and Surgeons of Manitoba asking that communication with the Canadian Blood Services be undertaken to support the addition of fibrinogen to the massive protocol transfusion packages.

II. Non-Preventable and Unavoidable: C. Perinatal Mortality

II. C.1

This case was reviewed for a neonatal death. A 35-year-old G5P3 lady had gestational diabetes with a baby that had large echogenic kidneys suggestive of autosomal recessive polycystic disease. At 34 weeks gestation, absolute oligohydramnios was noted. She presented to a rural hospital in labour and she underwent a caesarean section for a breech presenting fetus with Apgar scores of 5 and 5 at 1 and 5 minutes.

The newborn was transferred to a tertiary centre and maintained on a jet ventilator with PEEP as there were difficulties in ventilation. Given the polycystic kidneys the baby was in kidney failure so on Day 2 the baby was transferred from the NICU to a pediatric intensive care unit to begin dialysis. An attempt to place a VAS catheter in the right internal jugular vein failed, but on a second attempt, the left internal jugular vein was catheterized. A chest x-ray demonstrated a pneumothorax that was treated with a chest tube.

On the third day of neonatal life, a cut down was performed in the right internal jugular artery and a VAS catheter was placed successfully. On the 4th day of life, the baby suffered thrombocytopenia, leukocytosis, and evidence of myocardial dysfunction. The baby was also diagnosed at that time with pulmonary hypertension, acidosis, systemic hypotension, and bleeding from the jugular line. Neonatal death occurred on Day 6 of life.

While it was evident that the neonatal death was non-preventable given the dismal state of the neonatal kidneys, the MPHSC were concerned regarding the decision to transfer the baby for a shunt placement for hemodialysis while the baby was already on ventilatory support at the NICU. At the time of transfer to the Pediatric Intensive Care Unit (PICU), the baby had normal potassium, sodium and creatinine.

This case exemplifies the difficulty arising in managing a baby in the NICU with respiratory issues when the baby also needs services from the PICU, in this case for dialysis. The MPHSC felt that the PICU may not have been the ideal place to sustain respiratory support of a newborn during dialysis.

This case was raised to the neonatal and pediatric team for further discussion to streamline the care for such babies who need essential services at two different sites.

This neonatal death was classified as non-preventable and unavoidable.

II. C.2

This case was reviewed for a neonatal death. A 21-year-old G1P0 lady presented with bleeding and contractions at 26 weeks gestation. At 22 weeks gestation, the fetus was found to have scalp edema borderline ventriculomegaly, and cystic hygroma, with a plural effusion. Workup for viral serology were all negative. Subsequently the baby developed ascites. Results of DNA testing for Turner syndrome were unavailable. She was admitted to one of the tertiary centres where over a span of 1

week, the bleeding and contractions had settled. The cervix was at 2 centimeters dilated 80% effaced. She received betamethasone and magnesium sulphate when there was a real concern about her delivering.

At 27 ½ weeks gestation she had a spontaneous rupture of membranes and delivered vaginally of a baby that had no tone nor respiratory effort. The baby was intubated and had cardiac resuscitation. The fetal heart rate recovered for a very brief time and then it was lost. The patient had received full counselling on the very guarded prognosis at 22 weeks gestation. At 26 weeks gestation when she had the episode of preterm birth and bleeding, the patient wished to have a full resuscitation performed and without resorting to a caesarean section.

The MPHSC felt that this neonatal death was non-preventable and unavoidable.

II. C.3

This case was reviewed for a stillbirth. A 35-year-old G7P5 with adequate prenatal care. She had a history of depression and epilepsy but was not on any medications. On prenatal workup, she was discovered to have anti-Kell antibodies secondary to a past transfusion for postpartum hemorrhage. Fetal scans did not show any evidence of hydrops and no abnormalities were seen. The anti-Kell antibody levels were followed up regularly with no evidence of a rise. She did show up for a 3rd trimester fetal scan. She presented at 38 weeks gestation with a stillbirth. The stillborn had no evidence of hydrops. Autopsy was declined.

The baby was a female weighing 3 kilograms. A full stillbirth workup was carried out which showed no evidence of a fetomaternal hemorrhage and the serology testing was negative. Diabetic workup was negative.

The MPHSC was felt that this stillbirth was non-preventable and unavoidable.

II. C.4

This case was reviewed for a neonatal death due to prematurity. A 28-year-old G6P3 lady with three previous term deliveries had spontaneous rupture of membranes at 23 ½ weeks gestation. She was transferred for a Northern community to a tertiary centre. She wished to have a full intervention and resuscitation of her newborn if delivered early. She also wished to have the caesarean section if and when this was needed although she was counseled that the prognosis was very guarded.

She was started on ampicillin and erythromycin. The baby proved to be a breech presenting fetus and a few days after admission, the mother started to be febrile and chorioamnionitis was diagnosed. She underwent a caesarean section and the baby was immediately attended by the neonatal team. Full resuscitation occurred and the baby lived for two months during which the baby suffered recurrent episodes of septicemia and ultimately died of complications of prematurity.

Review by the MPHSC confirmed that this neonatal death secondary to early preterm rupture of membranes was non-preventable and unavoidable.

II. C.5

This case was reviewed for a stillbirth associated with maternal diabetic ketoacidosis. A 28-year-old G1P0 lady was at 33 weeks gestation when she presented to a peripheral hospital with nausea and vomiting and was transferred to a tertiary centre. She was known to be a type I diabetic under the care of both an obstetrician and an endocrinologist. The level of compliance was described as very good by her endocrinologist. Her hemoglobin A1C was 7.6% and her regular sugars on insulin showed good glycemic control.

During the transfer to the tertiary centre her membranes ruptured. On arrival the fetal heart rate could not be auscultated. Diabetic ketoacidosis was confirmed with elevated betahydroxybutyrate and elevated serum glucose levels. The labour was induced and during the induction, her blood pressure increased with evidence of proteinuria and elevated transaminases. She was started on magnesium sulphate and given antihypertensive agents. The baby was a breech presenting baby, so she pushed for three hours in the second stage and ultimately had a caesarean section. Stillbirth workup was negative.

The MPHSC felt there was no grounds for criticism for the care she received by her obstetrician, endocrinologist, or hospital staff. This case was classified as non-preventable and unavoidable.

II. C.6

This case was reviewed for a stillbirth in a post-date pregnancy. A 25-year-old primigravida lady had a smooth pregnancy with no evidence of hypertension, growth restriction or any viral infection. She was a smoker. She presented at 41 weeks and 1-day gestational age with decreased fetal movements and fetal demise was confirmed.

She had an appointment to have a fetal assessment just two days after the fetal death was confirmed. The baby weighed 3,364 grams. The placenta was quite small at 270 grams and on pathology it proved to be a circumvallate placenta. The rest of the stillbirth workup proved to be negative. The autopsy was declined.

The MPHSC felt that this stillbirth was non-preventable and unavoidable. It was most unfortunate that the stillbirth occurred just a couple of days before she was to have a fetal assessment.

II. C.7

This case was reviewed for a neonatal death. A 23-year-old G4P3 lady had a smooth pregnancy and a normal vaginal delivery of a live baby with Apgar scores of 9 and 9 at 1 and 5 minutes. The baby weighed 3,625 grams. At three weeks of age, this baby was noted by the parents in the morning to be cyanotic, cool, and limp. The mother immediately called her midwife, her parents, and 911. The baby was rushed to the hospital where resuscitation was not successful. Melena was noted on the diaper of the baby.

Upon further interview of the parents, this baby was woken up at 5:00 a.m. for feeding but then he was taken into the parental bed and slept between his parents. The father went to work at 8:30 a.m. and the mother continued sleeping. It was after that time that she woke up and she noted the baby to have no signs of life. The baby had a cough three days earlier. The autopsy of the baby showed no congenital anomalies, there was no evidence of injuries nor skeletal trauma, but the small and large bowels were infarcted with blood in the intestines. Toxicology screen was negative.

The MPHSC classified this neonatal death as non-preventable and unavoidable. The Child Health Standards Committee of the College also reviewed this case and was concerned regarding co-sleeping.

II. C.8

This case was reviewed for a stillbirth secondary to abruption. A 31-year-old G7P3 was at 33 weeks gestation when she presented with severe abdominal pain and absence of fetal movements. An ultrasound revealed a fetal demise with a large retroplacental clot. Her labour was induced with misoprostol. Her hemoglobin dropped to 67 g/L and she had to be transfused for two units of packed cells. Her Kleihauer-Betke testing was negative.

A full review of her prenatal sheet and course failed to reveal any predisposing factors for abruption. There was no history of trauma, no substance abuse, no hypertension and fetal growth was adequate. She was hypothyroid but was on replacement therapy under the care of an endocrinologist. She did show evidence of Raynaud's phenomenon in her extremities. The baby weighed 2,386 grams, which is appropriate for 33 weeks. The placental weight was 272 grams.

The MPSHC classified this stillbirth as non-preventable and unavoidable.

II. C.9

This case was reviewed for a stillbirth. The conception was possible through an assisted reproductive technology in out-of-country to a 37-year-old G3P0 lady. She had early prenatal care outside the country and came to Canada at around 25 weeks gestation, following which she had four recorded prenatal visits. At 40 weeks gestation she presented to triage with decreased fetal movement. She was having contractions that morning; however, a fetal heart rate could not be detected. She was induced with misoprostol and delivered a stillborn fetus at 2,785 grams. The placenta weighed 262 grams (i.e. at less than the 3rd percentile for gestational age).

At birth, a true knot of the cord was noted. The autopsy showed evidence of intrauterine fetal death having occurred 5 days prior to delivery. There was evidence of meconium aspiration, marked internal organ autolysis, and hypoxic ischemic brain damage. The placenta revealed focal placental infarctions and mild chorioamnionitis.

Clinically there were no indications of fetal compromise or growth restriction prior to the death. Obstetrical care was felt to be appropriate. There were also no indications to have her undergo an elective delivery prior to 40 weeks gestation. This stillbirth was most unfortunate.

The MPHSC classified this stillbirth event as non-preventable and unavoidable.

II. C.10

This case was reviewed for a stillbirth associated with severe placental insufficiency. A 22-year-old G1P0 was at 32 weeks gestation when she presented with decreased fetal movements and fetal demise. On scanning, the baby appeared to be more in keeping with a 25-27 weeks size. Oligohydramnios was confirmed. Pleural and pericardial effusions were noted. She was induced with misoprostol.

At birth the baby was 1,184 grams with definite evidence of growth restriction. The autopsy showed a hydropic fetus with pleural and pericardial effusions. The placental weight was 196 grams consistent with being less than the 3rd percentile for gestational age. The placenta showed evidence of extensive infarcts on microscopy.

The prenatal care of this patient was reviewed. The mother was obese with a BMI of 38 and measurements of the height of fundus appeared to be appropriate for gestational age. At 31 weeks she measured 31 centimeters; however, due to maternal habitus, the growth restriction was missed.

The MPHSC debated the classification on this case. Had this patient undergone a fetal assessment screening in the early 3rd trimester, intrauterine growth restriction would have been picked up. Unfortunately, because of the body habitus, that diagnosis was clinically missed.

Health care workers are reminded that clinical assessments of fetal growth tend to be unreliable in morbid obesity. Health care workers should consider obtaining a 3rd trimester ultrasound to confirm adequate growth in patients with a high BMI. A newsletter item was published on this issue in the August 2019 College newsletter. Given that this was a 2016 case (i.e. before the College recommendations), this stillbirth was classified as non-preventable and unavoidable.

II. C.11

This case was reviewed for a stillbirth. A 35-year-old G2P1 lady was at 40 weeks and 6 days gestation when she presented twice in early labour. On the two occasions the labour was not active and so she was sent home. The fetal heart rate tracing was completely normal at that time. She attended a routine visit two days later and no fetal heart tones could be heard. Fetal demise was confirmed.

This lady had a previous caesarean section in India at 37 weeks gestation for unknown reasons. Following confirmation of the demise, her labour was induced with a oxytocin and the use of a cervical Foley catheter. The baby was 3,017 grams. There was a nuchal cord. The autopsy grew enterococcus faecalis in the cardiac blood. The placental pathology showed acute chorioamnionitis and funisitis. The cause of death appeared to have been fetal sepsis. She did not have any clinically recognized rupture of membranes.

The MPHSC did not find fault in her management. She was not in active labour when she was sent home and there was no need for intervention given there were no clinical signs of concern at the

time she presented. This case is certainly unfortunate. The stillbirth was felt to be non-preventable and unavoidable.

II. Non-Preventable and Unavoidable: D. Perinatal Morbidity

II. D.1

This case was reviewed for uterine rupture resulting in low Apgar scores and admission of newborn to the NICU. A 30-year-old G2P1 lady with a previous caesarean section for a breech had a smooth pregnancy and presented at 39 weeks gestation in active labour. During her pregnancy she was counseled at length with regards to undergoing a trial of labour versus having an elective repeat caesarean section. She was deemed to be an excellent candidate for a trial of labour; however, the mother was undecided. She was initially booked for a repeat caesarean section but changed her mind 4 days before, wishing to undergo a trial of labour; however, once again she decided to proceed with an elective caesarean section. She then presented with rupture of membranes and contractions the night prior to her elective caesarean section. It was at that time that she decided to continue with a trial of labour.

She progressed well and at 5 cm dilation her contractions were spaced out every 5-7 minutes. A gentle augmentation with oxytocin was carried out to a level of no more than 4 milliunits per minute. She progressed very appropriately to full dilatation over a span of 2-3 hours. The baby was noted to be occiput posterior at station +1 at which time she began pushing. Twenty minutes into the pushing phase an acute fetal bradycardia occurred. This was recognized immediately and she was rushed to the case room where, under general anesthetic, the baby was born 15 minutes after the onset of the bradycardia. At surgery, uterine rupture was noted, and the baby was extruded up to the level of the shoulders associated with a small placental abruption.

The baby was flat at birth with Apgar scores of 1, 3 and 6 at 1, 5 and 10 minutes and was attended to by the neonatal team. The uterine arterial cord pH was 6.8 and the base excess was -24. The baby responded quickly to resuscitation and was placed on the cooling protocol. The baby was discharged home on day 6. The MRI of the head was normal and the baby did not demonstrate any seizures.

MPHSC members were satisfied with the care of this case and were impressed with the rapid response to the bradycardia. The oxytocin never exceeded 4 mu/min and no hyperstimulation was demonstrated. Uterine rupture is a calculated known risk associated with Trial of Labour.

This case was classified as non-preventable and unavoidable.

II. D.2

This case was reviewed for neonatal seizures. A 17-year-old G1P0 lady was at 36 weeks gestation when it was decided to have her induced. She had gestational diabetes treated with insulin; however, compliance with blood sugar control was poor. The baby was over the 90th percentile for gestational age and there was polyhydramnios as of 31 weeks gestation.

On admission for induction, it was noted that the fetal heart rate was atypical. No accelerations were seen. She was started on oxytocin which did not put the patient in labour. Prostin was then used which got her to 3 cm of dilation. She was then restarted on oxytocin, but the fetal heart rate tracing became progressively flat again with no accelerations. It was decided to proceed with a caesarean section. At the caesarean the extraction of the baby was difficult, and it took 7 minutes to deliver the baby. Forceps had to be used and there was shoulder dystocia at the lower segment incision.

The Apgar scores of the baby were 2 and 7 at 1 and 5 minutes and the birth weight was 4,290 grams. The umbilical arterial pH was 7.19 and the base excess was -8. The baby required positive pressure ventilation for 4 minutes and was then admitted to the NICU for blood sugar control. The baby suffered jaundice and had to be placed on phototherapy. On Day 5, the baby had a seizure and a brain MRI showed frontal lobe infarcts consistent with hypoxic ischemic injury. The pediatric neurologist felt that the infarcts likely predated labour and induction.

The MPHSC felt that the care in this case was appropriate. It is unfortunate that patient's non-compliance with diabetic control may have contributed to the CNS injury prior to labour. This case was classified as non-preventable and unavoidable.

II. D.3

This case was reviewed for both neonatal seizures and maternal seizures. A 29-year-old primigravida lady had a smooth pregnancy and presented in spontaneous labour at 40 weeks gestation. She was augmented with oxytocin and she became fully dilated after 24 hours of labour. In labour she was noted to have mild hypertension which was treated with oral labetalol. She had a prolonged second stage of labour because of an occiput posterior presenting fetus. She eventually had an assisted vaginal delivery with a vacuum. The obstetrician applied four pulls with two popoffs. The baby was delivered as occiput posterior with Apgar scores of 5, 7 and 8 at 1, 5 and 10 minutes. The arterial cord pH was 7.19; however, the baby was also noted to have right occipital hemorrhage. The mother sustained a 4th degree tear. While this was being repaired in the case room she had a seizure. This was thought to be an eclamptic seizure. Workup showed elevated liver enzymes, but there was no proteinuria. She was given magnesium sulfate, recovered and went home on labetalol on Day 5 postpartum.

The baby did well and went for observation; however, at 8 hours of age, the baby sustained a seizure and was readmitted to the neonatal intensive care unit. A second seizure occurred in the NICU. Neurology was consulted. The baby was treated with phenobarbital. A brain MRI showed right occipital hemorrhage and right cerebral hemorrhage and the phenobarbital was stopped. The baby recovered well and went to the ward on Day 4. Follow up arrangements were made for the baby at 6, 13, and 18 months. The follow up documented that the baby was normal with no neurologic deficits.

The MPHSC felt that this was a difficult delivery given a prolonged second stage of labour and given the nature of the vertex position. Given that the fetal heart rate tracing during the second stage was normal, the outcome would probably have been the same even with a shorter second stage. MPHSC members felt that it would have been more appropriate to use forceps rather than a vacuum, which may have averted the problem of a right occipital hemorrhage, but many physicians in this specialty are more comfortable using a vacuum than forceps. This case was classified as non-preventable and unavoidable.

II. D.4

This case was reviewed for a fractured clavicle and left-sided Erb's palsy. A 24-year-old G2P1 lady had gestational hypertension that was treated with labetalol. She was admitted at term for induction of labour. The baby was felt to be macrosomic. She had a negative 50-gram glucose challenge test, but her previous baby was born at 8 lbs. 8 oz. Her induction took place over three days, and then finally got to full dilation. The baby's head delivered easily, but shoulder dystocia occurred. The usual standard procedures to deliver the baby were done, including the McRobert's maneuver and supra pubic pressure.

At the birth of this baby, there was a possible fracture of the left clavicle and the left upper limb was limp. The baby weighed 4,695 grams and had Apgar scores of 6 and 8 at 1 and 5 minutes and the arterial cord pH was 7.26.

It was realized by the committee that the obstetrician who delivered this lady was not the primary obstetrician for this patient and did not have a copy of the ultrasound scans which were done in another province which suggested a large for gestational age baby. MPHSC members suggested that even if the ultrasound showed and confirmed macrosomia, there are no Canadian recommendations to perform an elective caesarean section for macrosomia, particularly in a multigravida in the absence of diabetes. Shoulder dystocia remains an unpredictable event. The MPHSC reviewed the proceedings of the delivery and felt that the appropriate steps were taken to deliver this baby in a systematic manner.

This neonatal morbidity was classified as non-preventable and unavoidable.

II. D.5

This case was reviewed for a brachial plexus injury. A primigravida was at 42 weeks gestation when she was induced. A vacuum delivery was used for second stage dystocia. The obstetrician faced a moderate degree of shoulder dystocia and finally the baby was delivered with Apgar scores of 8 and 9; however, there was evidence of right brachial plexus injury with decreased right arm movement. There was some improvement of the function of the right arm at 6 months of life.

The MPHSC reviewed the records and noted that there was no description of the maneuvers used, and the documentation was poor, particularly with regards to the maneuvers used. The MPHSC classified this neonatal injury as non-preventable and unavoidable but with error in documentation not affecting outcome.

II. D.6

This case was reviewed for low Apgar scores. A 33-year-old lady, G4P3 with two previous caesarean sections presented with preterm labour at 34 weeks gestation in a remote area of a neighboring province. The mother was then transferred to a tertiary centre in Winnipeg and preterm labour was confirmed so a repeat caesarean section was carried out. The caesarean section was very

difficult as the uterus was plastered against the anterior abdominal wall. A classical caesarean section had to be done. On entry of the uterine cavity, the placenta was anterior and had to be removed before the baby was delivered.

After delivering the placenta it took around 5 minutes to deliver the head of the baby. At delivery, the baby appeared to be pale, flat and had Apgar scores of 1, 1 and 3 at 1, 5 and 10 minutes. The cord arterial pH was 7.1 and the baby weighed 2,640 grams. The neonatal team in attendance were informed that the baby was delivered after the placenta was removed from the uterine wall. The neonatal team provided this baby with positive pressure ventilation and was intubated. It took approximately 28 minutes before the baby received a blood transfusion and/or any volume replacement. Ultimately the baby did well.

There were some concerns that it took nearly half-an-hour before any volume replacement was given to this baby, particularly that there must have been some significant fetal blood loss given the delivery of the placenta prior to the delivery of the baby; however, MPHSC members felt that there was no need for a rushed transfusion given that the baby's heart rate was pulsing at a normal rate for the first half-hour of life. Review of the records also indicated that the baby indeed did receive a volume expansion with normal saline to sustain normal vital signs. The MPHSC concluded that the resuscitation of this newborn was appropriate. This neonatal depression was classified as non-preventable and unavoidable.

II. D.7

This case was reviewed for neonatal seizures and meconium aspiration. A 31-year-old G5P4 was admitted at 40 weeks gestation following 18 hours of premature rupture of membranes. At 24 hours of ruptured membranes, the patient sustained a fever and antibiotics were initiated. Oxytocin was initiated at 33 hours post rupture of membranes. Vaginal delivery occurred 3 hours later and the baby weighed 4,430 grams with Apgar scores of 4 and 6 at 1 and 5 minutes with an arterial venous pH of 7.39 and a lactate of 2.7. The baby had respiratory stridor with evidence of pulmonary hypertension and was placed on a jet ventilator for 48 hours. At 7 ½ hours of age, the baby was thought to have tonic clonic seizures and the SPO2 showed desaturation. An MRI done on Day 3 showed tiny cerebral infarcts but the baby's neurological condition was normal.

Upon review of the proceedings in the intrapartum and neonatal management, the MPHSC felt that neonatal seizures and meconium aspiration were not preventable nor avoidable.

II. D.8

This case was reviewed for neonatal pneumothorax and admission to the NICU. A 31-year-old primigravida presented at 39 weeks gestation with spontaneous rupture of membranes. There was a delay in her induction due to staffing resources. She declined to be transferred to a tertiary centre so she was induced in the rural setting with prostaglandin which effectively put her in labour. She got to full dilation in 7 hours and she had a prolonged second stage of labour of 4 hours. At birth, a cord around the neck twice was noted. It appeared that the baby stayed at the perineum for some time

before delivery, but there was poor documentation as to the duration of the fetal head being at the perineum and poor documentation of the status of the fetal heart rate during the late second stage of labour.

The baby's Apgar scores were 2, 7 and 9 at 1, 5 and 10 minutes. The umbilical arterial cord pH was 7.21 with a lactate at 3.4. The baby was resuscitated with positive ventilation pressures and the oxygen saturation picked up to more than 90%. The baby was subsequently noted to be tachypneic and chest x-ray showed bilateral pneumothoraces.

The MPHSC felt that this outcome was probably non-preventable and unavoidable. Proceeding with induction after 24 hours of SPROM was acceptable given that group B streptococcus colonization status was negative. Fetal heart monitoring tracing appeared normal throughout labour except in the late 2nd stage of labour. The committee members felt that the pneumothorax may have occurred spontaneously and may not have been necessarily the result of positive pressure ventilation efforts; however, MPHSC members did find that documentation was somewhat lacking. A letter was sent to the hospital standards committee to address the issues of documentation with the physician involved. This outcome was classified as non-preventable and unavoidable.

II. D.9

This case was reviewed for low Apgar scores and hypoxic ischemic encephalopathy. A 31-year-old G3P2 lady was at 38 weeks gestation when she presented in spontaneous labour after a smooth pregnancy. At the time of her presentation the cervix was 3 centimeters dilated and the fetal heart tracing was abnormal from the start. The baseline fetal heart rate was 170 bpm associated with late decelerations. The patient was advised that she would need a caesarean section but it was declined and she wished to proceed with having a vaginal birth. With her refusal of a caesarean section, further urgent discussion took place between the attending physician and the patient. A plan was put in place to allow her to labour for a short time, given that she had delivered twice vaginally before, but if delivery did not occur, she will proceed with a caesarean section. Unfortunately, she did not progress quickly, and hence she underwent a caesarean section.

At the time of delivery, the umbilical arterial pH was 7.34 and the Apgar scores were 1, 4 and 7 at 1, 5 and 10 minutes. The baby was soon realized to have profoundly neurologic impairments and neonatal seizures occurred. Cortical blindness was confirmed, and an MRI done on the day of birth showed evidence of CNS injury.

Given that the baby was born with a good acid base status, and given that the MRI showed neurology physical damage on Day 1 of life, it was felt by both the neurologist as well as the obstetrician that this hypoxic ischemic encephalopathy must have occurred prior to the onset labour.

This case was classified as non-preventable and unavoidable.

II. D.10

This case was reviewed for birth trauma and a humeral fracture. A 38-year-old G2P0 was at 40 weeks gestation when she presented in spontaneous labour. She was augmented in labour by oxytocin and by artificial rupture of membranes. The second stage was quite prolonged at 3 ½ hours after which assisted vaginal delivery was carried out with forceps. The baby was delivered through two pulls from the lower pelvis; however, this was followed by a 1-minute shoulder dystocia event which was managed with McRoberts's and suprapubic pressure, but these maneuvers failed to deliver the baby. It was very difficult to proceed with a Wood's maneuver so the posterior arm on delivery was resorted to and this led to a fracture of the left humerus.

The Apgar scores were 3 and 8 at 1 and 5 minutes. The baby weighed 3,864 grams and the arterial cord pH was 7.17. The baby was briefly admitted to the observation unit but was back with the mother at 3 hours of age.

The MPHSC felt that the usual maneuvers were employed when the shoulder dystocia occurred. Having to resort to delivery of the posterior arm as a last resort was appropriate. The fracture of the humerus obviously occurred as a result of the attempt of delivery of the posterior arm management was not faulted. This case was classified as non-preventable and unavoidable.

II. D.11

This case was reviewed because of low Apgar scores. A 31-year-old G1P0 lady presented at 38 weeks gestation for an induction of labour for gestational diabetes for treated with insulin and for gestational hypertension treated with labetalol. Induction was started with prostaglandin and then augmented with oxytocin. She progressed quite quickly. In the second stage of labour she was noted to have very deep variable decelerations, but the second stage lasted only 15 minutes. The baby's Apgar scores were 4, 5 and 8 at 1, 5 and 10 minutes with an arterial cord pH of 7.0 and a base excess of -15 and a CO₂ of 84 mmHg.

A review of the fetal heart rate tracing in the first stage of labour showed it to be normal. On the second stage of labour, severe variable decelerations occurred. Given that this lady delivered within 15 minutes, this delivery had occurred much faster than if a caesarean section would have been performed.

The MPHSC classified this morbidity as non-preventable and unavoidable.

III. Unknown/Unclassifiable:

III. E.1

This case was reviewed for maternal admission to the intensive care unit. A 19-year-old G1P0 presented at 23 weeks gestation with no prenatal care to that point. She was brought to the emergency room with decreased level of consciousness that was acute in onset. The patient had a history of seizures with the last documented seizure a year prior to this presentation; however she was not compliant with her antiepileptic medications with the last dosage being taken more than three years prior to the current event. The patient was a victim of assault several days prior to admission.

Upon arrival to the emergency room, she was intubated, neurology was consulted and an EEG was performed that showed normal results. The cause of decreased level of consciousness was unspecified. This lady was noted to have vesicles on her back and a lumbar puncture was performed. Results were negative for herpes and acute varicella-zoster virus. It was decided to continue to treat this lady with acyclovir as this was already initiated despite the negative cerebrospinal fluid results. The patient was discharged from the Intensive Care Unit within 24 hours and was subsequently discharged on an anti-epileptic medication.

The preventability of the maternal morbidity necessitating admission to the intensive care unit remains unknown. Hence this case was labelled unclassifiable; however, the patient's failure to engage with the medical system for prenatal care may have had some impact on preventability, but the degree of preventability remains uncertain.

III. E.2

This case was reviewed for meconium aspiration and acidosis. A 39-year-old lady G4P1 with a previous 20-week fetal demise presented at 39 gestation with spontaneous labour. Fetal monitoring was carried out by intermittent auscultation. At 7-8 centimeters dilation an artificial rupture of membranes performed and thick meconium was encountered. Continuous EFM was then started at that time. This lady had a vaginal delivery but there was severe shoulder dystocia that was resolved after 2 ½ minutes.

The baby's Apgar scores were 1, 6 and 6 at 1, 5 and 10 minutes. The umbilical arterial pH was 7.0 with a base excess of -19. The birth weight was heavy at 4,810 grams. The baby was intubated for meconium below the cords and was admitted to the intensive care unit then received CPAP support for 14 days. The baby was eventually sent home on Day 18.

The MPHSC was unable to review the fetal heart rate tracings of this fetus as they could not be found by the care centre, thus we could not identify whether there were intrapartum causes for this severe acidosis. The level of metabolic acidosis cannot be explained by the 2 ½ minute shoulder dystocia. Without the fetal heart rate tracings to review, it was difficult to identify whether there was error in management or the outcome was non-preventable.

III. E.3

This case was reviewed for a neonatal fracture of the humerus. A 32-year-old G2P1 lady was at 40 weeks gestation when she presented in spontaneous labour. She had a smooth pregnancy.

At birth, shoulder dystocia was evident and was resolved within less than 3 seconds. The baby was delivered by a posterior auxiliary traction. The birth weight of the baby was 4,228 grams with Apgar scores of 9 and 9 at 1 and 5 minutes. The arterial cord pH was 7.18. X-rays of the humerus showed a mid-shaft fracture of the humerus. The clavicle was intact. This baby also suffered a brachial plexus injury on the same side as the fracture of the humerus. This brachial plexus palsy resolved at the time of discharge.

The MPHSC discussed the management of this case and it was felt by some members that the posterior auxiliary traction was utilized rather early in the cascade of events for the management of shoulder dystocia, bypassing the usual McRoberts procedure, suprapubic pressure or the Wood's maneuver. Obviously, while delivering the posterior shoulder pressure must have been applied to the mid-shaft of the humerus rather than the axilla and/or elbow of the fetus.

Other members of the committee felt that even with a fracture of the humerus brachial plexus palsy typically results from pivoting of the neck rather from the fracture itself.

The MPHSC were unable to agree on whether this humeral fracture and the associated brachial plexus at the site of the fracture would have been preventable or unavoidable. The management of this case was felt to be unclassifiable.

Statistical Summary

A total of 17,408 births occurred in Manitoba in 2016 with the MPHSC reviewing 387 cases. The following tables represent the cases reviewed by the MPHSC that occurred in 2016.

Many causes of stillbirths are interrelated or cross associated. For example, one of the abruptio stillbirths occurred in context of uterine rupture. Some placenta abruptio cases involved placental insufficiency. Nearly one third of stillbirths occur without identified causes.

Causes of Stillbirth of Cases Reviewed

Cause	Total
Anomalies (Genetic, Congenital)	12
Antepartum Placental Insufficiency / Hypoxia-Acidosis +/- IUGR	9
Intrapartum Acidosis with Asphyxia	1
Cord Accident (prolapse knot stricture)	9
Abruptio	8
Premature Rupture of Membranes / Chorioamnionitis	8
Bacterial Infection (e.g. bacteroides)	1
Diabetes Mellitus / DkA	2
Fetal Hemorrhage (e.g. vasa previa)	2
Prematurity Complications	1
Trauma	1
Unknown	25
Other (Thyrotoxicosis)	1
Twin-to-Twin Transfusion	0
Cholestasis	0
Viral Infection (e.g. parvo virus)	0
Severe Hypertension Disorder (eclampsia)	0

Source: MPHSC Database

Causes of Neonatal Mortality of Cases Reviewed

Many of the causes of neonatal mortalities are interrelated or cross associated. For example, some of neonatal mortalities are due to extreme prematurity were associated with intraventricular hemorrhage (IVH). Any case with multiple associated complications is listed only once in the table below.

Cause	Total
Extreme Prematurity Complications	21
Congenital Anomalies (without documented genetic anomaly)	16
Genetic Anomalies (with or without congenital anomalies)	3
Perinatal Hypoxia / Acidosis / Asphyxia / Abruption / Cord Prolapse	3
Necrotizing Enterocolitis*	2
Intraventricular Hemorrhage**	1
Prematurity with RDS, HMD, Respiratory Collapse / Pneumothorax	7
Pulmonary Hypoplasia / Oligohydramnios	4
Sudden Infant Death Syndrome	1
Prematurity with Sepsis / Septic Shock	5
Trauma	0
Smothering of Newborn	0
Cardiomyopathy	0
Pulmonary Hypertension	3
Meconium Ileus with Perforation	0
Hydrops (associated with prematurity)	1
Viral Infection (CMV)	1
Unexplained	0

Source: MPHSC Database

*One case was associated with pulmonary hypertension.

**Associated with RDS.

More than 90% of Neonatal Mortalities were associated with prematurity and its complications (Secondary to sepsis, respiratory distress syndrome, necrotizing enterocolitis, intraventricular hemorrhage, pneumothorax, pulmonary hypoplasia, pulmonary hypertension).

Cases of Neonatal Morbidity Reviewed

The following table represents neonatal morbidity cases that were reviewed by the MPHSC that occurred in 2016.

Neonatal Morbidity	Total
Acidosis / Low 5 Minute Apgar Score	73
Encephalopathy / Seizures / IVH	18
Meconium Aspiration / Persistent Pulmonary Hypertension of Neonate / Pneumonia / Pneumothorax	17
Respiratory Distress Syndrome	18
Transient Tachypnea of the Newborn	12
Trauma:	
Humeral Fracture	9
Clavicle Fracture	8
Femoral Fracture	0
Cephalohematoma / Facial Injury / Lacerations	8
Erb's Palsy / Brachial Plexus Injury	4
Abnormalities / Genetic Disorders*	30
Hypoglycemia / Hyperglycemia / Hyperbilirubinemia / Hypercalcemia	5
ABO Incompatibility / Rh Disease / Hydrops / Fetal Maternal Hemorrhage	0
Sepsis (GBS, Syphilis)	2
Dehydration	0
Bradycardia / Cardiac Arrhythmia	1
Substance Withdrawal	0
Bowl Perforation / Megacolon	2
Other (includes IUGR, Prolonged NICU Stay)	2

Source: MPHSC Database

*Abnormalities included: Cardiac anomalies such as Tetralogy of Fallot, transposition of the great vessels, WPW cardiac rhythm abnormality, polycystic kidneys, gastroschisis, diaphragmatic hernia, bowel malrotation, bowel perforation due to megacolon, laryngomalacia, meningomyelocele, DiGeorge syndrome, Trisomy 21.

Cases of Maternal Morbidity Reviewed

The following table represents categories of the maternal morbidity cases that were reviewed by the MPHSC that occurred in 2016.

Maternal Morbidity	Total
Hemorrhage – Hemorrhagic Shock with ICU Admission	10
Peripartum Hysterectomy / Uterine Rupture	4
Hypertension Related Morbidity	
Eclampsia	2
Severe Gestational Hypertension / HELLP / Severe Pre-eclampsia	4
CVA / Stroke	1
Epilepsy	1
Thrombotic Morbidity	0
Organ Injury at Caesarean Section, Fistulae	1
Embolism	0
Cardiac Arrest	0
Pulmonary Edema / Dyspnea / Intubation	0
Infectious Morbidity / Sepsis / Septic Shock*	4
Necrotizing Fasciitis	0

Source: MPHSC Database

*One case of retained sponge after a caesarean section.

Total Deliveries and Caesarean Sections in Manitoba

The following tables represent the number of total deliveries and caesarean sections in Manitoba by RHA of hospital for 2013 to 2016.

2013				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Prairie Mountain				
Assiniboine Brandon Parkland	2,049	579	326	253
Interlake- Eastern				
Interlake North Eastman	258	40	31	9
Northern				
Burntwood NOR-MAN	1,305	234	134	100
Southern				
Central South Eastman	1,727	299	156	143
Winnipeg	11,167	2,416	1,390	1,026
Manitoba	16,506	3,568 (21.6%)	2,037 (12.3%)	1,531 (9.3%)

Source: Discharge Abstract Database

2014				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Prairie Mountain				
Assiniboine Brandon Parkland	2,095	645	337	308
Interlake- Eastern				
Interlake North Eastman	316	80	58	22
Northern				
Burntwood NOR-MAN	1,328	224	135	89
Southern				
Central South Eastman	1,819	334	118	146
Winnipeg	10,941	2,372	1,376	996
Manitoba	16,499	3,655 (22.1%)	2,094 (12.7%)	1,561 (9.4%)

Source: Discharge Abstract Database

2015				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Prairie Mountain				
Assiniboine Brandon Parkland	2,032	579	267	312
Interlake- Eastern				
Interlake North Eastman	301	75	50	25
Northern				
Burntwood NOR-MAN	1,340	221	128	93
Southern				
Central South Eastman	1,831	365	202	163
Winnipeg	11,153	2,564	1,494	1,070
Manitoba	16,657	3,804 (22.8%)	2,141 (12.9%)	1,663 (10.0%)

Source: Discharge Abstract Database

2016				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Prairie Mountain				
Assiniboine Brandon Parkland	2,125	623	335	288
Interlake- Eastern				
Interlake North Eastman	199	31	15	16
Northern				
Burntwood NOR-MAN	1,350	206	117	89
Southern				
Central South Eastman	1,796	363	193	170
Winnipeg	11,334	2,651	1,546	1,105
Manitoba	16,804	3,874 (23.1%)	2,206 (13.1%)	1,668 (7.0%)

Source: Discharge Abstract Database

Appendix

HOSPITAL PERINATAL REVIEW DATA SHEET

<p>Perinatal Mortality (≥ 500 grams):</p> <p>___ stillbirth and check one box below:</p> <p><input type="checkbox"/> antenatal <input type="checkbox"/> intrapartum <input type="checkbox"/> unknown</p> <p>___ neonatal death under 29 days of age ___ Age at death (in days; "0" if less than 24 hours)</p> <p>Perinatal Morbidity (≥ 1000grams) check all that apply:</p> <p>___ Five minutes Apgar score ≤ 5 ___ Seizures ___ Meconium aspiration with low Apgars (≤7) ___ Significant birth trauma (specify) _____ ___ Baby transfer to ICU (reason if not listed above) _____ except for the following: - For observation when no observation unit is available - TTN - Congenital Anomalies (if certain only reason for admission) - Hypoglycemia - Psychosocial</p> <p>___ Other (specify) _____</p>	<p>Maternal Mortality: ___ Direct Obstetric ___ Indirect Obstetric ___ Non-obstetric</p> <p>Maternal Morbidity:</p> <p>___ Uterine rupture ___ Caesarean or peripartum hysterectomy ___ Fistula involving the female genital tract ___ Admit to Intensive Care Unit (specify) _____ ___ Thrombo-embolic ___ Eclampsia ___ Other (specify) _____</p>
---	---

<p>Mother's Name: _____</p> <p>Mother's Hospital #: _____</p> <p>Mother's Birth Date (dd/mm/yyyy): _____</p> <p>Mother's Age (at time of birth): _____</p> <p>Gravida: _____ Para: _____</p> <p>BMI: _____</p> <p>Mother's Residence: _____</p> <p>Gestational Age (on admission to hospital): _____</p> <p>Gestational Age (at birth): _____</p> <p>Baby's Name: _____</p> <p>Baby's Hospital #: _____</p> <p>Sex of Baby: ___ Male ___ Female</p> <p>Baby's Birth Date (dd/mm/yyyy): _____</p> <p>Baby's Birth Weight (grams): _____</p> <p>Placenta Weight (grams): _____</p> <p>Hospital of Birth: _____</p> <p>Transfer from: _____ to: _____</p>	<p>Antenatal Care: Number of visits (Circle appropriate number)</p> <p>0. None 1. < 4 2. > 4 3. Unknown</p> <p>Gestational Age at Initiation of Prenatal Visits: _____</p> <p>Mode of delivery (Circle appropriate)</p> <p>1. Spontaneous 2. Operative vaginal 3. Caesarean Section – 1° 4. Caesarean Section – Repeat 5. VBAC after a Trial of Labour 6. Caesarean section after a Trial of Labour 7. Breech delivery 8. Twin delivery 9. Induction: Mode: _____</p> <p>Apgar score at One minute _____ Five minutes _____</p> <p>Cord pH – Arterial _____ Umbilical Vein _____</p> <p>Date of Death (dd/mm/yyyy) _____</p>
---	---

Maternal and Perinatal Health Standards Committee

Committee Members (2016)

Dr. W. Hooper, Chair, Obstetrics & Gynecology
Dr. O. Akintola, Obstetrics & Gynecology
Ms K. Fitzmaurice, Midwife
Dr. M. Jamieson, General Practice
Dr. L. Nause, General Practice
Dr. C. Ruth, Neonatologist
Dr. C. Schneider, Obstetrics & Gynecology
Ms. K. Thiessen, Nurse

Administrative Staff (2016)

Dr. M. Helewa, Obstetrician & Gynecologist, Medical Consultant
Dr. T. Babick, Deputy Registrar, CPSM
Mr. J. Martin, Administrative Assistant, MPHSC, CPSM

Current Administrative Staff (2020)

Dr. M. Helewa, Obstetrician & Gynecologist, Medical Consultant
Dr. A. Mihalchuk, Assistant Registrar, CPSM
Mr. J. Martin, Administrative Assistant, Maternal and Child Programs, CPSM

This annual report was prepared and written by Dr. Michael Helewa, Medical Consultant for the MPHSC.