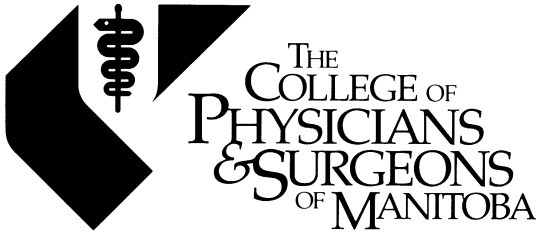
The Maternal and Perinatal Health Standards Committee 2015 Annual Report



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Acknowledgements

The Maternal and Perinatal Health Standards Committee (MPHSC) is pleased to present the 39th Annual Report for the calendar year 2015.

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 2015.

While this report summarizes completed reviews of cases from 2015, 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 2018. We have also included two cases from 2014 and one from 2013 whose reviews have recently been completed and were felt to have educational value.

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 2016. The summary of these cases and the subsequent deliberations will be presented in the upcoming report to be released in 2019.

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.mp.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,

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MPHSC Executive Summary

The Perinatal Mortality rate, according to the Vital Statistics Agency of Manitoba 2016 Annual Report was 12.8 per 1000 births in 2015 which is a small decrease from the rate of 13.0 in 2014. Statistics Canada reports a Perinatal Mortality rate of 8.8 in 2015 which is a small decrease from the rate of 8.9 in 2014. 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 no maternal deaths reported to the MPHSC in 2015; however, this report includes a maternal death that occurred in 2013 as the review was completed in 2018, and another case of maternal death from 2014. 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 MPSHC 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 two cases of maternal death included in this report, one was felt to be a theoretically preventable maternal death in the context of cerclage complications (I.A.1), and the other was non-preventable due to a ruptured aneurysm (II.A.1).

There were 18 cases of maternal morbidity that were reviewed by the MPHSC. Of those cases, all were classified as non-preventable and unavoidable. One case from 2014 that was classified as theoretically preventable due to patient non-compliance with care which resulted in eclampsia is presented for its educational value (I.B.1).

There were 68 stillbirths reported to the MPHSC in 2015. One-third of the stillbirths occurred without any identifiable cause. Two were classified as preventable, one due to family or patient error in judgement, and one due to resource issues. Eight cases were classified as theoretically preventable. Of those 8 cases, 3 were due to physician error in judgement, 3 were due to family or patient error in judgement, 1 was due to in hospital error in management, and 1 due to systemic issues.

In addition, there were 52 cases of early and late neonatal deaths reported to the College. Of those cases, one was classified as preventable with family or patient error in judgement and care provider error in judgement. Three cases were classified as theoretically preventable. One case was associated with resource issues (I.C.2).

There were 212 cases of neonatal morbidities reported to the MPHSC in 2015. All of these cases were reviewed by the medical consultant and many were reviewed by the MPHSC. There were six cases deemed preventable with the following causative factors which contributed to the outcomes:

- In hospital error in management
- Physician error in judgement.
- Two cases of family or patient error in judgement
- Two cases of physician error in judgement combined with in hospital error in management

There were 15 cases of neonatal morbidity that were classified as theoretically preventable with the following causative factors (some cases had more than one causative factor) which may have contributed to the outcomes:

- One case of error in management not affecting outcome
- One case of resource issues
- Two cases of error in documentation
- Three cases of physician error in judgement & technique
- Four cases of in hospital error in management
- Seven cases of physician error in judgement

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. Resource issues that caused delays in delivery of appropriate care resulting in perinatal morbidity or mortality:
    a. Neonatal death due to a delay in performing an emergency caesarean section secondary to unavailability of an operating room at a tertiary centre (I.C.2. Compare this case to II.D.4).
    b. Delay in urgent induction of labour for a twin pregnancy due to bed availability on a labour unit resulting in death of a member of a twin pregnancy (I.C.1).
    c. Severe neonatal acidosis associated with a delay in induction of labour in context of worrisome fetal condition in a mother with severe pre-eclampsia (I.D.4).

2. Errors in judgement or management by physician or hospital staff associated with preventable or theoretically preventable perinatal morbidity or mortality:
    a. Missing the diagnosis of a small for gestational age fetus (I.C.6) or substandard management of small for gestational age fetus leading to fetal death (I.C.5. Compare these cases to II.C.8).
    b. Errors in interpretation or management of abnormal fetal heart tracing in latent phase of labour or active labour (I.D.18, I.D.7, I.D.13, I.D.11, I.D.9).
    c. Errors in performance, interpretation, or management of non-stress tests in the antepartum period leading to neonatal morbidity (I.D.4, I.D.6).
    d. Discontinuation of fetal heart monitoring during transfers or while preparing for a caesarean section in context of a pre-existing abnormal fetal heart rate tracing resulting in neonatal morbidity or mortality (I.C.4, I.D.9, I.D.10).
    e. Inappropriate discharge of patients in latent phase with pre-existing maternal morbidity or abnormal fetal heart rate tracings leading to perinatal morbidity (I.D.3, I.D.5).

f. Substandard documentation by physicians or house staff resulting in communication errors and associated with perinatal morbidity and mortality (II.C.6, I.D.2, I.D.9, I.D.14).

g. Errors in management of induction of labour by employing prostaglandin in context of placental insufficiency and oligohydramnios resulting in severe neonatal morbidity (I.D.4).

h. Failure to identify cervical spinal fracture in a neonate with prolonged hypotonia and respiratory stridor following a traumatic delivery (I.D.1).

i. Error in standard precautions prior to embarking on an assisted vaginal delivery in the context of an abnormal fetal status (I.D.14).

j. Errors in technique by physicians, pertaining to the management of a pneumothorax in a newborn (I.D.2) or pertaining to the use of vacuums or forceps resulting in neonatal trauma or acidosis (I.D.15, I.D.16. Compare these cases to II.C.1 and II.C.2).

k. Proceeding with an elective caesarean section in a patient at no identifiable risk prior to 38 completed weeks resulting in neonatal morbidity (I.D.17).

3. System operative deficiencies on the labour floor or in postpartum period community care, associated with neonatal morbidity (I.D.8, I.D.18) and infant mortality (I.C.8).

4. Patient non-compliance with health advice or care leading to perinatal deaths (I.C.3, I.C.7).

MPHSC in 2018

The MPHC met on three occasions on 2018, reviewing and classifying a total of 52 cases. Significant fact seeking and educational correspondence ensued from these meetings.

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

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. We also discovered that maternal morbidities were not being reviewed in past years at one of the tertiary centres. Upon request of the MPHSC this was rectified.

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 three items for the College newsletter in 2018:

- “Impact of Peri-Partum Depression on Maternal Mortality in Manitoba”
- “Monochorionic Diamniotic and Monochorionic Monoamniotic Twin Pregnancies”
- “Estimate of Fetal Growth During Prenatal Care for Patients with a Higher BMI”

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 2015. 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

There were no cases of preventable or theoretically preventable maternal mortalities in 2015.

I. A.1

This case is from 2013. It is presented in this annual report as the review was just recently completed.

This case was reviewed for a maternal death resulting from septicemia. A 21-year-old primigravida had a previously uncomplicated obstetrical course and normal fetal scan at 20 weeks gestation presented at 24 weeks gestation with cramping. A speculum exam showed membranes prolapsing into the vagina. It was felt that this patient may benefit from having an emergency cerclage placed. The patient was counselled with very thorough discussions of the risks involved and the potential benefits of the intervention. A pre-cerclage amniocentesis was performed, demonstrating 2+ WBC but no bacteria. Ultimately, the culture from the amniotic fluid from the pre-cerclage amniocentesis showed no growth. The procedure went well without complications. She was also given betamethasone for fetal lung maturation and indomethacin to relax the uterus. Maternal urine showed Group B streptococcus colonization and so she was also started on Penicillin G.

On day 1 post-procedure, the patient was noted to be having tachycardia that persisted throughout the day with progressively lower blood pressure of 93/45 mmHg. The house staff ordered a septic workup and she was seen by her attending physician who agreed to the workup and continued with present management until a follow up amniocentesis in 48 hours. On the evening of that day, she became overtly septic, at which time Penicillin G was changed to cefalexin and the patient was taken back to the Labour Floor for removal of the cerclage. At the time of the removal, it was evident that there was pus-like discharge. She was then switched to a broader antibiotic and was admitted to the Intensive Care Unit as her clinical condition deteriorated further.

By 8 hours in the Intensive Care Unit, her clinical condition deteriorated to the point of needing multiple vasopressors and multiple blood products to reverse disseminated intravascular coagulopathy and the patient received ECMO for hypoxemia. The patient was then transferred to another tertiary centre for cardiovascular support. The patient passed away in the Intensive Care Unit from cardiovascular collapse. Her blood cultures by then grew Klebsiella pneumonia.

The MPHSC felt that the cerclage placement was appropriate and was proceeded by appropriate steps to obviate chorioamnionitis. The patient had received very thorough discussion and she provided

and informed consent. Klebsiella is also a rare organism at the tertiary institution, but is known to be associated with significant morbidity and mortality. The MPHSC felt that the early signs of sepsis should have prompted a more aggressive antibiotic intervention, particularly when she was diagnosed with tachycardia and lower blood pressures. It was felt that the sepsis management may have been initiated between 4 and 12 hours earlier than when it was initiated. Such a delay in antibiotic therapy is known to be associated with an increased risk of mortality in cases of sepsis.

This case was classified as theoretically preventable with in hospital error in management. Following this case, a hospital-wide sepsis protocol was developed. This protocol aids in the recognition and management of sepsis and can be initiated by both nursing and physician staff.

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

I. B.1

This is a case from 2014. It is presented in this annual report for its educational value and as review of this case has just recently been completed.

This case was reviewed for eclampsia and ICU stay. A 19-year-old primigravida was brought in by ambulance to a tertiary centre emergency room at 37 weeks and 3 days gestation. She had three seizure events at home. On arrival to the emergency room, her blood pressure was noted to be 200/135 mmHg, which was immediately treated with IV labetalol and magnesium sulphate. Her pre-eclampsia workup was unremarkable, and she underwent an emergency caesarean section. She also underwent a CT scan of the head and EEG, both of which were normal. She was started on Dilantin postpartum and an MRI demonstrated PRES. It was felt that her seizure activity was secondary to eclampsia. She was transferred to the surgical intensive care unit following her caesarean section and was discharged home a few days later and was followed up by the community based antenatal home care program.

Of note, this lady had poor prenatal care. She had two visits, one prior to 20 weeks and one at 20 weeks. She also had a 26-week ultrasound. At 20 weeks gestation, it was noted that her systolic blood pressure was borderline elevated at the level of 140/75 mmHg.

Physiologically, the blood pressure starts to drop early in the second trimester; however, in this lady's case, it was somewhat elevated, which has been shown to be predictive of a hypertensive disorder of pregnancy to evolve. Had she followed with prenatal care, pre-eclampsia may have been detected in the middle or late second trimester and institution of appropriate management and delivery may have prevented her eclamptic seizures and subsequent SICU admission. This case was classified as theoretically preventable at the level of family/parent with patient error in judgement.

Of note, a small percentage of patients in Manitoba have no prenatal care or are non-compliant with prenatal care. In 2014, the Partners in Inner-City Integrated Prenatal Care program was funded by the Canadian Institute for Health Research to address barriers to access for prenatal care amongst underprivileged populations, tackle these barriers, and to improve compliance with prenatal care. The data from this research project showed that this program improved prenatal engagement among hard to reach patients, and improved outcomes. Continued support for this program is essential to improve prenatal care access amongst the vulnerable population.

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

I. C.1

This case was reviewed for a stillbirth of a member of a twin. A 34-year-old G1P0, was diagnosed with dichorionic diamniotic twins following invitro fertilization. The pregnancy was complicated by hypertension and hypothyroidism for which the patient received methyldopa and thyroxin. She was also gestational diabetic and was placed on a diet.

At 32 weeks gestation she presented with premature rupture of membranes. On fetal assessment, while both twins were cephalic, Twin A, which was supposed to be the twin whose membranes ruptured, still had amniotic fluid in the normal range. Twin B was normal. She received a course of betamethasone, and antibiotics were started to prevent chorioamnionitis. Within a few days, she started to experience intermittent contractions and was found to be 5 centimeters dilated by speculum examination. It was decided to have her induced, but the induction was delayed because of lack of beds on the Labour Floor and she was sent back to the antepartum ward. Both twins had normal fetal heart rate recordings and the patient was afebrile.

Six hours later, she was transferred back to the Labour Floor to initiate induction, but Twin A's fetal heart tones could not be auscultated. Ultrasound confirmed the fetal death of Twin A. It was then decided to continue with the induction, but the mother started to have a fever of 38.5°C and Twin B had fetal tachycardia of 170 bpm. She was then delivered by caesarean section.

The MPHSC classified this case as preventable with resource issues as a causative factor due to the fact that the death of Twin A and the onset of clinical chorioamnionitis could have been prevented had the induction been initiated that morning as was initially planned. The induction was delayed more than nine hours due to resource issues pertaining to the availability of labour beds and nursing resources to attend to the patient due to the work load on the Labour Floor that morning. The MPHSC raised a letter to the Chair of the standards committee at the tertiary centre and to the Chair of the department and WRHA Women's Health Program, hoping to minimize delays of necessary inductions of labour. Such delays have been shown repeatedly to result in significant maternal and perinatal morbidity or mortality.

I. C.2

This case was reviewed for neonatal death secondary to severe asphyxia. A 24-year-old G1 had a pregnancy complicated with mild gestational diabetes that was diet controlled. She presented to the triage area at a tertiary centre at 41 weeks gestation in active labour. In the triage area, the fetal heart rate tracing was abnormal in that there was decreased variability and onset of late decelerations. A caesarean section was then planned. She was promptly seen by anesthesiology, but during the assessment there was acute bradycardia with a fetal heart rate that dropped to 80 bpm and an emergency caesarean section under general anesthesia was performed.

The delivery occurred one hour and forty minutes from the time of her presentation to the triage area. The baby's Apgar scores were 0, 2 and 3 at 1, 5 and 10 minutes. The umbilical artery pH was 6.59. The baby suffered hypotonia and seizure activity. A cooling protocol was started. The neonatal course was further complicated by renal failure, hypotension, and left thrombocytopenia. At 10 hours of age, life support was withdrawn.

The long duration between the presentation with an abnormal fetal heart rate and the emergency caesarean section was an area of concern. On further analysis, it appeared that while the nurse and the resident identified an abnormal fetal heart rate tracing and called for the caesarean section, this could not be performed as the obstetrician was in a case room with a different patient at that time, and the case rooms were occupied by other delivering patients. The obstetrician, resident, and nurse were not felt to be at fault as it appeared that the Labour Floor was quite busy at the time of this lady's crisis. Resources at the institution were felt to be a contributing factor to the delay and the poor outcome of this delivery.

This case was classified as theoretically preventable with resource issues as a causative and contributing factor. The proceedings of this case were raised further to the manager of patient care for the Labour Floor as well as to the department chair.

I. C.3

This case was reviewed for a neonatal death. A 29-year-old G4P2 was under the care of midwifery. She was at 35 weeks gestation when she presented with spontaneous premature rupture of membranes and contractions. As per protocol, the midwife consulted with obstetrics. The obstetrician assessed the patient and recommended admission and antibiotics; however, the patient decided to leave the hospital against the obstetrician's advice, only to return 14 hours later to the triage area with evidence of a sinusoidal fetal heart rate, and decelerations. The obstetrician on duty was not consulted for one hour after the patient was admitted to triage. When the obstetrician assessed the patient again, a caesarean section was strongly recommended. The patient initially declined, but finally consented, and the baby was delivered 20 minutes later by caesarean section under general anesthetic.

The baby was born profoundly acidotic with an umbilical arterial pH of 6.8. The baby developed disseminated intravascular coagulopathy and severe asphyxia and subsequently suffered neonatal death.

The MPHSC believed that this case was preventable with patient error in judgement. The committee also believed that there was a delay by the midwife to consult with obstetrics in the face of an ominous fetal heart rate tracing on the mother's second admission to triage, demonstrating an error in judgement.

The MPHSC also pointed out that obstetrics consultants should be warned by midwives when patients are prone to resort to unconventional choices or are prone not to comply with standard treatments. While this would not have made a difference in the current case under review, it may be of assistance in aiding downstream care providers in understanding the unconventional choices sometimes taken by patients.

I. C.4

This case was reviewed for intrapartum fetal demise. A 41-year-old G1P0 presented at 29 weeks gestation with uterine cramps, uterine contractions and vaginal bleeding. Initial fetal heart rate showed a normal tracing but with reduced variability and possible sinusoidal rhythm.

The fetal monitoring was discontinued one hour later as the patient wished to go to the washroom. There was an attempt at hearing the fetal heart rate nearly an hour later to re-establish fetal heart monitoring, but the fetal heart tones could not be found. An ultrasound confirmed asystole, and the patient was taken for an emergency caesarean section which was done 30 minutes later. The baby had Apgar scores of 0, 1 and 0 at 1, 5 and 10 minutes. A complete placental abruption was noted.

The MPHSC classified this case as theoretically preventable at the level of obstetrical care with in hospital error in management. Fetal heart monitoring should not have been discontinued for one whole hour in the context of preterm antepartum bleeding and abnormal fetal heart rate tracing. Educational activity took place with the hospital staff.

I. C.5

This case was reviewed for a stillbirth. A 24-year-old G4P2L3 (one set of twins) had a relatively smooth pregnancy. At 38 weeks gestation a fetal heart rate could not be picked up. Review of the prenatal sheet indicates that there was evidence of clinical intrauterine growth restriction as of 35 weeks gestation. There was no evidence that a fetal assessment was requested or done. She was initially planned to be induced at the tertiary centre; however, it was decided by the attending physician to call a rural hospital in her home town and have the induction done there.

On the way to the rural hospital, she went into spontaneous labour and delivered a stillbirth baby boy weighing 2,400 grams with Apgar scores of 0 and 0 at 1 and 5 minutes. Both the baby and placenta were on the 3rd percentile for gestational age.

The MPHSC classified this case as theoretically preventable at the level of obstetrics with physician error in judgement. It was believed that the small for gestation age fetus by clinical assessment in the 3rd trimester should have prompted a quest for a fetal assessment which would have documented intrauterine growth restriction and possible placental insufficiency, which in turn, may have necessitated earlier intervention. An educational letter was sent to the physician involved.

I. C.6

This case was reviewed for a stillbirth in the context of intrauterine growth restriction. This mother was a 34-year-old G2P1 with regular prenatal care. At 28 weeks the height of fundus was noted to be 22 centimeters. A fetal assessment was booked, but the appointment was given for ten days later. Four days prior to her fetal assessment, at 29 weeks gestation, she presented with absence of fetal movement and fetal death was confirmed. At the stillbirth workup the maternal serology was negative for any viral or bacterial infections. There was no record that the placenta had been sent to pathology. The patient had a previous child weighing 5 lbs. 11 oz at 37 weeks gestation.

The MPHSC classified this case as theoretically preventable with physician error in judgement due to having missed several prompts in this patient's history and clinical assessments. A previous growth restricted fetus should have prompted vigilance in assessment of fetal growth at this index pregnancy. The prenatal care visits were given at longer intervals than is appropriate by standards. When growth restriction was realized at 28 weeks gestation, the physician should have ensured that the fetal assessment be done promptly by arranging this patient's appointment to a closer date. An educational letter was sent to the physician involved.

I. C.7

This case was reviewed for a stillbirth. A 31-year-old G7P4 lady was known to have type II diabetes with a hemoglobin A1C of 11% at 25 weeks gestation. She was advised to initiate insulin, but her diabetes remained poorly controlled and she was not compliant with her medication.

She presented to a rural hospital in a diabetic ketoacidosis state and was then subsequently transferred to a tertiary centre. At the Emergency Room she was diagnosed with a fetal demise. She was induced and had a normal vaginal delivery. Placental pathology showed advanced maturation of the placenta at 29 weeks gestation. The cause of the stillbirth was felt to be ketoacidosis. This case was classified as preventable at the level of family/patient with patient error in judgement due to poor compliance with the recommended treatment for diabetes in pregnancy.

I. C.8

This case was reviewed for child mortality. A 43-year-old G4P2 gave birth to a child with Down syndrome. This lady had nuchal translucency done in early pregnancy. The test was positive but she declined further genetic assessments. At term, the baby presented in a breech presentation. Given that she had a previous caesarean section, she was scheduled for an elective caesarean section, but she went in to labour the day prior to her caesarean section, so an emergency caesarean section was carried out.

During the immediate postpartum period, the patient demonstrated anger and disbelief that her child had Down syndrome and there were concerns by the nursing staff that she appeared detached from her baby. There were elements of denial and poor bonding with the child. Hospital social workers got involved and put the parents in contact with support groups for babies with disabilities and with Child and Family Services.

This lady was discharged from the hospital on day 3 postpartum upon the family request, despite showing verbal aggressive behavior against her obstetrician and showing elements of self-blame as well.

At two months of age, the baby was brought to the Emergency Room by the father with an alleged history of the baby having fallen down the stairs at home. On arrival, the baby was limp and lethargic with evidence of multiple bruises to the head. Examination revealed evidence of cranial cerebral trauma, scalp contusions, skull fractures, subdural hematoma, brain edema and morphology confirmed Down syndrome. The baby was declared brain dead.

Subsequently, the case was brought forward to the MPHSC for review. Full investigations were carried out by the MPHSC and the attending physician involved was asked for comments. The MPHSC expressed concerns that the immediate postpartum management of this patient did not meet standards, given the early discharge, particularly that the mother was showing signs of severe depression, self-blame, anger, and aggressive verbal behavior to her health care workers and a total detachment and apathy to her child. The physician involved commented that despite the mother's initial negative attitude following the birth of her child, there were signs that she was showing acceptance based on religious faith and beliefs. Child and Family Services as well as the College's Child Health Standards Committee also investigated and reviewed this case to ensure that standards were met.

The MPHSC classified this case as theoretically preventable at the level of obstetrical care, in hospital nursing care, pediatric care, psychiatric care and community-based nursing care. It was strongly felt that this lady should have been assessed by psychiatry prior to discharge. Equally, when she was later seen by the social workers and community nursing care at the home environment, further intervention should have been initiated given documentation that the mother was showing signs of persistent detachment and depression.

I. C.9

This is a case from 2014. It is presented in this annual report for its educational value and as review of this case has just recently been completed.

This case was reviewed for a neonatal death. A G4P3 lady delivered a healthy baby at term by caesarean section. The baby appeared to be healthy and vigorous at birth, but at Day 7 the baby was brought in by the parents to the Emergency Room with non-specific symptoms of poor feeding, increased requirements for sleep, and essential irritability. The baby underwent a septic and hematologic workup which proved to be negative. An echocardiogram showed a normal heart. Metabolic and coagulation studies were done, all of which were negative.

It was noted that the baby's neck movements appeared to be painful to the child. When this was pointed out to the mother, she indicated that the day before she attended a chiropractor for her back discomfort therapy. She reported that the chiropractor offered to manipulate the baby's neck as the chiropractor perceived a "high occiput" and "T2 misalignment". Given this information, the emergency physician ordered a brain MRI. But after returning from the MRI, the baby had a rather peculiar disconjugate gaze. The MRI showed evidence of large acute bilateral infarcts encompassing both cerebral hemispheres. Given the history of recent chiropractic manipulation, there was a concern of dissection in the carotid or cerebral vasculature. A CT angiogram was requested, particularly to assess the carotid arteries; however, the CT report came back as inconclusive as the odds of finding a small dissection would be quite difficult at this baby's age.

The baby had repeated episodes of apnea, desaturation and left eye deviation. Ventilation was required. The baby's level of consciousness continued to wane and was subsequently intubated. A repeat CT scan was done because of concerns of possible bilateral strokes. The baby subsequently developed shock that was resistant to fluids, inotropes, and steroids with resultant multi-organ dysfunction. The care was withdrawn.

Multiple metabolic and hematologic investigations were done to rule out metabolic diseases or hypercoagulopathy issues and microemboli. Neurology service recommended that the baby have a full central nervous system autopsy with special emphasis on anomalies of the carotid and basilar arteries.

The MPHSC had concerns with regards to the chiropractor's manipulation of this newborn's neck which may or may not have contributed to the overall picture of the cerebral infarcts. This case was classified by MPHSC as theoretically preventable with possible chiropractor error in management/judgement. Given that the concern pertained to a health care worker from another discipline, the case was raised to the Manitoba Chiropractors Association for their own internal review.

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

I. D.1

This case was reviewed for neonatal hypotonia, respiratory distress, and neonatal trauma. The mother was a 24-year-old G2P1 with a smooth pregnancy. She presented at 34 weeks gestation in active labour to a rural setting. She was nearly fully dilated when she presented and became fully dilated about six minutes later. The baby was noted to be in a face presentation. She pushed for two and a half hours. The rural physician called a specialist at a tertiary centre for instructions regarding delivery of a face presenting fetus. The baby was born three hours following admission to the rural setting.

The baby had poor Apgar scores of 1 and 1 at 1 and 5 minutes and was noted to be somewhat hydropic with an abdominal hernia. There was also evidence of a fractured humerus and brachial palsy. The baby suffered respiratory distress and was transported to a tertiary centre.

All workup for viral infections proved to be negative, including CMV, herpes, rubella, toxoplasma, syphilis, and parvovirus. Genetic testing was done to rule out Turner's Syndrome and all metabolic disorders were ruled out as well. The mother's serum screening for aneuploidy was low risk for Trisomy 13, 18 and 21. The fetal growth was appropriate throughout pregnancy and there was no evidence of hypertension, diabetes or viral infections during pregnancy.

Throughout the neonatal period, this baby remained generally hypotonic and was a poor feeder. The follow up with neonatology suggested that this baby may have a neuromuscular disorder. The baby had one episode of respiratory distress soon after delivery while in the home environment. The parents presented to the hospital with concerns regarding the respiratory distress but the workup at the time did not reveal any specific concerns. The parents brought the baby to the hospital again at 4 months of age with persistent hypotonia and another episode of respiratory distress. An MRI of the brain and spine revealed evidence of severe C6-7 fracture dislocation.

A full review was carried out by the MPHSC which included a review of the mother's prenatal course, course of delivery in the rural setting, as well as her management at the tertiary centre and at subsequent neonatal visits. There was a significant concern by the committee regarding the delay in the diagnosis of the severe C6-7 fracture dislocation. The committee believed such hypotonia that could not be explained by the usual screens should have prompted a more thorough investigation for spinal injuries, particularly in the context of a face presentation delivery with the potential of multiple traumatic fractures.

This case was classified as theoretically preventable at the level of pediatric care with physician error in judgement. The MPHSC went further to suggest to the Division of Neonatology at the WRHA to undertake educational activity for neonatologists to stress the importance of checking the cervical spine, particularly in cases of difficult deliveries and/or in neonates who are poor feeders and who demonstrate neonatal hypotonia. Similar correspondence was also sent to the Section Heads of the Neonatal Intensive Care Units at the two tertiary centres and to the Medical Director of the Pediatric Intensive Care Unit and to the Child Health Standards Committee of the College of Physicians and

Surgeons of Manitoba. Educational activities to the primary neonatologist involved in the care of this baby took place.

I. D.2

This case was reviewed for neonatal pneumothorax and respiratory distress. A 23-year-old G3P2 lady was at 39 weeks gestation when she underwent an elective repeat caesarean section as she had two previous caesarean sections. The Apgar scores of the baby were 9 and 9 at 1 and 5 minutes. The baby did not require resuscitation. Unfortunately, this patient did not have early prenatal care and her first ultrasound was done in the 3rd trimester for dating.

The baby initially did well and was seen by the pediatrician the morning after the caesarean section. Later that day, 4 hours after being seen by the pediatrician, the baby suffered cyanosis and respiratory distress. Oxygen saturations were at 50%. Neonatology was summoned and free flow oxygen was given to the baby. The baby was admitted to the NICU for CPAP.

On Day 2 at the NICU, the baby deteriorated further and an x-ray showed a right pneumothorax. Needle compression was performed, and a chest tube was inserted, but this was a difficult procedure to do. The baby had bradycardia and respiratory distress needing intubation, chest compressions, and epinephrine. The second attempt of decompression resulted in a hemothorax of 35 cc of fresh blood. This necessitated a blood transfusion. The baby needed inotropes for 48 hours. Finally, a chest tube was placed by pediatric surgery. While the baby suffered acute spontaneous pneumothorax, complications were iatrogenic from repeatedly attempting to decompress the pneumothorax and placement of the chest tube.

Three days later, the chest tube was removed and the baby was extubated. The baby was discharged on Day 12 of life.

There were concerns that appropriate documentation with regards to the insertion technique and technical aspects of the chest tube by the neonatologist was poor and not described. Such documentation is essential for the continuity of care and communication amongst neonatal colleagues as well as for medical-legal purposes. The MPHSC discussed the use of a guidewire through the chest needle to allow subsequent chest tube placement. A letter was raised to the Head of Neonatology with regards to documentation requirements and suggestions for the appropriate technique for placement of chest tubes to be relayed to the physician involved.

This case was classified as theoretically preventable at the level of pediatric care with physician error in technique and error in documentation.

I. D.3

This case was reviewed for low Apgar scores of less than 5 at 5 minutes and neonatal acidosis. A 19-year-old G3P2 presented at 36 weeks gestation with contractions. The contractions settled three hours later, and it was decided to send the mother home. She presented five hours later with a resurgence of the contractions, and at that time her cervix was 4 centimeters dilated. She was observed another hour, after which the nurses called the attending physician and it was decided to send her

home again. Three hours after the second discharge, her membranes ruptured and she was brought back to the hospital in an ambulance and she was found to be fully dilated. The baby was delivered and weighed 1,900 grams with Apgar scores of 2 and 2 at 1 and 5 minutes.

The MPHSC reviewed the fetal heart rate tracing and the particulars of the events surrounding her admissions, discharges and ultimate delivery. The fetal heart rate tracing showed that while the baseline of the fetal heart rate was normal on both admissions and the variability was preserved, there were multiple recurrent variable decelerations. She also had a bloody discharge following her second admission when she was at 4 centimeters dilated. Given her multiparity, bloody discharge, and abnormal fetal heart rate tracing, this patient should not have been sent home but kept in the hospital setting and monitored throughout. This case was classified as theoretically preventable at the level of obstetrical care with physician error in judgement. A letter was sent to the Chair of the standards committee at the rural hospital for educational purposes to prevent such scenarios in the future.

I. D.4

This case was reviewed for neonatal acidosis and a prolonged NICU stay. A 33-year-old G1P0 had her first prenatal visit at 32 weeks gestation. She was noted to have gestational hypertension with blood pressures at 160/110 mmHg. A fetal assessment was done that same day showing a baby on the 20th percentile for growth, no abnormalities, and normal amniotic fluid. She was then admitted to the triage area. Her blood pressure remained quite high at 171/106 mmHg. Eclampsia workup showed elevated levels of uric acid and definite proteinuria with a protein creatine ratio of 1,360. She was started on Labetalol and then was subsequently discharged on the antenatal homecare program with daily nursing visits to assess her blood pressure and response to medication.

She was re-admitted the next day to triage as her blood pressure was noted to still be high. She stayed at the hospital for two weeks, and by that time, she was spilling 11 grams of protein per day. She received a course of betamethasone, and another fetal assessment was carried out. The baby demonstrated evidence of oligohydramnios and the cord doppler studies showed elevated systolic-to-diastolic ratio. There was evidence of increased middle cerebral artery flow in the fetus. The mother had significant ascites, which was likely the result of pre-eclampsia and hypoalbuminemia. Given these changes, it was decided to have her induced. Unfortunately, induction was not carried out on that day, and was delayed for two days because of lack of NICU beds for the baby.

When a bed finally became available, the mother was brought to the triage area where a non-stress test was interpreted as normal, but in fact, there were no accelerations. Induction was initiated with dinoprostone and she subsequently was returned to the antepartum ward for an overnight stay to give the prostaglandin a chance to work.

In the morning, there was evidence of deceleration on auscultation of the fetal heart rate and the patient was sent back to the triage at which time a 25-minute deceleration was heard. The fetal heart rate tracing was abnormal with reduced variability. It was decided to proceed with a caesarean section, which was done just prior to noon.

The baby weighed 1,750 grams and the arterial cord pH was 6.9 with a base deficit of 22. The baby stayed in the NICU for ten days and was then discharged home. The maternal postpartum course

improved, but she needed close monitoring for blood pressure. Pathology of the placenta showed changes consistent with placental insufficiency with infarcts and fibrin disposition.

The MPHSC had significant concerns in this case:

1. Dinoprostone was used to initiate the induction of labour. Prostaglandins are contraindicated in the context of placental insufficiency and oligohydramnios.

2. Following the placement of Dinoprostone vaginal insert, this patient was sent back to the ward without adequate monitoring because of lack of nursing resources to do a non-stress test on the antepartum ward at that time.

3. Misinterpretation of the non-stress test just prior to placement of the dinoprostone. The tracing was reviewed and there was evidence that the non-stress test was non-reactive with no accelerations, yet the patient received a prostaglandin product and was sent to the ward.

4. The delay in the induction of labour because of lack of NICU beds. This timeframe for induction was not ideal, and such delay may have contributed to the worsening of the fetal acidosis, given that the mother was quite hypertensive at the time and the placenta was dysfunctional.

As a result, the hospital instituted the performance of non-stress tests on the antepartum ward, particularly after patients receive prostaglandins and are kept in hospital for further monitoring. The attending physicians and the residents involved were advised with regards to the inappropriate use of prostaglandin products in the context of oligohydramnios and placental insufficiency. The fetal heart rate tracing in the triage area, which was believed to be reactive prior to placement of the dinoprostone, was reviewed with nursing and resident staff as well as with the attending. The department subsequently made it mandatory that non-stress test be available on the antepartum wards for patients undergoing cervical ripening with prostaglandins. Such antepartum ward non-stress tests have to be checked and signed by the attending staff shortly after completion of the test.

The NICU resource issues that caused such a delay in the induction of labour were raised to the administration officials of the hospital for management.

This case was classified as theoretically preventable at the level of obstetric care with in hospital error in management, physician error in judgement, and resource issues regarding severe concerns of NICU resources at the tertiary centre.

I. D.5

This case was reviewed for low Apgar scores and hypoxic ischemic encephalopathy. A 24-year-old primigravida was at 41 weeks gestation with gestational diabetes treated with diet and had good glycemic control. She presented to hospital with early labour. She was planned to have an induction of labour the next day. At entry, her blood pressure was slightly elevated at 144/94 mmHg. The fetal heart rate tracing was normal, and her cervix was 1 centimeter dilated 50% effaced. Unfortunately, she was sent home.

She returned 16 hours later with hypertension, and an abnormal fetal heart rate tracing with reduced variability and what appears to be a sinusoidal rhythm. She was kept on monitor for two hours, but the paper ran out and the monitoring was not resumed until an hour later at which time there were deep decelerations. She was allowed to be disconnected from the monitor for 20 minutes to go to the washroom. An epidural was placed, during which she was not monitored. On the resumption of the monitoring, the fetal heart beat was at 60 bpm. She was immediately transferred to the operating room where a crash caesarean section was done under general anesthetic.

The baby weighed 5,000 grams and had Apgar scores of 0, 1 and 2 at 1, 5 and 10 minutes. The umbilical arterial pH was 6.8 with a base deficit of 24. The baby had to be intubated and chest compressions were employed. The baby was then admitted to the NICU for a cooling protocol. The baby suffered hypoxic ischemic encephalopathy.

The MPHSC was concerned that this patient was sent home after she first presented to the triage area given a borderline tracing and gestational diabetes at 41 weeks gestation. In fact, induction of labour should have been initiated. It was also concerning that the patient was off the monitor for a significant amount of time on two occasions. An earlier ARM with the scalp clip should have been done, rather than prioritizing the placement of an epidural anesthetic.

This case was classified as theoretically preventable at the level of obstetrical care with physician error in judgement and in hospital error in management. Educational letters were sent to the obstetrician and the nursing staff.

I. D.6

This case was reviewed for poor Apgar scores and hypoxic ischemic encephalopathy. A 38-year-old G5P3 with three previous caesarean sections had poor prenatal attendance and non-compliance in the management of diabetes mellitus. She was admitted at 34 weeks gestation for management of diabetes and treatment of late onset gestational hypertension.

During her hospital stay, she had daily non-stress tests, but these were not evaluated by an attending physician, except for one non-stress test two days after admission, while the other non-stress tests were reviewed by the junior residents. Some of the non-stress tests were quite brief (i.e. less than 20 minutes) and do not meet standards for non-stress testing. Others were more prolonged.

Between Day 2 and Day 4, the non-stress test had acceptable variability, but there were no accelerations; hence, by definition, the non-stress tests were not reactive. On Day 5, the nurse noted fetal bradycardia and the patient was transferred to the Labour Floor where the fetal heart rate was documented at 75 bpm. An emergency caesarean section was done, resulting in a birth of a baby whose Apgar scores were 0, 1 and 2 at 1, 5 and 10 minutes. The umbilical arterial pH was 6.3 with a lactate level of more than 20. The baby subsequently suffered hypoxic ischemic encephalopathy.

The MPHSC felt that this poor outcome could have been prevented had the non-stress test and fetal evaluations been assessed properly. With the non-stress test on Day 2 of admission being truly non-reactive, an intervention should have taken place. This case was classified as preventable at the level of obstetrical care with physician error in judgement and in hospital error in management.

As a result, it is now required that attending physicians sign-on on all non-stress tests done on the antepartum wards within 24 hours of the tests being done. The nursing staff have been directed to call the attending physician directly to review the non-stress tests and document the findings and sign that they have seen the tracing. It is strongly advised that this be carried out at all hospitals in Manitoba.

I. D.7

This case was reviewed for low Apgar scores and hypoxic ischemic encephalopathy of the neonate. An 18-year-old G1P0 lady with a smooth pregnancy presented at 41 weeks gestation in early labour. At the start of her labour, the fetal heart rate tracing showed fetal tachycardia beyond 160 bpm. The fetal heart rate variability was also minimal. She was augmented with oxytocin. Twenty-four hours later she was still at 5 centimeters, but the fetal heart rate showed deep variable decelerations. Two-to-three hours prior to delivery the intensity of the variable decelerations was progressively worsening.

At birth, the baby had Apgar scores of 1, 4 and 8 at 1, 5 and 10 minutes. The umbilical arterial pH was 7.02 with a base deficit of 14 and a lactate of 11. The baby did not cry at delivery and the fetal heart rate was less than 60. The baby had to be intubated and suctioned for meconium below the cords. The baby received positive pressure ventilation and Narcan. The baby was noted to be very pale and hypotensive with a blood pressure of 45/18 mmHg. Initially the baby was resuscitated with normal saline. At one hour and forty minutes of age, the hemoglobin of the baby was detected to be at 78 grams per liter. Seven hours later, the baby received his first blood transfusion and the Keilhauer test done on the mother showed evidence of a large fetal maternal transfusion.

The baby suffered severe encephalopathy with an abnormal brain MRI. There was a concern with regards to the delay in transfusing this baby, which was more than seven hours after birth. The MPHSC reviewed the fetal heart rate tracing and members of the committee were quite concerned with regards to the delay in initiating a caesarean section given the abnormalities in the tracing. This case was classified as theoretically preventable at the level of obstetrics and neonatology with physician error in judgement at both levels. Educational activity took place for the physicians involved.

I. D.8

This case was reviewed for poor Apgar scores. A 40-year-old G1P0 lady was at 37 weeks gestation in a pregnancy complicated with late onset pre-eclampsia. She was induced at 37 ½ weeks, which culminated in delivery of a live baby whose Apgar scores were 1, 1 and 9 at 1, 5 and 10 minutes. The umbilical arterial pH was 7.13 and the base deficit was 2. The baby weighed 3,220 grams. At the time of delivery there was evidence of a mild abruption. The baby did well after having received positive pressure ventilation and naloxone.

The MPHSC reviewed the fetal heart rate tracing on this neonate. During the labour there was a concern that the fetal heart rate was quite ominous with severe variable decelerations, evidence of umbilical arterial compressions, exaggerated variability and bradycardia more than 30 minutes prior to birth. The MPHSC also noted that the delivery was performed by a junior member of the resident staff

without the attending physician being present. Equally, at the time of delivery, the neonatology team was not summoned to the delivery, particularly in the presence of an abnormal fetal heart rate tracing.

The MPHSC classified this case as theoretically preventable with in hospital error in management. It was felt that the attending physician should have been present at the time of delivery, particularly when the fetal heart rate was not normal. Obviously, the escalation protocol in this particular case did not occur. A letter was sent to the Chair of the standards committee at the tertiary centre to ensure that the hospital and attending staff are sensitive to such abnormalities and escalation protocols are implemented in the future.

I. D.9

This case was reviewed for neonatal acidosis and poor Apgar scores. A 29-year-old primigravida, GBS-, Rh+ lady with a smooth pregnancy presented at 41 weeks gestation with spontaneous rupture of membranes. Her presentation was around midnight and she was not in very active labour. Oxytocin induction was initiated eight hours later, but by the evening of that day, there was evidence of late decelerations. The mother was also febrile, so antibiotics were given. The patient remained at 4 centimeters dilation without further progress, so she underwent a caesarean section 45 minutes after the decision to do so in the operating room. During that period of time, there was no fetal heart rate monitoring taking place.

The baby was born with Apgars of 1 and 1 at 1 and 5 minutes. The neonatal heart beat was about 100 bpm. The baby needed suctioning of the airway and intubation as well as some cardiac compressions. Epinephrine through the ET tube was also administered. It took nearly an hour before the baby started respirations on its own. There was difficulty in placement of the umbilical venous catheter and the baby suffered its first neonatal seizure at 2½ hours of age. There was evidence of pneumonic infiltrates on the chest x-ray, and blood cultures grew streptococcus anginosus and as a result had a prolonged neonatal stay.

The MPHSC expressed concerns regarding the timeline of events. The fetal heart rate tracing was reviewed, and the fetal heart rate was not normal for quite some time before the decision to proceed with a caesarean section for poor progress was made. There were also some serious concerns for lack of monitoring from the time the decision was made to undertake a caesarean section to the initiation of surgery, which was more than 45 minutes later.

Further review of the documentation showed deficiencies in documenting labour events, ongoing documentation of the fetal heart rate and documenting the cord pHs in the chart. The MPHSC classified this case as theoretically preventable with physician error in judgement, in hospital error in management, and error in documentation. Educational activity took place with the staff and the physicians involved.

I. D.10

This case was reviewed for low Apgar scores of less than 5 at 5 minutes. A 24-year-old G3P2 lady with two previous caesarean sections presented at 38 weeks gestation with lower back pain and evidence of labour contractions. Her pregnancy was uneventful. She was originally booked to have an

elective caesarean section a week later, but the fetal heart rate monitoring showed evidence of fetal tachycardia with recurrent late onset decelerations. As such, she underwent a repeat emergency caesarean section.

At birth, the baby appeared to be pale and hypotonic, with no attempts at aspiration. The Apgar scores were 0, 3 and 3 at 1, 5 and 10 minutes. Positive pressure ventilation took place together with chest compressions. Subsequently, the baby was intubated and chest compressions were continued. While the baby was born at 1247 hours, the resuscitation team did not arrive to resuscitate the baby until 0150 hours, at which time blood transfusions were given and antibiotics were initiated. The baby was transferred out of the rural setting to a tertiary centre.

A review of this case by the MPHSC revealed that this baby was not monitored between the decision to have the mother undergo a caesarean section and the actual delivery, which was a span of more than 40 minutes. This absence of monitoring does not meet standards, given the abnormalities just prior to the decision to undergo a caesarean section. *The standard of care dictates that the fetus should continue to be monitored until the caesarean section is initiated and continue to be monitored even when the anesthetic is being administered.* The standard was relayed to the Chair of the standards committee in the rural setting for local education of the staff involved. This case was classified as theoretically preventable with in hospital error in management in regards to fetal monitoring.

I. D.11

This case was reviewed for poor Apgar scores, neonatal acidosis, and meconium aspiration. A 28-year-old G2P1 with a previous caesarean section wished to have a trial of labour. She presented at 39 weeks gestation following a smooth pregnancy with some bleeding. It was decided to proceed with induction of labour and the cervix was primed with a Foley catheter. Oxytocin was then initiated, but she failed to progress beyond 5 centimeters dilation for more than 6 hours. A decision was then made to deliver her by caesarean section.

The baby weighed 3,900 grams and had Apgar scores of 2 and 7 at 1 and 5 minutes and an umbilical arterial pH of 6.94 with a base deficit of 14. The baby was admitted to the NICU for perinatal acidosis. Initially, the baby was noted to have low tone, but that improved. The baby had tachypnea and was intubated for meconium aspiration.

On further review, it appears that this lady stalled at 5 centimeters dilation for more than 6 hours and the fetal heart rate tracing was non-reassuring. The MPHSC felt that this caesarean section should have been done much earlier, given the previous caesarean section and abnormal fetal heart rate tracing. One should remember also, that absence of progress in dilation and/or descent over a prolonged period of time (e.g. more than 3 hours) increases the risk of uterine rupture in patients with previous caesarean sections. Thankfully, this did not occur in this case. This neonatal acidosis was preventable at the level of obstetrical care with physician error in judgement.

I. D.12

This case was reviewed for low Apgar scores of less than 5 at 5 minutes and neonatal acidosis. A 32-year-old G1P0 who was morbidly obese with a BMI of 53 had gestational hypertension and was

induced at 40 weeks gestation. She was not on any medication for control of her blood pressure. She had three days of induction to get her into labour. Initially, prostaglandins were used and this caused her to go into labour. Oxytocin augmentation was then employed. She was monitored with a continuous electronic fetal monitoring system. There was concern of reduced fetal heart variability but the monitoring was interrupted as at times it was very difficult to pick up the fetal heart rate. Unfortunately, scalp electrode was not used.

She progressed to full dilatation and delivered a live male baby weighing 3,600 grams with Apgar scores of 2 and 3 at 1 and 5 minutes with a cord arterial pH of 6.8. Thick meconium was noted at the rupture of membranes. The baby was transferred to a tertiary centre.

The MPHSC believed that this case may have been prevented if appropriate monitoring with scalp electrodes and intrauterine pressure catheter were used to assess contractions. An earlier intervention may have taken place, perhaps by caesarean section. This case was classified as preventable at the level of obstetrical management with in hospital error in management.

I. D.13

This case was reviewed for neonatal seizures and admission to the neonatal intensive care unit. This was a primigravida at 39 weeks gestation who had gestational hypertension that was treated with Labetalol. In the late 3rd trimester, her blood pressure peaked at 180/110 mmHg, so she was admitted for an induction of labour. She was treated with Labetalol and hydralazine. The induction took place with oxytocin followed by artificial rupture of membranes. She became fully dilated at 15 hours of labour and following two hours of a second stage of labour, the baby was felt to be in an LOP position at +2 station. There was an attempt at an assisted vaginal delivery with forceps at 3 ½ hours into the second stage, but the application was not successful. A vacuum extraction was then tried, but was also unsuccessful and so a caesarean section was done at 4 hours and 8 minutes of the second stage.

The baby weighed 3,620 grams with Apgar scores of 2 and 6 with an umbilical arterial pH of 6.9 and a base deficit of 13. At 5 hours of age, the neonate suffered a seizure-like episode and an MRI showed vasogenic edema within the frontal lobes and restricted diffusion in the subcortical white matter. Subsequently the baby had weakness on the left side involving the limbs.

On review of the fetal heart rate tracing and the contraction pattern, it appeared that the contraction pattern was hypertonic in the second stage of labour and an assisted vaginal delivery and/or caesarean section may have been indicated at an earlier stage. This case was classified as theoretically preventable with physician error in judgement and technique. Educational activity took place with the physician involved.

I. D.14

This case was reviewed for admission of the baby to the NICU. A 28-year-old G1P0 had a smooth pregnancy and was induced at 41 weeks gestation with the use of prostaglandin gel. At 7 centimeters dilation she needed oxytocin augmentation and progressed to full dilation. At full dilation,

she started to show deceleration. Oxytocin was discontinued and the fetal heart rate improved. The oxytocin was then restarted with recurrence of the decelerations. At that time, a decision was made to assist the delivery with the Kiwi vacuum. There was no documentation of the fetal station. The initial attempt at the use of the vacuum resulted in popoffs. Simpsons forceps extraction was attempted, but could not be placed adequately on the fetal head and there was no pull. At that time, the obstetrician decided to use the vacuum again, and at that time requested the operating room be prepared in the event that the vacuum failed, but the operating room was busy with another ongoing case. Ultimately, the baby was delivered by Kiwi vacuum with Apgar scores of 4 and 6 at 1 and 5 minutes with a cord pH of 7.19.

The MPHSC felt that this neonatal acidosis was theoretically preventable in that the oxytocin should have been shut off when decelerations recurred and the attempt at assisted vaginal delivery be postponed until the obstetrician ensured that the operating room was available as a backup in the event that the assisted vaginal delivery failed. Educational activity took place with the physician involved.

I. D.15

This case was reviewed for hypoxic ischemic encephalopathy and birth trauma. A 37-year-old nullipara presented at 40 weeks gestation with premature rupture of membranes. She was induced with prostaglandin and a Foley catheter followed by oxytocin infusion. Her first stage went well without any issues with the fetal heart rate. At full dilation, the position of the fetal head was occiput posterior, and after two hours in the second stage with the vertex at +2 station and no further decent with maternal pushing, a double set up was entertained for a trial of assisted vaginal delivery. A Kiwi vacuum was used for nine pulls and was subsequently replaced by a Simpson forceps with two pulls and delivery of the baby.

The baby weighed 3,400 grams and had Apgar scores of 1 and 4 at 1 and 5 minutes, and an arterial cord pH of 6.97, a base deficit of 13, and a lactate of 10. It should be noted that there was severe fetal bradycardia at the time of pulling with the Simpson forceps, associated with maternal hypotension needing phenylephrine to maintain blood pressure. At 4 hours of neonatal age, the baby showed evidence of seizures, and a cooling protocol was employed. A cranial ultrasound was normal, but on MRI, there was evidence of subdural hemorrhage, but no suggestion of hypoxic ischemic encephalopathy.

On further review, the maternal hypotension lasted more than 15 minutes and explained the fetal bradycardia observed. The MPHSC believes that the decision to attempt a trial of operative vaginal delivery was somewhat premature at less than two hours of a second stage in a primigravida. There were also concerns regarding the number of pulls with the vacuum extractor. The MPHSC classified this case as theoretically preventable at the level of obstetrical care with physician error in judgement and technique. Discussion took place with the parties involved and educational activity took place.

I. D.16

This case was reviewed for neonatal cephalohematoma following an instrumental assisted vaginal delivery. A 33-year-old primigravida was at 40 weeks gestation when she presented with

spontaneous rupture of membranes. Oxytocin was used to augment contractions and she progressed to full dilation. The baby was in an ROP position and decelerations started to occur.

After two hours of pushing and three hours of the second stage, it was decided by the physician to proceed with an assisted vaginal delivery with a Kiwi vacuum. There were two popoffs and the vacuum was replaced by a Mityvac, but it also popped off twice. At that time, the patient consented for an emergency caesarean section, and she delivered a live infant weighing 3,600 grams with Apgars of 3 and 8 at 1 and 5 minutes. Cord pHs were not done, and on a pediatric assessment of the neonate, the baby had cephalohematoma with conjunctival hemorrhages and strabismus. It appeared that the Kiwi vacuum suction cup was placed over the anterior fontanel.

The MPHSC believed that this case was theoretically preventable at the level of obstetric care with physician error in judgement and technique due to the inappropriate placement of the suction cup over the anterior fontanel as this should have been placed over the occiput. Use of multiple instruments to affect a vaginal delivery increases risk of neonatal morbidity. The physician was temporarily working at the centre on a locum bases and has subsequently left the province.

I. D.17

This case was reviewed for neonatal respiratory distress syndrome. A 25-year-old G3P2 lady with two previous caesarean sections was booked for an elective caesarean section at 39 weeks gestation, but she was complaining of lower abdominal pain without evidence of bleeding or abnormal maternal and fetal vital signs. Her caesarean section was moved up a week early and was done just prior to 38 weeks gestation. The baby had good Apgar scores, but had respiratory difficulty and evidence of bilateral pneumothorax with evidence of Hyaline membrane disease.

The MPHSC classified this case as theoretically preventable at the level of obstetrical care with physician error in judgement due to the decision to undergo an earlier caesarean section because of the patient's expression of pain in her lower quadrant. The committee believes that this patient and her baby could have been served better by waiting to the appropriate time for a caesarean section, namely 39 completed weeks, especially that the patient was not showing any signs of bleeding or bradycardia to suggest an active uterine dehiscence. Educational activity was sent to the physician involved.

It should be reminded that elective caesarean sections in the absence of any proven medical obstetrical or fetal complications should not be done prior to 39 completed weeks. While respiratory distress syndrome and Hyaline membrane disease has a low incidence in the late preterm gestational ages of 37-38 weeks, the incidence remains significant.

I. D.18

This is a case from 2014. It is presented in this annual report for its educational value and as review of this case has just recently been completed.

This case was reviewed for neonatal acidosis. A 27-year-old G3P2 lady was at 36 ½ weeks gestation. She presented to triage at a tertiary centre with hematemesis and contractions. Her pregnancy was complicated by type II diabetes that was treated with insulin. Her last fetal assessment prior to delivery showed a baby on the 50th percentile with normal doppler studies and a biophysical score of 8/8. The fetal heart rate tracing showed decelerations right from the onset of her monitoring in the triage area. Of note, is that she had a previous normal vaginal delivery followed by a caesarean section in her past pregnancy. This baby continued to have an abnormal fetal heart tracing and it was decided to proceed with a caesarean section. There was an acute fetal bradycardia in the operating room.

Following the caesarean section, the baby's Apgar score was 1, 3 and 6 at 1, 5 and 10 minutes and weighed 2,860 grams. No arterial umbilical cord or venous blood pH was obtained at delivery. At 30 minutes of age, the baby's pHs were 6.93 with a lactate of 24.

The MPHSC reviewed the timeline for the events of this case, and there was concern that there was an undue delay in performing the caesarean section. In utero, this baby was not monitored until approximately 20 minutes after arriving to the triage area. An hour and forty minutes later, variability decreased significantly and there were recurrent late decelerations. It was 30 minutes later that the attending physician came to assess the patient, and it took another 50 minutes before a caesarean section was called for. Delivery occured one hour after the call for a caesarean section.

This baby had a nine-day course in the NICU. The baby required PPV and chest compressions for 45 seconds, and the baby was intubated at 5 minutes and went to the nursery for a cooling protocol. There was evidence of moderate hypoxic ischemic encephalopathy. An MRI done a few days later was normal.

This case was classified as theoretically preventable at the level of obstetrical care with physician error in judgement and in hospital error in management. Educational activity took place with the physician involved.

As a result of this case, rebranding of the levels of urgency to perform a caesarean section once called was introduced at both tertiary centres in Winnipeg. When a physician decides on a caesarean section, this request is appended by clearly stating an urgency level as either "crash", "emergent", "urgent", or "elective" to reflect the time interval to initiate the caesarean section. For example, a crash caesarean section will be done within 10-15 minutes, an emergency caesarean section will be done within one hour, while an urgent caesarean section will be done within two hours. An elective caesarean section is scheduled. It is advised that all labour and delivery units adapt this classification system as a communication tool for levels of urgency.

II. Non-Preventable and Unavoidable:
A. Maternal Mortality

II. A.1

This is a case from 2014. It is presented in this annual report for its educational value and as review of this case has just recently been completed.

This case was reviewed for a maternal mortality secondary to a ruptured splenic aneurism in pregnancy. A 35-year-old G2P1 lady was at 35 weeks gestation. She collapsed at home. EMS found her in pulseless cardiac arrest. She was intubated and CPR was initiated and she was rushed to the emergency department. Her prenatal care up to that time was appropriate and complication free. She was known to have a low-lying placenta in pregnancy.

At the emergency department, fetal demise was confirmed. Ongoing resuscitation allowed for return of pulse; however, the patient was quite acidotic with a pH of 6.6. An ultrasound showed evidence of hemoperitoneum. She was then rushed to the operating room, where upon opening of the abdomen, 4 liters of blood was encountered, the source of which was a ruptured splenic aneurism. She was aggressively treated with 30 units of packed cells, with plasma and platelets, and she was thereafter sent to the Intensive Care Unit.

Unfortunately, she continued to deteriorate in the Intensive Care Unit, and care was withdrawn. This patient died as a result of a catastrophic intra-abdominal bleed. Her care by obstetrics, anesthesia, vascular and general surgery was appropriate.

This case was classified as non-preventable and unavoidable.

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

II. B.1

This case was reviewed for a pulmonary embolism. A G7P7 lady who had a normal vaginal delivery two weeks earlier presented in the postpartum period with shortness of breath. Her BMI was 36 and her prenatal course was uneventful with no specific concerns. All her previous pregnancies were smooth and uneventful. She was a non-smoker and never had a history of thrombophlebitis in her past. Throughout her pregnancy, her blood pressure remained within normal range and the fetal growth was appropriate for gestational age. Her delivery was through a normal vaginal delivery and was uneventful.

Workup in the emergency room where she was received showed that she was hypoxemic and lung scans were consistent with pulmonary embolism. The MPHSC concentrated particularly on any risk factors this patient may have had to have a pulmonary embolism and none were found. She was not known to have any evidence of thrombophilias. This case was classified as non-preventable and unavoidable.

II. B.2

This case was reviewed for uterine rupture. A 29-year-old G2P1 lady was at 40 weeks gestation. She had a previous vaginal delivery. She presented in spontaneous labour following a smooth pregnancy. At the time of birth, shoulder dystocia was encountered and it took nearly 4 minutes for the body of the fetus to be delivered after delivery of the head. The baby's Apgar scores were 3 and 7 at 1 and 5 minutes and the cord pH was 7.21. There were no concerns with the management during labour.

Following delivery, the mother became unstable in the recovery room. Her pulse was tachycardic at 100 bpm, and within three hours she had a hemorrhage with passage of clots and she was having significant pain in the suprapubic area. Following assessment by the attending physician, it was planned to continue observation. Nine hours later, her pain had improved and her blood pressure was noted to be normal at 116/84 mmHg with a pulse of 92 bpm. At 16 hours postpartum, her blood pressure became hypotensive again at 95/52 mmHg and her hemoglobin was noted to be quite low at 69 grams per liter. At 24 hours, she was noted to be hemodynamically stable with a pulse of 85 bpm and a blood pressure of 107/61 mmHg. At that time, an ultrasound was ordered to assess her pelvic area because of her discomfort. A 15-centimeter hematoma was noted in the lower segment that was consistent with a uterine rupture. She underwent uterine artery embolization and was transfused with one unit of packed cells.

Initially, there were some concerns raised with regards to a delay in the diagnosis of the uterine rupture; however, upon review of the case, this presentation appeared to be unusual, particularly that this patient had an unscarred uterus. The patient was never severely hypotensive or unstable, therefore a laparotomy was not needed. She was monitored closely and she received attentive supportive care and appropriate conservative measures were taken.

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

II. B.3

This case was reviewed for eclampsia. A 31-year-old primigravida had a smooth pregnancy, but had a late onset hypertension just 24 hours prior to her admission for induction of labour. Her blood pressure was borderline elevated at 145/90 mmHg. A pre-eclampsia workup was obtained and it was decided to have her induced. Prostaglandin was instilled and she was sent home.

The next morning she underwent further administration of a prostaglandin and was admitted to the wards where it was noted that her blood pressure became elevated at the level of 167/87 mmHg. By then, she was already on labetalol that was started the day before. Following her prostaglandin administration, she started to have some contractions, and spontaneous rupture of membranes and delivered three hours later. She was maintained on labetalol 200 mg POBID. At ten hours following delivery, her blood pressure was noted to escalate to 180/90 mmHg. At 14 hours, she started to have some headache, and her blood pressure was 170/85 mmHg and she was noted to be hyperreflexic, but there was no clonus. She was further supplemented with Adalat 60 mg daily. At 26 hours she had an eclamptic seizure witnessed by her husband and she was immediately given magnesium sulphate and was transferred to the intensive care unit for blood pressure monitoring. Her blood pressure at the time of seizure was 148/105 mmHg. She was given IV labetalol and magnesium sulphate was continued for 48 hours. Her blood profile at that time, in contrast to the results when she was first diagnosed with blood pressure, showed a totally different picture in that it reflected a HELLP syndrome. Her platelet count was 2,800/mm^3. Liver enzymes revealed an AST level of 3,086 international units and a creatinine was elevated. There was definite proteinuria at that time with a protein creatinine ratio of 897. Thankfully, the process started to reverse after her admission to the intensive care unit and she ended up being discharged on Day 4 postpartum.

The MPSHC felt her picture on admission and during induction of labour did not warrant administration of magnesium sulphate. As she was already receiving antihypertensive agents. It was felt that the maternal management and care she received during her induction and delivery in the postpartum period was appropriate. This case was classified as non-preventable and unavoidable.

II. B.4

This case was reviewed for postpartum hemorrhage, a blood transfusion, and admission to the intensive care unit. A 39-year-old G2P0 underwent an elective caesarean section for complete placenta previa at 36 weeks gestation. Following delivery of the baby, there was an attempt to deliver the placenta, during which time the patient experienced seizure activity. The uterus was then noted to be atonic. There was profused hemorrhage from the placental bed after the placenta was removed. Both anesthesia and the obstetrical team recognized the issues quickly and responded in a timely manner in that uterine atony was treated with carboprost, ergotamine, oxytocin, placement of uterine compression sutures (B-Lynch procedure), and ultimately with persistent hypotonia and bleeding, a hysterectomy was performed. The massive transfusion protocol was instituted and a diagnosis of DIC was made, and the appropriate blood products were given. Unfortunately, there was ongoing oozing from the surgical site and this was felt to be secondary to the DIC picture. The patient was also experiencing non-sustained runs of ventricular tachycardia. She was taken back to the operating room where the abdomen was packed and the patient was subsequently cared for in the intensive care unit.

In total, she required nine units of packed cells, two units of platelets, and two units of fresh frozen plasma.

Ultimately the patient stabilized and was sent home in a stable condition. The presumptive etiology of the seizure and DIC was an amniotic fluid embolism. The MPHSC felt that the management was appropriate and timely. The complication observed was unavoidable.

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

II. C.1

This case was reviewed for a neonatal death. A 30-year-old G1P0 was at 37 weeks gestation. She suffered gestational hypertension that was managed with labetalol. On fetal assessments, the baby was noted to have intermittent absent end diastolic flow with cerebralization (increased middle cerebral artery flow). Given this fetal adaptation, labour was then induced.

The first stage of labour was normal. In the second stage of labour, fetal bradycardia occurred when the fetus was at +2 station. An assisted vaginal delivery with a vacuum was used and one pull was applied. The baby was born with Apgar scores of 6 and 9 at 1 and 5 minutes with an arterial pH of 7.15. At birth, the baby was noted to be vigorous, but at 30 minutes of age, the baby had shallow respiratory efforts and suddenly became apneic. There was also decreased tone, and a total vascular collapse. Imaging at that time showed a left temporal lobe and occipital lobe bleeding with a midline shift. By day 4, it was deemed that the prognosis was poor. Care was withdrawn and neonatal death confirmed.

The fetal heart rate tracing was reviewed and the MPHSC felt that the vacuum extraction was indicated at the time that it was applied. The vacuum was applied for one minute and there was only one pull with no popoffs. The obstetrical care was felt to be good. An autopsy was declined. The exact cause of intracranial hemorrhage remained either the result of the vacuum or possibly from an underlying arterial venous malformation, but this was not proven. The committee felt that the death was not preventable, and the obstetrical care provided was appropriate.

II. C.2

This case was reviewed for a neonatal death. A 26-year-old G5P4 presented at 25 weeks gestation with bleeding. There was evidence of bulging membranes. The mother went on to deliver promptly. Three days earlier she had an episode of bleeding as well, and she underwent a fetal assessment which proved to be normal.

At this birth, the baby's Apgar scores were 5 and 8 at 1 and 5 minutes with an umbilical arterial pH of 7.07 and weighed 840 grams. There was a single unsuccessful attempt at intubation in the case room, and so the baby was then maintained on CPAP. Another attempt at intubation in the neonatal intensive care unit was carried out, because of persistent acidosis; however, a chest x-ray demonstrated air collection suggestive of an esophageal tear. A nasogastric tube could not be passed. Blood cultures were positive for gram negative bacilli, and the neonate was maintained on broad spectrum antibiotics. The baby subsequently had a pulmonary hemorrhage and disseminated intravascular coagulation. Life support was withdrawn after 24 hours of life.

It was felt that this esophageal tear was probably iatrogenic. Esophageal tears in a very premature infant are a recognized complication. The single attempt at intubation was carried out by an experienced operator, and it was felt by the MPHSC that this esophageal tear and subsequent complications were non-preventable and unavoidable.

II. C.3

This case was reviewed for a stillbirth secondary to abruptio. A 25-year-old G4P2 mother was seen as of early pregnancy. She had a previous caesarean section at 32 weeks gestation and she was overweight with a BMI of 38. She was noted to have a normal 20 week fetal ultrasound. A screen for diabetes was borderline positive with a one-hour 50-gram challenge test of 8 mmoL per liter. She was requested to have a glucose tolerance test, but there was no evidence that she carried out with this test. Her hemoglobin A1C in early pregnancy was within normal range.

She presented at 36 weeks gestation with a stillbirth, and given a previous caesarean section, she had a repeat caesarean section for a stillborn baby weighing 3,374 grams and evidence of pathologically proven placenta abruptio. Her family physician suggested that she was abusing cocaine following the delivery. While cocaine may have been the reason for the sudden abruption, there is no evidence that she had used cocaine during the pregnancy or prior to sudden placental abruption.

This stillbirth was classified as non-preventable and unavoidable. Members of the MPHSC felt that it would have been more appropriate to have this patient undergo a trial of labour given the stillbirth, and that she has had one previous caesarean section, rather than undertaking an urgent repeat caesarean section. This is particularly so given that the patient was quite stable and there was no acute urgency to delivery immediately.

II. C.4

This case was reviewed for a stillbirth. A 23-year-old G4P2 who lived in a remote geographic location outside the province, was known to have non-medicated epilepsy, a multi-cystic dysplastic kidney, with a Wilms tumor of the right kidney. She was seen as of early pregnancy at 12 weeks gestation. She was a smoker of 4 cigarettes per day. She had missed a few of her prenatal appointments. There was no evidence of diabetes. She had mild gestational hypertension in the third trimester. Her blood pressure was 138/88 mmHg. It was noted that her height of fundus, while appropriate for gestational age throughout, was only 32 centimeters at 36 weeks gestation. She was then referred to Winnipeg.

Her first prenatal visit in Winnipeg was at 38 weeks gestation, and the consultant found no fetal heart tones. The patient reported absence of fetal movements for a few days. Her labour was induced and she delivered a small for gestational age fetus at 2,375 grams. Her serologic workup was negative. The autopsy of the fetus showed severe hypoxic ischemic brain damage, with moderate chronic villitis.

After much discussion by the MPHSC, it was felt that the intrauterine growth restriction was not detected until quite late in the pregnancy and her transfer to the city was appropriate. It was very unfortunate that the baby died just prior to being seen in the city within a short time after the consultation and transfer. This case was classified as non-preventable and unavoidable.

II. C.5

This case was reviewed for a stillbirth. A 36-year-old G2P1 lady with a previous caesarean section had her care in a rural setting. It was noted that she had proteinuria with elevated blood pressure as of early pregnancy, suggestive of kidney disease. She was kept on labetalol which was

progressively increased over time. She was also diagnosed to have gestational diabetes that was treated with diet. She had several non-stress tests that were reactive. Arrangements were made for her to be seen by the fetal assessment unit in Winnipeg.

Unfortunately, two days prior to her arrival to the fetal assessment unit, there was no fetal heart rate to be heard and fetal demise was documented. Given the fact that this lady had a previous caesarean section, she was transferred to another hospital where she was induced. It took some time to get her into active labour. She was induced with misoprostol and oxytocin and delivered a stillborn baby weighing 2,380 grams. All stillbirth workup was done. The autopsy did not reveal any abnormalities. The placental pathology was negative. All the blood tests for serology were normal. There was no evidence of infection.

Postpartum, the mother continued to have proteinuria and was being evaluated by nephrology. Further assessment by the MPHSC documented that in fact this lady's blood sugar was within the normal range. It remains uncertain why this fetus died, and the case was classified as non-preventable and unavoidable.

II. C.6

This case was reviewed for a stillbirth of a baby with Down syndrome. A 37-year-old G9P6 had 5 previous normal vaginal deliveries. At 31 weeks gestation, a fetal assessment scan was performed showing a double bubble stomach appearance of the fetus, suggestive of duodenal atresia. There was evidence of oligohydramnios so a therapeutic amniocentesis was performed and Trisomy 21 was confirmed through assessment of fetal cells. The mother underwent another therapeutic amniocentesis at 34 weeks gestation and was followed weekly thereafter in a fetal assessment unit. The baby demonstrated normal fetal growth, but there was evidence of increased resistance in the umbilical arteries with an increased systolic to diastolic ratio.

At 36 weeks gestation, the mother presented with decreased fetal movement and fetal death was confirmed. Her last fetal assessment was done six days earlier which showed the baby to be on the 45th percentile for gestational age. There was evidence that while the systolic diastolic ratio was elevated in the umbilical artery, there was still persistent flow throughout diastole.

Upon review, the MPHSC believed that the surveillance was appropriate. Labour was induced with misoprostol. There was passage of blood after delivery, which the attending thought was suggestive of placental abruptio. Nevertheless, the placenta had to be removed manually. This case was classified as non-preventable and unavoidable.

II. C.7

This case was reviewed for an intrapartum death. A 23-year-old G2P1 had a previous caesarean section, and was known to have a uterus didelphys and vaginal septum that was detected during her previous labour. A section of the septum was offered to the patient to allow birthing of the baby once she got to full dilation. The patient refused this option and she subsequently underwent a caesarean section for CPD.

Her current pregnancy under review was smooth until around 32 weeks gestation when she presented to a rural setting with a history of abdominal tightening, maternal tachycardia of 129 bpm and a normal blood pressure of 130/72 mmHg. There was no fever. She was assessed at the time by a resident and an obstetrician, but there was no documentation by the physician who assessed her. The resident indicated in their notes that fetal fibronectin was positive and that the cervix was closed. She received steroids and was monitored further with a fetal heart rate monitoring that appeared to be normal. Uterine activity abated. The second physician came on call and indicated to the nurses that the patient could go home, but this was done without any pelvic examination prior to discharge.

Three days later, the patient presented to the rural setting with ruptured membranes. It was noted then that she was 4 centimeters dilated and she was immediately rushed to a secondary hospital in rural Manitoba. On arrival, she was fully dilated and vaginal delivery was imminent. There was no recording of the fetal heart rate or any documentation of any fetal heart rate during transit or on arrival to the secondary centre. She moved on to delivery vaginally immediately after arrival of a stillborn baby weighing 2,045 grams. Resuscitative efforts of the baby failed.

There were some concerns, particularly to the lack of pelvic examination prior to discharge from the rural setting after her first episode of contractions at 32 weeks (i.e. 3 days prior to delivery). There were also concerns with regards to the documentation by an attending physician, and finally, there were concerns with regards to the lack of fetal heart rate monitoring during transit and on arrival to the receiving hospital. It appears that events occurred quite quickly, given that she was fully dilated on arrival to the secondary centre.

The MPHSC classified this case as non-preventable and unavoidable, but concurred with the concerns in that this lady should have had a pelvic examination by an attending physician prior to her first discharge from the hospital three days prior to delivery and that the fetal heart rate should have been monitored during transit and on arrival to the receiving hospital.

II. C.8

This case was reviewed for a stillbirth in an obese patient. A 32-year-old G1P0 was followed up in a Northern unit. At 38 weeks gestation she noticed decreased fetal movements and was transferred to a tertiary centre where fetal demise was confirmed. It was documented on her prenatal record that she was an avid user of marijuana. Her prenatal sheet was reviewed for fetal growth during her prenatal visits. The height of fundus appeared to be consistent with gestational age, but at birth this baby weighed only 2,470 grams. This was an undiagnosed intra uterine growth restriction which contributed to the demise. It was noted in the history that there was no evidence of diabetes, but she did have late onset gestational hypertension with no evidence of pre-eclampsia.

The MPSHC felt that it is very hard to judge a height of fundus in an obese patient with a large panniculus and highly recommended that physicians caring for similar patients have their patients undergo an assessment scan of the baby to assess the growth percentile for the fetus at around 35-36 weeks gestation as this will help many cases where a small for gestational age fetus may have been missed. Should a small for gestational age fetus be diagnosed, further scrutiny would be possible.

This case was classified as non-preventable and unavoidable. Of note, it is not always feasible for patients in the North to travel to Winnipeg on a regular basis for prenatal care, fetal assessments, and early transfers to a tertiary centre due to child care issues. An outreach program from Winnipeg tertiary centres with a travelling nurse technician and a specialist has facilitated a fetal assessment of many mothers between 32-and-37-weeks gestation.

II. C.9

This case was reviewed for a child mortality. A G3P1 SA2 lady was carrying monoamniotic twins. There was evidence of fetal-fetal transfusion and so this twin pregnancy was subjected to laser ablation reconnecting the vessel.

She presented at 26 weeks gestation in preterm labour. She was at 3 centimeters dilated. Steroids were initiated. It was hoped to delay delivery until the second dose of steroids could be administered. While waiting for 24 hours, the contractions settled and she was on the monitor for many hours. Both babies had occasional significant variable decelerations during that period of observations. At one point the patient was taken off the monitor to go to the washroom. Upon reinstituting the fetal heart rate monitor, only one fetal heart rate could be detected and the second area was detecting the maternal heart rate. For fear of a profound bradycardia in the second twin, the patient was raced to the case room and had a crash caesarean section.

Unfortunately, the baby whose heart rate could not be detected was a growth restricted fetus with evidence of high resistant in the umbilical arteries. At birth, the second baby had Apgar scores of 4 and 8 at 1 and 5 minutes and was taken to the neonatal intensive care unit where CPAP was initiated. The baby's weight was 560 grams. Unfortunately, this baby had complications of prematurity, including a left-sided pneumothorax and a grade III intraventricular hemorrhage with dilated ventricles. The baby continued to deteriorate and the decision was made to discontinue care.

The MPHSC classified this case as non-preventable and unavoidable. Of interest is that the obstetrical team acted in a very timely and efficient manner to undertake the crash caesarean section without wasting time to look for the second fetal heart rate that could not be detected. An attempt to pick up a fetal heart rate by an external monitor under such circumstances would have delayed the delivery by a minimum of 5-10 minutes which could have resulted in stillbirths of both twins. Unfortunately, this twin died on day 15 of life due to complications of prematurity.

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

II. D.1

This case was reviewed for Apgar scores of less than 5 at 5 minutes. A 26-year-old G1P0 had a smooth pregnancy and presented at 39 weeks gestation in active labour. This lady's first stage of labour went well; however, there were prolonged recurrent decelerations in the second stage of labour with the fetal heart rate baseline dropping to 50 bpm. Thirty minutes after the beginning of decelerations, a decision was made to use a vacuum extraction. The position of the baby was not mentioned in the operative report; however, the baby was cephalic at station plus two. The vacuum extraction was complicated by two popoffs that were felt to be due to maternal tissue that got in the way between the suction cup and the fetal head.

The baby was born with Apgar scores of 1 and 5 at 1 and 5 minutes. The baby needed neonatal resuscitation because of severe neonatal bradycardia and poor ventilatory efforts. The baby ultimately did well.

The MPHSC questioned why a caesarean section was not performed given that the fetal heart rate tracing was ominous. At this rural hospital, the operating team is not on site and the team has to be called in for a possible caesarean section. Preparation for a caesarean section usually takes more than 30 minutes. The maternity physicians working at this hospital have a directive to call the OR team whenever there is an operative vaginal delivery so that if the operative vaginal delivery was not successful, the OR staff would be on site to proceed with an emergency caesarean section. In this case, there was an urgency to deliver the baby given an abnormal fetal heart tracing. Thankfully the baby responded to resuscitation. The MPHSC decided to classify this case as non-preventable and unavoidable.

II. D.2

This case was reviewed for admission of neonate to the Neonatal Intensive Care Unit. A 32-year-old G2P1 lady with a BMI of 43 had a pregnancy complicated by type II diabetes and pre-existing chronic hypertension since early pregnancy. Her diabetes was treated with insulin, but control was suboptimal. Her hypertension was treated with labetalol and Methyldopa but her blood pressure remained elevated at 160/85 mmHg in the 3rd trimester.

At 37 weeks gestation, she underwent an induction of labour with spontaneous rupture of membranes occurring at 5 centimeters dilation. There was difficulty in picking up the fetal heart rate and a scalp electrode showed bradycardia with a cord prolapse. A caesarean section was then rushed and she delivered a baby that had Apgar scores of 4 and 7 at 1 and 5 minutes with an umbilical arterial cord pH of 7.03 and a base deficit of 2. The baby weighed 4,740 grams. The baby was admitted to the NICU and had a prolonged stay because of problems with management of hypoglycemia.

Upon detailed review, it was felt that the management of this patient was appropriate. The need to admit the neonate to the NICU was non-preventable and unavoidable.

II. D.3

This case was reviewed for low Apgar scores and admission of baby to NICU. A 22-year-old primigravida at 39 weeks gestation was visiting a rural community over the weekend and she presented to the regional hospital with decreased fetal movements. A non-stress test was initiated, showing fetal tachycardia with a fetal heart rate of 240 bpm. The baby was felt to be in a breech presentation, which was confirmed by an ultrasound. There was suspicion at the ultrasound that the baby may be suffering hydrops. The patient underwent an emergency caesarean section after the OR staff were called in. The baby had Apgar scores of 4 and 6 at 1 and 5 minutes, and the cord pH was 7.26. The baby weighed 3,300 grams and was transferred to the city for further management.

A review of the prenatal record indicated that there were no risk factors identified for hydrops. The management of the case, both antenatally and in the rural setting, was felt to have been appropriate. As such, this case was classified as non-preventable and unavoidable.

II. D.4

This case was reviewed for low Apgar scores at 5 minutes and neonatal seizures. A 28-year-old G5P1 had a pregnancy that was complicated by gestational diabetes treated with insulin. Initially, she was booked for an induction of labour, but she developed spontaneous labour and bleeding. An ambulance picked her up from home and noted that her blood pressure was 156/102 mmHg.

On arrival to the Labour Floor, the fetal heart rate was 55 bpm and a crash caesarean section took place under general anesthetic. The baby was born 34 minutes after arrival. A placental abruptio was noted. The Apgar scores of the baby were 0, 3 and 5 at 1, 5 and 10 minutes with an umbilical arterial pH of 6.6 and a base deficit of 22. The baby had to be resuscitated with intubation, ventilation and chest compressions and was put on a cooling protocol at 9 minutes of age. The baby suffered early neonatal seizures and the electroencephalogram showed diffuse encephalopathy and a subsequent MRI showed hypoxic ischemic changes. Follow up of the baby took place, and at 8 months of age, the baby appeared to be developing normally.

The committee was wondering why it took 34 minutes from arrival of the patient to the triage area to the actual delivery of the baby, during which the baby was in a state of bradycardia. Further discovery with regards to the delay showed that at that tertiary centre, neither the operating room or the case rooms were available to be used at the time of the patient's arrival with a bradycardia. This could have explained the delay as one of the operating rooms needed to be cleaned. Cleaning efficiency was reviewed by the nursing team manager to see how cleaning an operating room could have been expedited.

The MPHSC classified this case as non-preventable and unavoidable as placental abruptions remain mostly unpredictable. Review of the prenatal sheet showed that until 37 weeks gestation, this lady's blood pressure appeared to be normal with no evidence of hypertension and she had repeated fetal assessments for her diabetes. The baby was on the 25th percentile for gestation age with good biophysical scores just a few days previous to delivery.

II. D.5

This case was reviewed for a birth trauma. A 29-year-old G2P1 lady presented with antepartum hemorrhage at 25 weeks and received steroids at that time. She returned at 27 weeks gestation in preterm labour and was found to be 4 centimeters dilated and the baby was a breech presenting fetus. A caesarean section was called, but on arrival to the case room the patient had an urge to push and the baby was partially delivered. As may occur at this gestational age, the head was entrapped by a non-fully dilated cervix, and it took seven minutes for the delivery of the rest of the body. The delivery necessitated the performance of a Duhrssen incision of the cervix made at twelve o'clock position.

The baby had Apgar scores of 1 and 7 at 1 and 5 minutes and an umbilical arterial pH of 7.13. The baby sustained a laceration on the cheek at the corner of the mouth. It remains uncertain why this baby sustained a laceration at the cheek, given that the Duhrssen incision was made at the twelve o'clock position (i.e. at the back of the fetal head). The patient had an episiotomy, but this was done far away from the baby's mouth. The placental pathology confirmed an abruptio.

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

II. D.6

This case was reviewed for neonatal cephalohematoma. A 26-year-old G3P1 was at term following a smooth pregnancy. She had a previous caesarean section for a transverse lie. She presented in early labour for a trial of labour. During the labour process, she developed incisional pain associated with recurrent deep decelerations. Four decelerations occurred, after which there was concern that the uterus may have ruptured, and so she was rushed for an emergency caesarean section.

There was no uterine rupture, but the caesarean section was complicated by difficulty in exteriorizing the fetal head from the uterus and the incision had to be extended in a T-incision fashion towards the fundus. The baby had a cephalohematoma even though the fetal head was described as being delivered atraumatically. The Apgar scores were 3, 7 and 9 at 1, 5 and 10 minutes. The baby weighed 2776 grams. The cephalohematoma may have developed during manual attempts to deliver the fetal head.

A full review was carried out by the MPHSC, and it was felt that the management was appropriate. The cephalohematoma was non-preventable and unavoidable.

II. D.7

This case was reviewed for intracranial hemorrhage and bilateral subgaleal hemorrhage. A 21-year-old G2P0 had a smooth pregnancy and presented at 41 ½ weeks gestation in active labour. Her first stage was ten hours long, and the second stage was two hours and seventeen minutes.

The baby was born spontaneously with Apgar scores of 8 and 9 at 1 and 5 minutes and the umbilical arterial pH was 7.16, with an umbilical venous pH of 7.3. The baby weighed 3,657 grams. Meconium was noted at birth, but the baby was vigorous.

Neonatally, it was noted that this baby's head was somewhat asymmetrical with an area of swelling at the occiput. The next day, the swelling extended across the midline and became bilateral. By then, the baby was irritable and was not latching well at breast feeding. An ultrasound was done which showed bilateral subgaleal hematoma and features of intracranial hemorrhage. The baby was subsequently transferred to a tertiary centre for management.

It appears that this was a spontaneous cephalohematoma with subgaleal hemorrhage as well as intracranial hemorrhage. There were no precipitating factors identified. The management of labour and delivery was appropriate. This case was classified as non-preventable and unavoidable.

II. D.8

This case was reviewed for neonatal trauma of a fractured humerus. A 19-year-old lady, G1P1, with a BMI of 34 presented at term in active labour. Her pregnancy was complicated with mild late onset pre-eclampsia.

The delivery of the baby was complicated by shoulder dystocia and ended with the neonate having a fractured humerus. There was discussion regarding the shoulder dystocia and the ensuing fracture of the humerus that may have been prevented through appropriate maternal diet and prenatal care as this patient had only four prenatal visits.

Ultimately, the MPHSC felt the patient could not be blamed for this shoulder dystocia, as shoulder dystocia, in principle, tends to be unpredictable and can occur in patients with perfect prenatal care and average sized babies. The patient herself was not diabetic even though this neonate weighed 4,830 grams. The MPHSC classified this case as non-preventable and unavoidable.

II. D.9

This case was reviewed for a neonatal trauma involving a humeral fracture. A 33-year-old G4P2 lady was at 38 weeks gestation. She had gestational diabetes that was managed with insulin. She was admitted for an induction of labour as the baby was on the 90th percentile for gestational age by fetal assessment. Her induction went well with both prostaglandin gel and oxytocin, but the delivery was complicated by shoulder dystocia. The physician involved managed the shoulder dystocia with an attempted McRoberts procedure and then proceeded to a posterior auxiliary traction which resulted in a humeral fracture.

The physician involved did not employ the standard progression of maneuvers and skipped the Woods maneuver or supra pubic pressure maneuver, both of which could have relieved shoulder dystocia without resulting in injury to the humerus. Educational activity took place with the physician involved to employ more standard maneuvers as these steps may have led to lesser fetal injury.

Of interest, is that it has been promoted at one of the urban tertiary centres in management of shoulder dystocia to employ posterior auxiliary traction to resolve shoulder dystocia as an early or first step. Associated with that practice is the observation of significant increase in the number of humeral fractures. The argument made to employ posterior shoulder traction as a very early maneuver is that it

may reduce the risk of Erb's palsy, but at the expense of humeral fractures. Long term impact of humeral fractures in newborns or the future risk of repeat fractures or nerve injuries needs to be assessed through a longitudinal study.

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

III. Unknown/Unclassifiable:

III. E.1

This case was reviewed for fetal birth trauma. A G2P1 lady was at 40 weeks gestation in a pregnancy complicated by gestational diabetes. The baby was felt to be macrosomic at greater than the 90th percentile for gestational age. She had a smooth first stage of labour. Her second stage of labour was 8 minutes. Following the delivery of the head, shoulder dystocia was noted and the dystocia was managed by delivery of the posterior arm. The baby sustained a humeral fracture during delivery. The birth weight of the child was 4,700 grams with Apgars of 6 and 9 and a cord arterial pH of 7.31. The fracture of the humerus was confirmed after birth.

This is one example representing a series of humeral fractures forwarded to the MPSHC that occurred when posterior arm disimpaction was used as the primary intervention to resolve shoulder dystocia. Many of these fetuses demonstrate humeral fractures. On review of such cases, the MPHSC have classified these cases as unclassifiable as to preventability. The logic of delivering the posterior shoulder first is based on the idea of attempting to reduce the potential for neonatal Erb's palsy that may be associated with standard shoulder dystocia management.

It remains uncertain whether delivery of the posterior shoulder as a first step is safe from a neonatal and maternal perspective when compared to the outcomes of neonates managed by the standard algorithm. Long term outcome of these neonates with humeral fractures remains uncertain. The rate of permanent Erb's palsy, while a serious complication, remains very low.

The reader will notice the difficulties that the MPHSC members face in classifying such cases of humeral fractures in context of shoulder dystocia. This case is similar to case II.D.9 that was classified as non-preventable and unavoidable, while in this case members of the committee felt that it is unclassifiable.

Statistical Summary

A total of 17,182 births occurred in Manitoba in 2015 with the MPHSC reviewing 356 cases. The following tables represent the cases reviewed by the MPHSC that occurred in 2015.

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

Cause	Total
Antepartum Placental Insufficiency / Hypoxia-Acidosis +/- IUGR	12
Cord Accident	2
Abruptio	5
Premature Rupture of Membranes / Sepsis	7
Diabetes Mellitus	5
Twin-to-Twin Transfusion	2
Anomalies (Genetic, Congenital)	9
Viral Infection (e.g. parvo virus)	1
Prematurity Complications	3
Fetal Hemorrhage (e.g. vasa previa)	1
Trauma	0
Cholestasis	0
Severe Hypertension Disorder (eclampsia)	0
Unknown	21

Source: MPHSC Database

Causes of Neonatal Mortality

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	15
Congenital Anomalies (without documented genetic anomaly)	11
Genetic Anomalies (with or without congenital anomalies)	8
Perinatal Hypoxia / Acidosis / Asphyxia / Abruptio / Cord Prolapse	3
Necrotizing Enterocolitis	0
Intraventricular Hemorrhage	0
Hypoxic Ischemic Encephalopathy	4
Prematurity with RDS, HMD, Respiratory Collapse / Pneumothorax	3
Pulmonary Hypoplasia / Oligohydramnios	0
Sudden Infant Death Syndrome	1
Prematurity with Sepsis / Septic Shock	3
Trauma	1
Smothering of Newborn	1
Cardiomyopathy	0
Pulmonary Hypertension	0
Meconium Ileus with Perforation	0
Unexplained	2

Source: MPHSC Database

Cases of Neonatal Morbidity

The following table represents neonatal morbidity cases that were reviewed by the MPHSC that occurred in 2015.

Neonatal Morbidity	Total
Acidosis / Low 5 Minute Apgar Score	58
Encephalopathy / Seizures / IVH	16
Meconium Aspiration / Persistent Pulmonary Hypertension of Neonate / Pneumonia / Pneumothorax	28
Respiratory Distress Syndrome	15
Transient Tachypnea of the Newborn	5
Trauma:	
Humeral Fracture	14
Clavicle Fracture	12
Femoral Fracture	1
Cephalohematoma / Facial Injury / Lacerations	12
Erb's Palsy	12
Abnormalities / Genetic Disorders	23
Hypoglycemia / Hyperglycemia / Hyperbilirubinemia / Hypercalcemia	6
ABO Incompatibility / Rh Disease / Hydrops / Fetal Maternal Hemorrhage	2
Sepsis	4
Dehydration	0
Bradycardia / Cardiac Arrhythmia	2
Substance Withdrawal	3
Other (includes IUGR, Prolonged NICU Stay)	0

Source: MPHSC Database

Cases of Maternal Morbidity

The following table represents categories of the maternal morbidity cases that were reviewed by the MPHSC that occurred in 2015.

Maternal Morbidity	Total
Hemorrhage – Hemorrhagic Shock with ICU Admission	6
Peripartum Hysterectomy / Uterine Rupture	5
Hypertension Related Morbidity	
Eclampsia	5
Severe Gestational Hypertension / HELLP	2
Thrombotic Morbidity	2
Organ Injury at Caesarean Section, Fistulae	2
Embolism	1
Cardiac Arrest	1
Pulmonary Edema / Dyspnea / Intubation	0
Infectious Morbidity / Sepsis / Septic Shock	1
Necrotizing Fasciitis	2

Source: MPHSC Database

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 2009 to 2015.

2009				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Winnipeg	10,967	2,131 (19.4%)	1,410 (12.9%)	721 (6.6%)
Brandon	1,502	424	256	168
North Eastman	7	0	0	0
South Eastman	490	76	40	36
Interlake	204	19	8	11
Central	1,183	223	137	86
Assiniboine	69	7	4	3
Parkland	408	98	60	38
Nor-MAN	517	82	44	38
Burntwood	910	132	71	61
Manitoba	**16,257**	**3,192 (19.6%)**	**2,030 (12.5%)**	**1,162 (7.1%)**

Source: Discharge Abstract Database

2010				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Winnipeg	10,692	2,260 (21.1%)	1,496 (14.0%)	764 (7.1%)
Brandon	1,440	413	218	195
North Eastman	4	0	0	0
South Eastman	502	82	47	35
Interlake	229	22	11	11
Central	1,269	258	155	103
Assiniboine	62	10	7	3
Parkland	358	98	50	48
Nor-MAN	499	79	48	31
Burntwood	870	120	75	45
Manitoba	**15,925**	**3,342 (21.0%)**	**2,107 (13.2%)**	**1,235 (7.8%)**

Source: Discharge Abstract Database

2011				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Winnipeg	10,700	2,282 (21.3%)	1,536 (14.4%)	746 (7.0%)
Brandon	1,579	456	243	213
North Eastman	3	0	0	0
South Eastman	475	72	43	29
Interlake	228	27	19	8
Central	1,181	225	123	102
Assiniboine	88	19	10	9
Parkland	356	85	49	36
Nor-MAN	452	78	42	36
Burntwood	785	99	57	42
Manitoba	**15,847**	**3,343 (21.1%)**	**2,122 (13.4%)**	**1,221 (7.7%)**

Source: Discharge Abstract Database

2012				
RHA	Total Deliveries	Total C/S	Primary C/S	Repeat C/S
Winnipeg	10,990	2,344 (21.3%)	1,481 (13.4%)	863 (7.9%)
Brandon	1,645	515	291	224
North Eastman	9	0	0	0
South Eastman	481	71	40	31
Interlake	230	26	21	5
Central	1,296	265	160	105
Assiniboine	89	18	9	9
Parkland	305	87	9	9
Nor-MAN	480	79	52	27
Burntwood	804	118	74	44
Manitoba	**16,329**	**3,523 (21.6%)**	**2,180 (13.4%)**	**1,343 (8.2%)**

Source: Discharge Abstract Database

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

Appendix

_____HOSPITAL PERINATAL REVIEW DATA SHEET

Perinatal Mortality (≥ 500 grams):

____ stillbirth and check one box below:
- ❑ antenatal
- ❑ intrapartum
- ❑ unknown

____ neonatal death under 29 days of age
____ Age at death (in days; "0" if less than 24 hours)

Perinatal Morbidity (≥ 1000grams) check all that apply:
____ 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

____ Other (specify)_____

Maternal Mortality:
____ Direct Obstetric
____ Indirect Obstetric
____ Non-obstetric

Maternal Morbidity:
____ Uterine rupture
____ Caesarean or peripartum hysterectomy
____ Fistula involving the female genital tract
____ Admit to Intensive Care Unit (specify) _____
____ Thrombo-embolic
____ Eclampsia
____ Other (specify) _____

Mother's Name:_____

Mother's Hospital #:_____

Mother's Birth Date (dd/mm/yyyy):_____

Mother's Age (at time of birth):_____

Gravida: _____ **Para**: _____

BMI: _____

Mother's Residence:_____

Gestational Age (on admission to hospital):_____

Gestational Age (at birth):_____

Baby's Name:_____

Baby's Hospital #:_____

Sex of Baby: _____ Male _____ Female

Baby's Birth Date (dd/mm/yyyy):_____

Baby's Birth Weight (grams):_____

Placenta Weight (grams):_____

Hospital of Birth:_____

Transfer from: _____ **to**:_____

Antenatal Care: Number of visits (Circle appropriate number)
0. None
1. < 4
2. > 4
3. Unknown

Gestational Age at Initiation of Prenatal Visits: _____

Mode of delivery (Circle appropriate)
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: _____

Apgar score at One minute _____ Five minutes_____

Cord pH – Arterial _____ **Umbilical Vein** _____

Date of Death (dd/mm/yyyy) _____

Stillbirth Information

Timing of Stillbirth: _____ Antepartum
_____ Intrapartum

Congenital Anomalies (if any) _____

Karyotype Anomalies (if any) _____

Autopsy: _____ done _____ not done _____ refusal

Significant Findings:_____

_____

Placental Pathology: _____ done _____ not done

Significant Findings:_____

_____

Antenatal Testing (check all that apply)

	Done	Positive	Negative	Unknown
Syphilis				
Toxoplasmosis				
Cytomegalovirus				
Herpes				
Hepatitis				
Parvovirus B19				
B-Streptococus				
Listeria				

Maternal Factors (check all that apply):

- ❑ Diabetes
- ❑ Hypertension
- ❑ Nutrition
- ❑ Medication Exposure
- ❑ Trauma
- ❑ SLE/APLA
- ❑ Uterine Rupture
- ❑ Cholestasis of pregnancy
- ❑ Smoking
- ❑ Abruption
- ❑ Multiple Pregnancy:
  - ❑ Feto-Fetal TX
  - ❑ Severe IUGR
  - ❑ Preterm SROM
  - ❑ Antenatal death of one of the twins
- ❑ Fetal Anemia, Heart Failure, Hydrops: _____
  - ❑ Maternal Antibodies
  - ❑ Kleihauer-Betke Test Result: _____
- ❑ Asphyxia Related Death
- ❑ Cord Event: ❑ prolapse ❑ compression ❑ knot

Most probable cause of death:_____
_____/ or unknown

Preventability (Circle appropriate number):

0. non-preventable
1. preventable
2. theoretically preventable
3. unknown & therefore unclassifiable

If 1 or 2 (above), **Preventable at Level of**:

1. obstetric care
2. paediatric care
3. anaesthetic care
4. family/patient
5. combined

Causative Factors (Circle appropriate number):

0. unavoidable
1. physician error in judgment
2. physician error in technique
3. physician error in judgment & technique
4. in hospital error in management
5. family or patient error in judgment
6. intercurrent disease
9. error in management, not affecting outcome
10. other: _____
11. combined, more than 1 of above
13. error in documentation/communication
14. resource Issues

Action: ___ Referral to College of Physicians and Surgeons Central Standards Committee
___ Referral to College of Registered Nurses of Manitoba
___ Referral to College of Midwives of Manitoba
___ Referral to Chief Medical Examiner's Office
___ Referral to other _____
___ Letter of Advice
___ Discussion with Involved Parties
___ None

Response to Action:

Maternal and Perinatal Health Standards Committee

Committee Members (2015)

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

Administrative Staff (2015)

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

Current Administrative Staff (2018)

Dr. M. Helewa, Obstetrician & Gynecologist, Medical Consultant
Dr. T. Babick, Deputy 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.