

THE  
**M**ATERNAL AND  
**P**ERINATAL  
**H**EALTH  
**S**TANDARDS  
**C**OMMITTEE  
2011 ANNUAL REPORT

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# Acknowledgements

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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.
- 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

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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 2011.

While this report summarizes completed reviews of cases from 2011, 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 three years from 2012-2014.

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 years of 2012 and 2013. The summary of these cases and the subsequent deliberations will be presented in the upcoming report to be released in early 2016.

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

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

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

- I. Those that are deemed “Preventable, or Theoretically Preventable” with causative factors pertaining to physician error in judgement or technique, in hospital error in management, patient error in judgement, inadequate or absent documentation, errors in communication, or problems precipitated by resource issues.
- II. Those that are deemed “Non-preventable and Unavoidable”.
- III. Those that could not be classified by the MPHSC primarily due to absent or missing documentation.

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

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

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

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

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

Respectfully submitted,



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

## MPHSC Executive Summary

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The total number of births in the province has shown a 0.01% decrease compared to 2010. In 2011 there were 16,187 births. This was a decrease in 65 births in the province compared to 2010.

Perinatal Mortality rate, according to the Vital Statistics Agency of Manitoba Annual Report was 13.9 per 1000 births in 2011 which is an increase of 1.2 from 2010. Statistics Canada reports a perinatal mortality rate in Manitoba of 9.3 per 1000 births. The two agencies use different definitions for calculating perinatal mortality; The Vital Statistics Agency of Manitoba's definition includes stillbirths  $\geq 500$  grams or born of  $\geq 20$  weeks gestation, plus neonatal deaths up to 7 days of life. Statistics Canada includes stillbirths of  $\geq 28$  weeks plus neonatal deaths up to 7 days of life.

There were no maternal deaths reported to the MPHSC in 2011.

There were 43 cases of maternal morbidity that were reviewed by the MPHSC. We have included 11 cases in this report. Of these, 6 cases were felt to have been theoretically preventable and avoidable and were the result of errors in judgement. In all 6 cases a change in the type of medical care delivered could have altered the outcomes.

There were 68 stillbirths reported to the MPHSC in 2011. In addition there were 85 early and late neonatal deaths reported to the College. All these cases were reviewed by the medical consultant and many were reviewed by the MPHSC. Of those cases, 6 were judged to have been preventable or theoretically preventable. One case was classified as preventable with in hospital error in management and hospital resource issues identified as contributory factors in the care provided. One case was classified as theoretically preventable with error in documentation, error in communication, and error in judgement. In 2 cases, poor maternal judgement was thought to have affected the outcome. A further 2 cases were classified as theoretically preventable with physician error in judgement and technique which may have altered the outcome.

There were 237 cases of neonatal morbidities reported to the MPHSC in 2011. All of these cases were reviewed by the medical consultant and many were reviewed by the MPHSC. Of those cases, 20 were judged to have been preventable or theoretically preventable and avoidable. In 13 cases, errors in judgement could have altered outcomes and in 3 cases errors in technique by physicians were contributory factors and changes in medical management could have altered outcomes. There were also 3 cases attributed to in hospital error in management. In all the above cases, educational letters and educational activities took place for the health care workers involved. In 2 cases, compliance issues by patients may have contributed to observed perinatal morbidity.

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

- Human and physical resources have faced some challenges in 2011 in community hospitals, rural hospitals, and tertiary centres. Such resource challenges have been implicated in theoretically preventable perinatal morbidity and mortality cases. (Cases in example: I-C.6, I-D.7, I-D.14)

- Uncoordinated and slow processes in evaluating patients on presentation to triage areas have resulted in theoretically preventable perinatal morbidities. (Cases in example: I-D.8)
- Poor documentation pertaining to ultrasound reports or pertaining to indications for operative delivery have been associated with perinatal mortalities and morbidities. (Cases in example: I-C.10, I-D.9)
- Errors in judgement, technique, and management by health care workers have contributed to many of the maternal and perinatal morbidities and mortalities. Pediatric errors in technique and in management are exemplified in several cases. (Cases in example: I-C.1, I-C.2, I-D.1, I-D.2)
  - Obstetrical errors in judgement and management, particularly in the management of severe pre-eclampsia and in aggressive use of oxytocin in patients with a previous caesarean scar or in a multiparity resulting in uterine ruptures have caused theoretically preventable morbidities and mortalities. (Cases in example: I-B.1, I-B.2, I-B.3, I-C.3, I-C.5, I-D.3, I-D.5, I-D.13. For comparison see case II-B.2.)
  - Perinatology errors in judgement especially pertaining to management of intra uterine growth restriction following assessment by Doppler studies have also resulted in theoretically preventable perinatal mortalities. (Cases in example: I-C.3, I-C.4, I-C.5)
  - Errors in judgement by the hospital staff, including residents have resulted in theoretically preventable perinatal morbidities. (Cases in example: I-D.4, I-D.14)
- Incomplete assessment of patients prior to transfer have resulted in unexpected deliveries during transfer. (Cases in example: I-B.4, I-B.5)
- Absence or errors in communication have resulted in several theoretically preventable perinatal morbidities. Such communication issues arose between residents in training and the attending staff, or between referring health care workers such as midwives or family physicians and specialists. (Cases in example: I-C.6, I-D.4, I-D.6, I-D.14)
- The perils of home birth are exemplified in one case in 2011 (Case I-C.7).
- Patients' non-compliance with recommendations for medical therapy and or absence of prenatal care have contributed to several theoretically preventable maternal morbidities as well as perinatal morbidity and mortality cases. (Cases in example: I-B.6, I-C.7, I-C.8, I-C.9, I-D.11, I-D.12)

## New Developments

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The following is a summary of developments that were undertaken by the MPHSC during 2012 to 2014.

In 2012, an effort was undertaken to ensure that rural regional hospitals involved in the delivery of maternity care set up local standards committees for review of obstetric and perinatal cases and submit a review of such cases to the MPHSC. The review of cases was based on predefined abstraction criteria. The local standards committees send their reviews and classification of cases and whatever educational activity took place to the MPHSC. As a result, we are now receiving a broader network of reports from the majority of regional rural centres throughout the province compared to previous years.

By way of example, we now receive regular reviews from:

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

Over the past two years we have introduced a new perinatal review data sheet (see Appendix). The new data sheet includes revised abstraction criteria and a section on stillbirth causes checklist to remind the reviewers of possible causes of stillbirths during their reviews.

The MPHSC have also increased its cooperation with the College of Midwives of Manitoba particularly in review of cases of morbidity and mortality under the care of midwifery. Such collaboration has been congenial, beneficial and strengthens the bonds between the health care workers in maternity care.

With the cooperation of the Chief Medical Examiner of Manitoba, the MPHSC is 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.

# 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  $\geq 20$  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 7<sup>th</sup> full day of life
- **late:** between the 8<sup>th</sup> and 28<sup>th</sup> 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  $\geq 20$  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 7<sup>th</sup> full day of life
- **late:** between the 8<sup>th</sup> and 28<sup>th</sup> 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

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## 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.
- Recommend 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 for 2011. 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 maternal mortality in the province of Manitoba reported to the MPHSC in 2011.

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

### I. B.1

This case was reviewed for eclampsia. A 21 year old lady G1P0 presented to a community hospital at 34 weeks and 5 days with epigastric pain. Her blood pressure was noted at 150/98 mmHg. She denied any visual disturbances or headaches. Her liver enzymes proved to be abnormal with an ALT of 136 U/L and LDH at 437 U/L and a proteinuria of more than 3 g/L. Platelet counts initially at  $202 \times 10^6$  per  $\text{mm}^3$ . The emergency officer treated her with morphine and initiated a consultation to her family physician. She was discharged to see her family physician at his office.

The family physician immediately gave her some labetalol to lower her blood pressure and arranged for an immediate transfer to a tertiary centre. Her blood pressure upon transfer was 150/110 mmHg and she was described as being jittery. On the arrival to the tertiary centre her blood pressure was 150/110 mmHg and she was jittery with visual disturbances. Within minutes of arrival her blood pressure escalated to 180/120 mmHg followed by an eclamptic seizure. She was immediately started on magnesium sulfate and antihypertension agents. Given that her cervix was unfavorable, she underwent a caesarean section.

The baby had a weight of 1817 grams, consistent with a small gestational age baby. The Apgar scores were 9 and 9 and the umbilical arterial pH was 7.27.

The case was classified as theoretically preventable and avoidable with errors in management at the level of obstetrics with physician error in judgement and management pertaining to her assessment and management by the emergency officer in the community hospital emergency room. This lady should have received aggressive hypertensive therapy and should have been initiated on magnesium sulfate with immediate transfer to the tertiary centre.

An educational letter was sent to the Chief Medical Officer of the community hospital and educational activity was carried out with the emergency staff as well as with the physicians involved.

### I. B.2

This case was reviewed for uterine rupture. A 37 year old G2P1 lady had a previous caesarean section performed for failing to progress one year prior to this index pregnancy. She was admitted at 41 weeks gestation with premature rupture of membranes. Induction of labor with oxytocin was initiated within two hours of rupture of membranes and she progressed rapidly from 4 cm to full dilation within 5 hours. There were significant decelerations in the second stage of labour while pushing. This was followed by an episode of severe bradycardia.

A crash caesarean section was performed and at the time of surgery a uterine rupture was documented. The rupture consisted of near total avulsion of the uterine fundus from the lower segment. The rupture extended along the previous uterine incision and extended to the back wall of the uterus. She underwent a total abdominal hysterectomy. The baby was noted to be acidotic and was

born with Apgar scores of 0, 6 and 8 at 1, 5 and 10 minutes with an umbilical arterial pH of 6.99. The baby required positive pressure ventilation and was admitted to the Neonatal Intensive Care Unit.

The MPHCC had much discussion and classified this case as being theoretically preventable with physician error in judgement given the very early initiation of oxytocin in the context of a previous caesarean section done at less than two years inter pregnancy interval. Oxytocin initiated within two hours of spontaneous rupture of membranes was felt to have been too aggressive and inappropriate.

The case was reviewed with the physician involved and education activity took place.

### I. B.3

This is the second case reviewed for a uterine rupture. A 32 year old G3P2 with two previous vaginal births presented at 38 weeks gestation with irregular contractions. She was noted to be 5 cm dilated. Given irregular uterine contractions, she was given an epidural aesthetic for sciatica pain, and oxytocin augmentation initiated. An artificial rupture of membranes was also performed at the same time. She progressed quickly to full dilatation but the head remained at station 0 to -1 in an occiput position. Despite the fact she was having contractions every two minutes it was decided to increase the oxytocin. The fetal heart rate tracing became non-reassuring with recurrent deep variable decelerations and there was an attempt at vacuum delivery of an occiput posterior baby. The attempt was successful and the baby was born with an Apgar score of 2, 6 and 8 and a pH of 7.8. The baby's weight was 4084 grams.

In the immediate post-partum period the mother became unstable with hypotension. Her blood pressure dropped to 50/20 mmHg. She was placed in Trendelenburg position, given oxygen and her intravenous infusion was increased. A Code 25 was called and she was taken to the operating room. Upon entry of the peritoneal cavity it was noted that she sustained a uterine rupture involving the posterior wall of the uterus extending down to the cervix and upper vagina. Significant hemoperitoneum was noted. Estimated blood loss was 4 ½ liters. She did receive some of her cell saved blood.

This case was classified as theoretically preventable at the level of obstetric care with physician error in judgement given the further escalation in oxytocin despite very active, if not hyper stimulated, uterine activity. This hyperstimulation was felt to be the direct cause of the posterior uterine rupture and the significant maternal morbidity that ensued. An educational letter was sent to the physician involved as well to the staff of the labour unit.

### I. B.4

This case was reviewed for transfer of patient from a community centre to a tertiary centre without proper assessment. A 21 year old lady, G2P1 presented to a community hospital with spontaneous ruptured membranes and active labour. She was initially assessed to have been 2-3 cm dilated. Plans were under way to transfer the patient by ambulance to the hospital where she can deliver. Prior to transfer however the patient indicated to the physician that she felt like pushing. No

further pelvic assessment was carried out. She was placed in an ambulance without accompanying labour nurse or doctor.

She was crowning 10 minutes prior to the arrival at the receiving centre and delivered in the ambulance. There was shoulder dystocia which was managed successively by McRoberts maneuver, suprapubic pressure, an attempt to extract the posterior shoulder and finally by delivering the anterior shoulder. Baby was born with low Apgar scores and appeared to be limp at delivery and non-responsive but with further stimulation the baby started to cry. The Apgar score was 8 and 9 at 1 and 5 minutes.

The case was classified as theoretically preventable with in hospital error in management as it was felt that a pelvic examination should have been repeated prior to her transfer by ambulance especially with the patient's voiced complaints of needing to push just prior to departing by ambulance. The MPHSC was also concerned with the absence of a medical escort during the transfer. An educational letter was sent to the physician.

### I. B.5

This case was reviewed for transfer of patient prior to appropriate assessment. A 36 year old lady G2P1 presented to a community hospital in active labour and was examined by an emergency officer who found her to be fully dilated. Despite this finding he decided to transport the patient out of the community hospital to another community hospital for delivery. The patient was escorted by physician and delivered in the ambulance very shortly after leaving her community centre.

The case was classified as theoretically preventable with physician error in judgement. Given her full dilatation status in a multigravida and given the duration of time needed to arrive at the receiving hospital the patient should not have been transferred from her community setting. While the outcome of this delivery was a healthy baby the scenario could have resulted in significant maternal or prenatal morbidity. An educational letter was sent to the physician involved as well as to the VP of Medical Services where this patient was managed initially. Educational activity took place.

### I. B.6

This case was reviewed for maternal ARDS secondary to urosepsis. A 24 year old presented at 29 weeks gestation with dysuria. The urine culture showed evidence of E. coli infection. She was given nitrofurantoin treatment; however, she was not compliant with that treatment.

She presented a few days later to a tertiary centre with pyelonephritis. She was febrile and she developed shortness of breath and required intubation. She was noted to have ARDS that was felt to be secondary to the urosepsis. She was admitted to the intensive care unit and recovered fully.

The MPHSC classified this case as theoretically preventable with patient error in judgement because of non-compliance to the provided treatment.

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

### I. C.1

This case was reviewed for twin neonatal death. A 34 year old lady, G12P4 with a dichorionic diamniotic twin pregnancy presented at 22 weeks and 6 days gestation with spontaneous rupture of membranes. She received corticosteroids as well as antibiotics prophylaxis. She showed signs of chorioamnionitis at 24 weeks gestation and it was decided at the time to provide resuscitation. The birth was vaginal. Twin A had an umbilical arterial pH of 7.11 while Twin B had an arterial cord pH of 7.25. The birth weights of the babies were 700 grams and 750 grams respectively.

Twin A showed evidence of sepsis on the day of birth. The baby's blood grew extended spectrum beta-Lactamase resistance E. coli (ESBL), the baby deteriorated quite quickly and care was withdrawn. The baby as such died neonatally on day 1.

Twin B remained stable at birth and received ampicillin and gentamycin, later changed to ampicillin and cefotaxime; however, at 1 week of life this baby showed signs of sepsis. Infectious Diseases was consulted and recommended a change in antibiotics to cover ESBL E. coli which was not covered by the administered antibiotics. Unfortunately the recommendation came quite late and by then the baby had deteriorated and died. The maternal urine culture on the day prior to delivery also was growing ESBL E. coli.

The MPHSC raised the question of whether the antibiotic spectrum should have been adjusted, particularly for Twin B given the maternal antibiotic resistant E. coli in the urine and the sepsis from the same bacteria occurring in Twin A. The consensus was that Infectious Diseases should have been involved in the care of Twin B much earlier and the antibiotic regime should have been adjusted to cover for ESBL E. coli.

The MPHSC classified this case as theoretically preventable at the level of pediatric care with error in documentation, error in communication, and in hospital error in management pertaining to the delay in consulting with Infectious Diseases and the provision of inadequate antibiotic coverage to deal with the bacteria ESBL E. coli in Twin B.

### I. C.2

This case was reviewed for neonatal death from necrotizing enterocolitis. A 30 year old lady G7P4 was seen in a fetal assessment unit at a tertiary centre because of suspicion of intrauterine growth restriction at 34 weeks gestation. On fetal assessment, the baby was found to be severely small for gestational age with an abdominal circumference at less than the 10<sup>th</sup> percentile for 34 weeks. There was absent fetal movements on a non-reactive non-stress test. She delivered by caesarean section the same day. The baby had Apgar scores of 9 and 9 at 1 and 5 minutes with an umbilical arterial pH of 7.25.

Four days after birth the baby was lethargic with evidence of abdominal distention. Contrast abdominal x-ray demonstrated that the umbilical catheter had perforated the portal vein with extravasation of the transplacental nutrition fluid into the abdominal cavity. The baby's status deteriorated further and he developed pancytopenia pulmonary hemorrhage and seizures. Life support was withdrawn on day 6 of life.

The cause of death was a complication of an umbilical venous catheter perforating the portal vein. It was felt that closer attention to the position of the catheter and the use of a lateral view x-ray in addition to the anterior and posterior views may have prevented this death.

The MPHSC classified this case as theoretically preventable at the level of pediatric care with physician error in technique and judgement as a causative factor. A letter was sent to the Head of Neonatology at the tertiary centre. Further educational activity took place with the neonatology team.

### I. C.3

This case was reviewed for a stillbirth. A 33 year old lady, G1P0 was at 41 weeks gestation, when she presented in active labour; however, the fetal heart rate could not be auscultated and fetal death was confirmed. She delivered vaginally. At delivery, blood and meconium staining of the amniotic fluid was noted. This lady had a fetal assessment two days earlier.

The fetal assessment report was reviewed upon request from the MPHSC. This lady had a history of depression and was on Citalopram. Her Manitoba serum screening for aneuploidy was positive and an amniocentesis was performed revealing normal chromosomal count. She was seen by fetal assessment at 39 weeks and 5 days for concerns regarding small for gestational age; however, the baby abdominal circumference was on the 25<sup>th</sup> percentile for gestational age and the biophysical scoring was normal.

She was seen again at 41 weeks. At that visit the biophysical score remained normal with a recorded amniotic fluid pocket of 2.3 cm; however, the abdominal circumference did not change. Also, on review of the films of that assessment visit, it appears that the amniotic fluid pockets were in fact less than 2 cm. Given the finding of a small baby at 41 weeks gestation that demonstrated no further growth and amniotic fluid volume being reduced, this lady should have been offered an induction of labour that same day.

The MPHSC classified this case as theoretically preventable at the level of obstetrical care with physician error in judgement. An educational activity took place with the Perinatologist involved.

### I. C.4

This case was reviewed for a stillbirth. A 26 year old G1P0 lady had decreased fetal movement and loss of fetal heart tones at 41 weeks gestation. Her pregnancy was complicated by concerns regarding possible intrauterine growth restriction. She was first seen at a fetal assessment unit at 37 weeks gestation at which time the biophysical score was normal. The abdominal circumference was on the 20<sup>th</sup> percentile for gestational age with an umbilical arterial SD ratio of 3.07.

She was seen again at her obstetrician's office for a routine visit at 39+ weeks gestation at which time her symphysis fundal height was 34 cm and the fetal heart rate was normal. She was again seen at 41 weeks gestation when the fetal heart rate was shown to be quite bradycardic and she was sent to the triage unit where the fetal death was confirmed. She was induced and delivered a stillborn weighing 2493 grams.

This case was reviewed by the MPHSC and by another perinatologist. It was felt that this baby should have been reassessed for any evidence of increased middle cerebral artery flow at the initial ultrasound at 37 weeks gestation. Also a repeat ultrasound for fetal well-being should have been done soon after. The MPHSC classified this case as theoretically preventable at the level of obstetrical care due to physician error in management. An educational letter to the physician involved took place.

### I. C.5

This case was reviewed for a stillbirth. A 23 year old G1P0 allegedly had a smooth pregnancy and presented in active labour at 38 weeks gestation; however, fetal heart rate could not be found and fetal compromise was confirmed by sonography. While initially the hospital standards committee classified this case as non-preventable and unavoidable, further review by the MPHSC of this lady's perinatal record indicated that this lady suffered hypertension with diastole of 98 mmHg at 36 weeks gestation. This hypertension persisted at her visit at 37 weeks gestation.

Unfortunately no hematologic renal profile was done to assess kidney, liver and platelet functions. Dipstick testing showed trace proteinuria. There was no request for fetal assessments to assess the wellbeing of the fetus. Further concern was that her height of fundus measurements were quite small for gestational age, at 27 cm at 38 weeks gestation. At birth this baby weighed only 2080 grams. There were concerns with regards to management of her hypertension that was not treated nor evaluated and the severe intrauterine growth restriction was missed.

The MPHSC classified this case as being theoretically preventable at the level of obstetric care with physician error in management and physician error in judgement. Educational activity took place.

### I. C.6

This case was reviewed for a stillbirth. A 26 year old G3P2 lady developed gestational diabetes and was booked for an elective caesarean section. She had two previous caesarean sections. She presented at 38 weeks gestation with a stillbirth 3 days before her planned elective caesarean section.

This lady was being followed up by the Radiology Department for fetal assessments. There was an abnormal biophysical score; however, that result was not relayed to the physician involved in her care, nor was a written report sent to the physician in an expedited manner. The hospital standards committee was concerned with regards to absence of a mechanism by which such reporting is sent in an expedited manner to the physicians involved. There appeared to have been a system problem with the

amount of time that reports are sent to physicians. In this particular case, such a delay was felt to have caused harm.

The MPHSC has requested the standards committee at the hospital involved to discuss this case with the Hospital Administration as well as with the Radiology Department involved. The case was felt to be theoretically preventable with physician error in communication exacerbated by ultrasound resource issues at the hospital involved.

### **I. C.7**

This case was reviewed for possible intrapartum fetal death. A 32 year old lady, G2P1 with a previous caesarean section done for non-reassuring fetal status was planning a home birth in the current pregnancy. She was being followed up through midwifery care with an apparently smooth pregnancy. She was referred to the fetal assessment unit at 41 weeks gestation. Fetal movements were discussed with the patient.

She had another follow up appointment 4 days later; however, a day prior to her appointment she went into spontaneous labour. The patient called the midwife about her contractions which appear to have been quite mild at that stage. Ten hours later, she called the midwife again, and indicated that the contractions were now regular every 4 to 5 minutes, increasing in strength but not strong enough. She informed the midwife that she did not want her present at that time yet. Two hours later, the midwife was finally summoned to attend for assessment.

Upon arrival, the midwife attempted to hear the fetal heart rate and felt that the heart rate was at 120 BPM, but there was great difficulty in obtaining the fetal heart tones. Maternal pulse was also tachycardic at around 96 BPM. At that time she was 4 cm dilated. A repeat fetal heart rate assessment failed to identify fetal heart tones and so the patient was taken to the tertiary centre where fetal death was confirmed by ultrasound. She became fully dilated 3 hours later and delivered a stillborn.

The autopsy showed evidence of infant maceration indicating several hours of intrauterine retention following death and there was evidence of severe hypoxic ischemic encephalopathy consistent with global hypoxic ischemic event having occurred in utero. The case was raised to the College of Midwives of Manitoba for further review.

It was evident from the College of Midwives review that this patient's previous crash caesarean section affected her decisions with this index pregnancy. This lady wished to have as normal a birth as possible. There was a written birth plan that was discussed with the midwife. The home birth choice agreement was signed by both parents at 34 weeks gestation and indicated that they had understood the risks and benefits of attempting to deliver at home, possibility of need for emergency procedures, possibility for need to transport to hospital etc. It was also evident that the patient did not wish to have the midwife in the early stages of labour. The intrapartum assessment by the midwife and the need to transport the patient to the hospital met the Midwifery standards of care.

Given the post-dates status of this pregnancy, this patient attended a Fetal Assessment Unit and a consultation was carried out with a consultant. Induction of labour was discussed with the patient who declined this option. There was some concern raised by the midwifery review on documentation pertaining to what information the midwife gave the patient during the informed choice discussion on management of post-date pregnancy.

The College of Midwives standards review felt that this case was theoretically preventable with patient error in judgement. The MPHSC also felt that this case was theoretically preventable due to absence of continuous intrapartum fetal surveillance. The College of Midwives of Manitoba, have requested that the midwife consider her practice of offering trials of labour following previous caesarean section in a home environment especially in a post-term pregnancy, to which the MPHSC agreed.

*This case demonstrates the perils of refusal or delay in assessment and monitoring for maternal and fetal well-being, particularly for patients with a previous caesarean section undergoing a trial of labour. This also applies for post-date pregnancies in labour.*

### I. C.8

This case was reviewed for a stillbirth secondary to a diabetic fetopathy. A 20 year old lady G3P2 presented at 39 weeks gestation with premature rupture of membranes. A fetal heart rate could not be auscultated and a stillbirth was confirmed. She was hence transferred to a tertiary centre from a rural setting.

This lady had nearly absent prenatal care. At the time of her labour, her blood sugars were noted to be quite elevated. Her stillbirth workup otherwise was negative. It was felt that this baby's death was secondary to uncontrolled diabetes and was theoretically preventable with patient error in judgement in not seeking prenatal care.

### I. C.9

This case was reviewed for a stillbirth secondary to diabetic fetopathy. A 21 year old G2P1 lady had Type I diabetes as well as a seizure disorder. She was non-compliant with her prenatal visits and did not keep her endocrinology appointments that were arranged for her. She was also not taking her anti-seizure drugs as prescribed for her epilepsy.

At 30 weeks gestation she presented with intrauterine fetal death. Labour was induced and she had a vaginal delivery of a stillborn weighing 1604 grams. She was noted to have very elevated blood sugars above 11 mmol/L and her glycosylated hemoglobin A1C was greater than 8%. It was felt that this death was theoretically preventable with patient error judgement for non-compliance in management of her diabetes.

### I. C.10

This case was reviewed for a stillbirth secondary to placental abruption. A 32 year old G4P3 lady presented at 27 weeks gestation with total placental abruption. An emergency caesarean section was carried out for delivery of a 1610 gram baby. The baby was stillborn. An ultrasound was done just prior

to the caesarean section documenting a breech position but there was no mention of whether the fetal heart was noted to be pulsating or not.

Given that this lady had had no prenatal care, this fetal death and possibly the abruptio were felt to be theoretically preventable at the level of the patient with patient error in judgement in not seeking prenatal care. Educational activity took place to ensure that appropriate complete scanning and documentation is done for such cases. Documentation should indicate whether the fetus is alive or not prior to embarking on an abdominal delivery.

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

### I. D.1

This case was reviewed for neonatal seizures and NICU admission. A 22 year old nulliparous patient was at 40 weeks gestation with a pregnancy complicated by late onset gestational hypertension being treated with labetalol. The patient presented in active labour. The fetal heart rate tracing was concerning, so fetal scalp pHs were done showing normal pHs of 7.3.

This lady progressed to deliver vaginally of a 3229 gram baby with Apgar scores of 1 and 8 at 1 and 5 minutes. The umbilical arterial pH was 7.23 with a base deficit of 2.5. Given the low 1 minute Apgar score, the baby received positive ventilation pressure and was given Narcan; however, the glucose reading at 22 minutes was only 0.2 mm/L. A bolus of D10W was not given until more than 1 hour later. The baby was very jittery and had some respiratory distress and so was taken back to the NICU.

At 36 hours the baby demonstrated seizure activity that could not be explained based on intrapartum events. Infections as well as metabolic screens were negative. An MRI done of the fetal brain at 60 hours of age showed cortical edema in the interior cerebral artery distribution area. Ischemic changes on the MRI of the brain were also described.

The committee reviewed this case at length and it appeared that the baby's seizures could not be explained by intra partum events; however, there was a concern of the finding of severe hypoglycemia at 23 minutes of age that was not treated until more than an hour later. The case was hence classified as theoretically preventable at the level of pediatric care. A letter was raised to the Section Head of Neonatology for review and educational purposes.

### I. D.2

This case was reviewed for neonatal seizures. A 32 year old G3P2 lady presented at 31 weeks gestation with antepartum hemorrhage secondary to abruption of placenta. An emergency caesarean section was carried out within a short time delivering a baby weighing 1599 grams with Apgar scores of 9 and 9 at 1 and 5 minutes. The umbilical vein pH was 7.35 and the base deficit was 1.8. Lactate was 2.0. The baby needed respiratory support in the first 24 hours with CPAP. The baby developed a small pneumothorax.

At 28 hours of age, the baby developed severe pulmonary edema after receiving an accidental fluid overload of 155 cc of TPN over a 40 minute period. The baby went on to have grade IV intraventricular hemorrhage and possible seizures as a result.

This case was reviewed by the hospital standards committee as well as by the MPHSC and it was felt that the morbidity was iatrogenic. The case was classified as theoretically preventable at the level of pediatric care. As a result, this case was reviewed by a Critical Incident Team at the hospital involved

and appropriate steps to avoid accidental overloading with TPN were identified and explored. Educational activities took place.

### I. D.3

This case was reviewed for NICU admission for newborn asphyxia. A 30 year old lady, G6P4 with a previous caesarean section had morbid obesity and was found to have gestational diabetes. She was treated with insulin. At 37 weeks gestation she underwent an amniocentesis to document fetal lung maturity. The biophysical score was 8/10. The nonstress test was borderline. The right atrium of the fetus was found to be dilated and the umbilical arterial Doppler showed absent end diastolic flow. A caesarean section was done the next morning.

The baby weighed 3341 grams with Apgar scores of 1, 6 and 7 at 1, 5 and 10 minutes. The umbilical arterial pH was 6.94 and the base deficit was 14. The baby required resuscitation with positive pressure ventilation and intravenous fluid. The baby also required CPAP for 17 hours and had pulmonary hypertension. A chest x-ray showed cardiomegaly.

The MPHSC as well as the hospital committee questioned why the delivery was delayed for 24 hours after the original fetal assessment showed concern, particularly with the presence of an enlarged right atrium, absent end diastolic flow and an equivocal nonstress test. It was felt that the baby may have suffered some further deterioration in it's metabolic state during that period of time. The MPHSC classified this case as theoretically preventable at the level of obstetrical care with physician error in judgement. The attending physician was made aware of the concerns and further educational discussion with the involved parties took place.

### I. D.4

This case was reviewed for fetal acidosis and a prolonged NICU stay. A 28 year old G2P0 presented at 40 weeks gestation in spontaneous labour. She was at 4 cm dilatation and the fetal heart tracing by electronic fetal monitoring was normal. In the second stage of labour the fetal heart rate started to show evidence of fetal tachycardia of more than 200 bpm for more than 1 hour. The Resident house staff following the patient ordered the patient to start pushing but it was two hours before the patient delivered. The attending physician was unaware of the abnormalities in the second stage of labour.

The baby was delivered with Apgar scores of 4, 6 and 7 at 1, 5 and 10 minutes with an umbilical arterial pH of 7.05 and had to be admitted to the NICU for management of neonatal acidosis. The case was felt to have been preventable at the level of obstetrical care with in hospital error in management pertaining to absence of communication by the resident to the attending physician, and pertaining to the judgement of the resident to pursue pushing in the context of an abnormal fetal heart rate tracing when delivery was not imminent. Educational activities with the parties involved took place.

### I. D.5

This case was reviewed for neonatal encephalopathy and a low 5 minute Apgar score. A 26 year old G1P0 lady who was morbidly obese with a BMI of 47 had a smooth course of pregnancy. She presented in active labour at 40 weeks and 5 days at which time she was admitted at 7 cm dilatation. An epidural anaesthetic was initiated at 8 cm dilatation and then oxytocin augmentation took place at 9 cm, only 4 hours after admission. She became fully dilated 4 hours later but by then had a fever. Antibiotics were started and her second stage of labour was three hours long, during which the uterine contraction activity was in a state of tachysystole. The fetal heart rate was non-reassuring, showing evidence of tachycardia and with loss of variability and late decelerations.

The baby was born depressed at birth and had Apgar scores of 1, 5 and 7 at 1, 5 and 10 minutes with an umbilical arterial pH of 7.02 and a base excess of 11. The baby weighed 4046 grams. At 20 hours of age, seizure activity was noted. An MRI showed extensive cortical changes on day 5.

The MPHSC could not determine the timing of the hypoxic ischemic insult of the baby's brain. The baby also did not qualify for therapeutic hypothermia. The committee expressed concern that the last three hours of this lady's labour in the second stage may have been mismanaged. The fetal heart rate tracing was non-reassuring, tachysystole was documented and yet oxytocin was continued and, in fact, increased during the second stage of labour. The committee felt that this case was theoretically preventable at the level of obstetrical care with physician error in judgement. A letter of education was sent to the physician involved in the management of this case and the hospital committee sent a letter of education to the staff involved.

### I. D.6

This case was reviewed for low Apgar scores and neonatal pulmonary hypertension. A 24 year old nulliparous patient presented in spontaneous labour at 41 weeks gestation after a normal pregnancy. At 7 cm dilatation, an artificial rupture of membranes was done revealing thick meconium. Forty-five minutes later, she felt an urge to push and the cervix was at a rim dilatation. The electronic fetal monitoring revealed a fetal heart rate in a state of severe decelerations with baseline bradycardia.

The patient did deliver 50 minutes later with the persistence of the decelerations and bradycardia. The baby had Apgar scores of 6 and 6 at 1 and 5 minutes with a pH of 7.07 and a base excess of -15. The baby suffered meconium aspiration and subsequently developed pulmonary hypertension. There was no CNS damage.

This lady was being managed in labour by a midwife. There was a delay in the consultation of the obstetrical specialist of about 20 minutes prior to delivery and after nearly 60 minutes of an abnormal tracing. The Resident house staff was the first on the scene and assessed the patient but did not facilitate delivery as it did not appear that there was a transfer of care. Nevertheless the attending was called. It was the impression of the resident and the attending physician involved that the midwife asked the obstetrical service to assess fetal position but not to facilitate the delivery.

The MPHSC was concerned regarding interprofessional communication. It was obvious that the consultation to the obstetrical service was not voiced clearly and the house staff did not communicate

the urgency of the case to the attending physician involved. This case was reviewed by both the MPHSC as well as by the College of Midwives of Manitoba and both felt that the case was theoretically preventable at the level of combined midwifery and obstetrical care. It was felt by both committees that the interprofessional communication was an issue. The reason for the consultation including its urgency could have been carried out effectively and that the house staff resident could have communicated the urgency of the case to the attending physician with more clarity. Educational activities took place for all parties involved. Both parties have been asked to attend the team STEPPS program on communication between inter-disciplines.

### I. D.7

This case was reviewed for low Apgar scores and NICU admission following a prolapsed cord. A 25 year old lady G2P0 presented in spontaneous labour at term and was 3 cm dilated. Seven hours later an artificial rupture of membranes was done to augment labour; however, four hours later, deep variable decelerations were noted. The physician was informed by the nurse of the development. The physician involved in the care of this patient was not on site. Another physician on the same unit who was attending another delivery placed an electronic fetal scalp electrode for fetal monitoring and left to go back to the other delivery. The primary attending physician arrived half an hour later.

On examination, a cord prolapse was noted. The patient was placed in Trendelenburg position. Another physician was called in to place pressure on the fetal head and relieve pressure off the cord. A crash caesarean section was ordered. During that time, the physician who was compressing the head felt that the cord had stopped pulsating. As the surgeon was on his way, the caesarean section was initiated by the emergency officer. The anaesthesiologist, who was in house attending to another patient in the operating room, came in to assist with the case. The baby was born flat with Apgar scores of 0, 2 and 6 at 1, 5 and 10 minutes. No cord pHs were documented.

In retrospect, it appeared that the hospital staff worked together well to save this baby. It was fortunate that the emergency physician had experience with caesarean sections and that the anaesthesiologist was on site; however, this case raised multiple concerns. The standards committee questioned whether the artificial rupture of membranes was done appropriately of a time when the head was applied to the cervix. Another concern was that the primary physician who initiated the artificial rupture of membranes was not on site, there was only one emergency officer and another physician who was tied up with another delivery. With the departure of the emergency officer to do the caesarean section, the emergency room was left without a physician and the only other physician who was on the labour floor had to assist with the transfer of this patient to the operating room, leaving the labour floor with no physicians while deliveries were ongoing.

This case exemplifies the problems of the availability of physicians that face many hospital units, especially in rural areas. Thankfully, this case had a good outcome; however, the MPHSC supported the local hospital standards committee to review physician resource issues. This case was classified as theoretically preventable in obstetrical care with physician error in judgement in performing the artificial rupture of membranes and suboptimal physician coverage secondary to human resource issues. The MPHSC has asked the Chief Medical Officer of the hospital to review its policies with regards to in house physician coverage, particularly for the maternity units.

### I. D.8

This case was reviewed for low Apgar scores and term neonate admission to the NICU. A 29 year old lady, G9P3 presented at 39 weeks and 6 days gestation with elevated blood pressures of 140/100 mmHg. She was admitted to the triage unit for assessment, but unfortunately, was not actually evaluated for another 2 hours, at which time she started to have antepartum hemorrhage, which was diagnosed immediately as being secondary to placental abruptio. She was immediately taken to the case room where a crash caesarean section was carried out.

The baby had Apgar scores of 0, 2 and 5 at 1, 5 and 10 minutes with an umbilical arterial pH of 6.68. The baby weighed 3000 grams. An MRI showed hypoxic ischemic encephalopathy with periventricular leukomalacia. Abruptio placenta was confirmed by pathology.

The MPHSC was concerned with regards to the delay in assessing this patient upon her arrival to the triage area. The case was classified as theoretically preventable at the level of obstetrical care with in hospital error in management. Subsequent to that case, the process by which patients are being assessed in the triage area has changed at the hospital involved. The patient is interviewed by a triage nurse upon presentation to the triage desk.

### I. D.9

This case was reviewed because of birth trauma with resultant Erb's palsy. A 34 year old G3P2 presented at 41 weeks gestation in spontaneous labour. She had good progress and had a second stage of labour of only 20 minutes. Assisted vaginal delivery was carried out with a Kiwi vacuum. Indication is uncertain. The physician was then faced with a shoulder dystocia and the baby was born with Apgars of 4 at 5 minutes. The baby was subsequently noted to have Erb's palsy.

Upon review of the chart, it was noted that there was poor documentation, particularly with regards to the reasons for which the vacuum vaginal delivery was performed. It remains uncertain of the fetal position, the station, and the indications. Correspondence with the attending involved showed that the fetal heart rate tracing was in fact normal. While the committee members felt that it was quite difficult to classify this case with regards to management, it was obvious that there was an error in documentation by the physician involved. An educational letter was sent to the physician involved.

### I. D.10

This case was reviewed for admission to the NICU. A 23 year old G1P0 presented with unknown dates and no prenatal care. This was a concealed pregnancy. She arrived to the triage area fully dilated. There was thick meconium. A fetal heart rate tracing showed deceleration but not severe enough to warrant an operative delivery.

At birth the baby had Apgar scores of 3 and 8 at 1 and 5 minutes, but surprisingly, no cord arterial blood sample was obtained. The baby suffered neonatal meconium aspiration. The case was classified as theoretically preventable with patient error in judgement. Equally, a letter of education was sent to the physician involved with regards to the importance of confirming cord pHs after birth, particularly for newborns who are at risk for neonatal morbidity.

### I. D.11

This case was reviewed for low Apgar scores and severe acidosis. A 19 year old G2P1 presented at 40 weeks gestation with decreased fetal movements. The fetal heart rate tracing showed deep variable decelerations and irregular contractions. It was the intention to manage this lady on the labour floor but the patient left against medical advice. She returned 12 hours later with a fetal heart rate that was ominous.

Thick meconium was noted in the vagina and the patient initially refused to have a caesarean section. She finally agreed to have a caesarean section when the fetal heart rate was in extreme bradycardia, between 50-60 BPM. A crash caesarean section was then done. The baby weighed 2944 grams with Apgar scores of 2 and 5 at 1 and 5 minutes and an umbilical arterial pH of 6.9 and a base deficit of 14 and a lactate of 19. The baby suffered severe neonatal acidosis and required ventilator support but fortunately had no encephalopathy.

This case was classified as theoretically preventable with patient error in judgement.

### I. D.12

This case was reviewed for low Apgar scores and neonatal seizures. The patient was a G1P0 of unknown age, presenting at 29 weeks gestation with signs of severe pre-eclampsia in the context of chronic kidney disease. Delivery was by caesarean section. The baby weighed 1018 grams and had Apgar scores of 1 and 5 and 1 and 5 minutes with a arterial cord pH of 7.14.

The baby suffered seizures at 16 hours of age and was treated with phenobarbital for 4 days. An MRI was normal. On further evaluation, this lady was abusing OxyContin frequently. The neonatal seizures that occurred at 16 hours of age were felt to have been related to withdrawal from OxyContin. This case was classified as theoretically preventable with patient error in judgement.

### I. D.13

This case was reviewed for fetal acidosis. A 24 year old primigravida lady with a monochorionic diamniotic twin pregnancy presented in preterm labour at 28 weeks gestation. On admission, she was 1 cm dilatation. She was given steroids. It was the plan to give her indomethacin; however, she fell

asleep during observation on the Labour Floor and when she awoke two hours later she was at 9 cm dilatation.

Twin A was cephalic and Twin B was in a transverse lie. It was decided to proceed with a caesarean section which happened an hour after she was diagnosed at being 9 cm. The caesarean section was difficult in that Twin A had to be delivered as a breech and Twin B which was in transverse lie delivered as cephalic. Twin B's Apgar scores were 1, 5 and 7 with an arterial cord pH of 6.95 and a  $pCO_2$  of 109 mmHg. The base excess was -14.

Upon review of this case, it was evident that this lady was not adequately monitored during her stay on the Labour Floor. She had short term monitoring when she was first admitted. The monitors were off when she was asleep, and even when she was diagnosed at 9 cm dilatation and for the full hour prior to her caesarean section, she was not being monitored. The fetal acidosis of Twin B was felt to have been secondary to respiratory acidosis explained by the events of her caesarean section of a difficult delivery.

While the hospital committee classified this case as non-preventable and unavoidable, the MPHSC classified this case as theoretically preventable with a combined physician error in judgement and in-hospital error in management pertaining to inadequate fetal monitoring prior to birth, and because the caesarean section that was not done expeditiously.

## I. D.14

This case was reviewed for neonatal acidosis. A 19 year old G2P0 presented at 40 weeks gestation in the latent phase of labour. She was discharged from the triage several times. The attending physician felt that she should be augmented but unfortunately the Labour Floor was full on these occasions and she was repeatedly sent home. She returned to the hospital three hours after discharge and she was noted to be active phase of labour at 6-7 cm. Her blood pressures were noted to be at 150/90 mmHg but she was monitored intermittently for a period of 4 hours. After that time, electronic fetal monitoring was started which showed reduced variability and late decelerations. The house staff resident was called and a fetal scalp electrode was placed. The interpretation at that time was that the tracing showed moderate variability; however, the concern regarding the tracing was not related to the attending physician.

It was 3 hours later that the physician was notified, who, upon reviewing the tracing, called for an immediate caesarean section. Unfortunately, the operating rooms at the centre were occupied and the patient was taken to a delivery room which was not an obstetrical operating room and an epidural was initiated. This epidural did not work well so she was underwent general anaesthetic.

The baby was born with Apgar scores of 1, 6 and 7 at 1, 5 and 10 minutes and weighed 3945 grams with an umbilical arterial pH of 6.88 and a base deficit of 23. The baby had to be suctioned for thick meconium and was admitted to the NICU for observation.

There were several concerns raised by the hospital review committee as well as by the MPHSC with regards to the nature of fetal monitoring when this lady first came into the triage area with hypertension. The monitoring was carried out by intermittent auscultation instead of continuous

electronic fetal monitoring. The second concern was that when electronic fetal monitoring was initiated, the fetal heart rate was misinterpreted. No communication took place between the nursing or resident staff with the attending involved. This outcome may have been impacted by inadequate space and human resources for the management of this patient. The attending physician wished her to be augmented after her recurrent admissions to the triage area with latent phase of labour. This could not be done due to lack of space and nursing resources. Equally, when a caesarean section was called for, both obstetrical operating rooms were occupied and the patient had to be done in a room not normally used for operative obstetrics.

As a result, the MPHSC classified this case as theoretically preventable with in hospital error in management and concerns regarding resource issues. An educational letter was sent to the hospital staff involved. Concerns were raised to the Team Manager with regards to the nature of fetal monitoring initiated when hypertension was diagnosed, and the non-compliance with the “escalation protocols” available at the institution. The Registrar of the College of Physicians and Surgeons of Manitoba was also notified of this case and a letter was forwarded to the WRHA with regards to concerns on resource issues in a tertiary centre.

## **II. Non-Preventable and Unavoidable:**

### **A. Maternal Mortality**

There were no cases of maternal mortality in the province of Manitoba reported to the MPHSC in 2011.

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

### II. B.1

This case was reviewed for postpartum eclampsia. A 24 year old G1P0 lady presented with elevations in her blood pressure two days prior to delivery at 39 weeks gestation. Her blood pressures were 133/90 mmHg. The pre-eclampsia work up was negative and she was given labetalol and was discharged home. Two days later she presented with spontaneous labour and on admission she was noted to have elevated blood pressures between 147/101 mmHg and 160/90 mmHg. Artificial rupture of membranes was carried out and she was augmented with oxytocin. Throughout labour her blood pressure remained at 145/90 mmHg. She had a normal vaginal delivery of a baby weighing 3626 grams with Apgar scores of 8 and 8 at 1 and 5 minutes.

In the immediate postpartum period her blood pressure remained borderline occasionally reaching 135/90 mmHg. She was discharged on the third day postpartum but was not given any hypertensive agents.

She was re-admitted two days later after she had a seizure at home. She was taken to a community hospital close to home where she had another seizure and then was immediately transferred to a tertiary centre where she was treated with magnesium sulfate, diazepam and labetalol. When she was received at the tertiary centre her blood pressure was 140/90 mmHg and she was demonstrating no proteinuria. Her pre-eclampsia workup showed mild elevation of the transaminases but these were less than 100 U/L and her platelet count was normal.

The MPHSC felt that this case of postpartum eclampsia was atypical. It was thought to be atypical given the blood pressure was only borderline and she was not demonstrating any other changes consistent with pre-eclampsia. It was felt that her management around the delivery time was appropriate and that she was discharged in a good stable condition without need for antihypertensives. As such this case was classified as non-preventable and unavoidable.

### II. B.2

This case was reviewed for uterine rupture. A 24 year old G2P1 with a previous caesarean section for a breech presentation presented at 40 weeks gestation, 4 cm dilated in active labour. An artificial rupture of membranes was done and she progressed quite rapidly from 4 cm to an anterior lip within 1 ½ hours.

At anterior lip fetus sustained an acute bradycardia at which time she was taken immediately to the operating room and a caesarean section was carried out. The fetal heart rate at the time was 40 beats per minute. Upon entry it was evident that the uterus had ruptured at her previous caesarean section scar. There was hemoperitoneum and the placenta was found freely floating in the abdomen. The Apgar scores were 3 and 8 at 1 and 5 minutes and the cord pH was 6.96.

Upon review, it was felt that the delivery was carried out in a very expeditious manner. She was being monitored in labour and that the response of the staff to the acute bradycardia was timely and appropriate. The baby was delivered 18 minutes after the onset of the bradycardia.

The MPHSC felt that the management of this case was satisfactory and as such it was classified as non-preventable and unavoidable.

It should be noted that the physician initially was planning to use oxytocin to augment labour but this was delayed. Despite the absence of oxytocin, this lady did sustain a rupture of the uterus. A letter of education was sent to the physician involved regarding caution with the idea of using augmentation with oxytocin in patients with a previous caesarean section. Nevertheless, uterine ruptures occur at a rate of 1 in 200 cases and are a known complication of trials of labour with a previous caesarean section.

### II. B.3

This case was reviewed for abdominal hematoma and venous thrombosis. A 28 year old lady, G8P7 presented at term with a breech presentation. She underwent a caesarean section for a frank breech. Membranes were intact. The baby was delivered with Apgar scores of 3 and 8 at 1 and 5 minutes.

Post operatively, this lady developed a wound hematoma which got infected and had to be opened, drained and she was treated with intravenous antibiotics. A clot was expressed from the hematoma site and her hemoglobin dropped. A CT scan was carried out at that time, showing the hematoma to have been quite extensive, measuring 16x5 cm in the subcutaneous tissue. With the CT scan there was an incidental finding of a thrombus in the inferior vena cava and this was further confirmed by an ultrasound which documented a 5 cm long mobile clot in the inferior vena cava.

Hematology was consulted and anticoagulation was started with Heparin and Coumadin. She had an episode of shortness of breath and a VQ scan showed a high probability of pulmonary embolism. Vascular Surgery was consulted but it was decided not to proceed with the placement of an IV filter. Because of her anticoagulation she kept bleeding into her hematoma.

Despite the fact that she was delivered with intact membranes, this baby was noted to have neonatal herpes and developed an encephalopathy and died. The mother underwent serologic testing and was found to be IgM positive for herpes virus Type II. There was no clinical evidence of maternal herpes viremia or vulvar lesions at the time of birthing.

Of note is that on further review of the case, this lady did receive prophylactic heparin post-operatively and despite the administration of heparin, she still sustained a thrombus in the vena cava, but, the prophylactic heparin as well as the subsequent therapeutic anticoagulants administered after the diagnosis of the thrombus, may have contributed to the initial appearance and sustenance of the hematoma.

The MPHSC felt that the obstetrical management was appropriate and that hematoma and venous thrombosis are known complications of such surgeries and as such the case was classified as non-preventable and unavoidable.

## II. B.4

This case was reviewed for maternal admission to the Intensive Care Unit. A 35 year old lady, G1P0 presented in active labour at 40 weeks gestation. She had appropriate prenatal care, was essentially healthy and progressed quickly in the first stage of labour, but had a relatively prolonged second stage of labour because of an occiput transverse fetal position. She delivered vaginally of a baby that weighed 3623 grams with Apgar scores of 8 and 9 at 1 and 5 minutes.

The third stage of labour was complicated by a retained placenta for more than one hour. She was taken to the operating room for manual removal of the placenta but during the attempt the mother sustained bradycardia followed by asystole. The mother was resuscitated requiring chest compressions for two minutes. She was intubated and was taken to the Intensive Care Unit.

It was felt that the bradycardia could have been the result of either an air or amniotic fluid embolism or could have been a the result of a severe vagal reflex. She stayed in the Intensive Care Unit for half a day and recovered fully. She was transfused with two units of packed cells for a hemoglobin of 61 g/L. She was discharged home on day 3 post-partum.

The MPHSC did not feel there was any error in the management of this patient and hence this case was classified as non-preventable and unavoidable.

## II. B.5

This case was reviewed for maternal admission to the Intensive Care Unit. A 30 year old lady, G2P1 presented fully dilated at 36 weeks and 4 days gestation. The baby was in a transverse lie with a back down. She underwent an emergency caesarean section and the baby was delivered as a total breech extraction. The extraction itself was quite difficult but the baby's Apgar scores were 1, 6 and 7 at 1, 5 and 10 minutes, and the arterial cord pH was 7.29. She had 800 ccs of blood loss in the operating room followed by at least 300 ccs of vaginal blood loss in the immediate postpartum period.

Two and a half hours later, while still in recovery, she was noted to become hypotensive and her blood pressure dropped to 55/35 mmHg and the heart rate was 30 bpm. She was transferred to the operating room and observed there for 4 hours.

Given her bradycardia, there was a question of whether her hypotension was a result of vagal episode. Serial hemoglobins were performed and while those remained relatively stable, she was complaining of increasing abdominal pain and she was noted to have increasing abdominal girth. At that point it was decided to proceed with a laparotomy and she was noted to have 2 liters of

intraperitoneal blood loss. She was transfused with two units of packed cells. Her intraoperative hemoglobin was 99. She was admitted to the Intensive Care Unit for a brief stay.

Upon review it was felt that the case was managed appropriately. She was carefully observed and the decision to proceed with the laparotomy was appropriate after the period of observation. The case was classified as non-preventable and unavoidable.

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

### II. C.1

This case was reviewed because of a stillbirth. A 34 year old G1P0 had a pregnancy complicated by increased maternal serum alpha feta protein and uterine artery notching in the early second trimester. She was followed serially by the fetal assessment unit until 34 weeks gestation at which point the baby's growth was estimated to have been on the 25<sup>th</sup> percentile for gestational age with a normal biophysical score and normal umbilical arterial Doppler results. This conformed to a standard of practice at the fetal assessment unit in which a fetus with unexplained high serum screening alpha feta protein is assessed until 32 weeks. If the fetal growth was adequate and the biophysical score was normal, the patient is discharged to clinical follow up.

At 37 weeks gestation the height of fundus was noted by her obstetrician to be at 32 cm and so a request for repeat fetal assessment was undertaken. The patient was given an appointment 5 days later at which time, unfortunately, fetal demise was found. The ultrasound demonstrated absolute oligohydramnios. The baby's abdominal circumference was measuring at less than the 10<sup>th</sup> percentile for gestational age. The pregnancy was induced and the baby's weight was 1805 grams. Placental pathology showed fibrin deposition. It was confirmed that the cause of the stillbirth was utero placental insufficiency.

After much discussion at the level of the hospital standards committee, the WRHA Women's Health Standards Committee and the MPHSC, it was felt that the management met standards of practice. It was reasonable to discharge the patient to clinical follow up when the baby proved to have adequate growth and had normal Dopplers at 34 weeks gestation. It was regrettable that when at 37 weeks gestation the height of fundus was noted to be small that fetal testing was not undertaken more urgently. The case was classified as non-preventable and unavoidable.

It should be noted that late onset fetal growth restriction is a problem that contributes to over 50% of unanticipated stillbirths at term. Unfortunately this form of late onset growth restriction often goes undetected and there are few Doppler abnormalities that may prompt further intervention. Increased middle cerebral artery flow and an increased cerebral to placental flow ratio are two findings that indicate impending fetal jeopardy.

### II. C.2

This case was reviewed for a neonatal death of a member of a twin. A 26 year old G7P4, was pregnant with a dichorionic twin gestation. At 17 weeks gestation Twin B had premature rupture of membranes and oligohydramnios. Twin A maintained normal amniotic fluid volume and the patient received antibiotics as well as steroids to reduce risk of prematurity complications. This lady started to bleed at 28 weeks gestation and an emergency caesarean section was undertaken as the presenting twin was a breech. Twin B had Apgar scores of 3 and 6 at 1 and 5 minutes respectively. Ventilation was

very difficult, likely because of pulmonary hypoplasia. This baby was also bleeding from the rectum and from the umbilical stump. Life support was withdrawn two hours after birth.

Twin A had a prolonged NICU stay, but was live. The neonatal death of Twin B was felt to have been non-preventable and unavoidable.

### II. C.3

This case was reviewed for neonatal death of a member of a twin. A 21 year old lady, G3P2 was pregnant with dichorionic twins. She presented at 29 weeks gestation with pelvic bleeding and was noted to be 9 cm dilated. She has had a previous classical caesarean section and so she underwent an emergency caesarean section. Twin A was born with Apgar scores of 5 and 7 at 1 and 5 minutes, weighing 1230 grams. Unfortunately, cord gas analysis could not be done due to an insufficient sample, but the baby suffered respiratory difficulty and required escalating support and was finally placed on an oxygen jet. The baby developed pulmonary hypertension and metabolic acidosis, deteriorated and had cardiac arrest.

On autopsy the baby had pericardial infusion as well as Grade III intraventricular hemorrhage. The pericardial infusion was subsequently confirmed to be 12 cc of fluid consistent with TPN fluid. When the catheter was inserted, the initial x-ray showed it was too far and so it was pulled back 1 cm. A subsequent x-ray confirmed good placement.

Proper steps have been taken to establish the placement of the catheter prior to initiating of parental feedings. Perforation of the atrial wall is a rare but possible complication of an umbilical venous catheter placement. Given that the appropriate steps have been taken to ensure proper placement, this case was classified as non-preventable and unavoidable.

Twin B survived and had a prolonged NICU stay.

### II. C.4

This case was reviewed for a stillbirth in a member of a twin. A 30 year old G2P0 was pregnant with a monochorionic diamniotic twin pregnancy. This lady was referred to early fetal assessments because of an increased alpha feta protein. At 22 weeks gestation, fetal growth discordancy was noted with the smaller fetus having absent end diastolic flow in the umbilical artery. At 25 weeks, the smaller twin had umbilical artery reversed end diastolic flow and the middle cerebral artery flow was increased suggestive of twin anemia-polycythemia sequence (TAPS). It was decided to manage the pregnancy expectantly with ongoing surveillance.

At 28 weeks gestation, growth discrepancy between the two twins was 43% with the bigger twin weighing an estimated 1224 grams while the smaller twin had an estimated weight of 702 grams. Betamethasone course was initiated and neonatology was consulted.

The pregnancy was followed up at the fetal assessment unit every 2-3 days. At 28 2/7 weeks, both fetuses had biophysical scores of 8/8 with the estimated fetal weight of the growth restricted fetus being 550 grams. Two days later that twin died in utero. The bigger twin had elevated MCA-PSV consistent with severe anemia. A fetal transfusion was performed the same day. Subsequent fetal surveillance of the surviving twin was felt to be normal.

At 33 ½ weeks gestation, premature rupture of membranes occurred followed by spontaneous labour. The surviving twin was delivered vaginally weighing 1967 grams with Apgar scores of 8 and 9 and an umbilical arterial pH of 7.3. The family declined autopsy on the deceased twin.

It appeared that the plan was to deliver the twin at 28 weeks, when the status of the smaller twin became dismal, given that steroids were administered and neonatology was consulted; however, this lady was not delivered at that time.

Further review indicated that there was no documentation of what the plan was after, and whether the Doppler studies were even done on the smaller twin after that time. There was no documentation of whether cord occlusion was carried out to avoid the risk of hemorrhage of the larger twin into the smaller, dead twin. The review acknowledged that there was insufficient literature to guide the perinatologist on the minimum threshold of growth discordance at which cord occlusion can minimize harm for the appropriately grown twin.

After much review and debate, the committee felt that this case could be classified as non-preventable and unavoidable.

## II. C.5

This case was reviewed for neonatal death. A 36 year old G5P3 SA1 lady had pre-existing hypertension and was being treated with Adalat. At 27 weeks gestation, her hypertension worsened and she was admitted to hospital and the fetus was monitored through fetal surveillance. The fetus had suffered intrauterine growth restriction and at 29 weeks gestation, the baby was noted to have absent end diastolic flow in the umbilical artery so an emergency caesarean section was done.

The baby had Apgar scores of 1, 3 and 6 at 1, 5 and 10 minutes with an umbilical arterial pH of 7.17. The baby weight 1000 grams with the placenta weighing 166 grams. The baby did well for 1 week, then became septic and grew bacillus cereus in the blood stream and in the spinal fluid. There was progressive neurologic deterioration and an MRI showed extensive encephalitis with hemorrhagic necrosis. The care was withdrawn and the baby died neonatally.

The management was felt to have been appropriate and the case was classified as non-preventable and unavoidable.

## II. C.6

This case was reviewed for a stillbirth. A 24 year old G1P0 developed hypertension and was transferred to a tertiary centre with a diagnosis of fetal death in utero. This lady had a history of schizophrenia and was on Seroquel. She had previously been admitted to a Psychiatry Unit. The baby weighed 595 grams at 28 weeks. Labour was induced with Misoprostol and an autopsy demonstrated placental infarcts and hypoxic ischemic changes in the brain.

It was questioned whether this lady was receiving any prenatal care; however, we were unable to locate any physician or midwifery service responsible for her care and it is likely that she did not seek prenatal care. Given her psychiatric status, the committee felt that her classification could be that of non-preventable and unavoidable.

## II. C.7

This case was reviewed for a stillbirth. A 35 year old G5P3 known to have gestational hypertension treated with Labetalol. She previously had sustained deep venous thrombosis and was on dalteparin. This lady was morbidly obese at 325 lbs. Her glycosylated hemoglobin was 6.1% and her screening for gestational diabetes was negative at 7.3 mmol. She presented with a stillbirth at 40 weeks gestation. She was induced and delivered.

The autopsy demonstrated evidence of hypoxic encephalopathy. Maternal serology screen was negative for viral infections. Further review of her prenatal record indicated adequate blood pressure control with pressures post treatment being at 120-130/80 mmHg. She was also being seen in the fetal assessment on a weekly basis during the last six weeks of her pregnancy. The biophysical score remained normal and the growth was adequate with an abdominal circumference being on the 60<sup>th</sup> percentile for gestational age.

Morbid obesity is associated with stillbirth at around term and in this particular case identifiable risk factors were attended to. The case was classified as non-preventable and unavoidable.

## II. C.8

This case was reviewed for a stillbirth. A 23 year old lady, G2P0 presented at 33 weeks gestation with a fetal demise. This lady was diagnosed with gestational diabetes and was on Metformin. She delivered vaginally of a frank breech stillbirth weighing 2595 grams. Further assessment of the maternal status indicated a hemoglobin A1C of 6.5%. Placental cultures were negative. Maternal serology was negative, particularly for parvovirus and CMV. The baby was normally grown but had evidence of hypoxic ischemic brain injury. Placental pathology showed histologic chorioamnionitis. A Kleihauer-Betke test was negative and the thrombophilia screen was negative. There was no identified cause for this stillbirth, although the maternal diabetic status may have contributed. This case was classified as non-preventable and unavoidable.

## II. C.9

This case was reviewed for a stillbirth. A 25 year old G2P1 was at 37 weeks gestation when she presented with cramping and decreased fetal movements. A fetal demise was confirmed. The baby weighed 2142 grams. The placental pathology showed meconium staining with an area of infarct of 2 cm. An autopsy was declined. All other stillbirth workup was negative. The baby at birth was noted to have a very tight triple nuchal cord.

The committee further reviewed the prenatal care of this patient. The height of fundus was consistent with the gestational age. There was no clinical evidence of intrauterine growth restriction, hence it is felt that this baby died from a cord accident and the case was classified as non-preventable and unavoidable.

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

### II. D.1

This case was reviewed for hypoxic ischemic encephalopathy of the newborn. This lady was a 24 year old G1P0 known to have gestational hypertension treated during pregnancy with Aldomet. There were several attempts at having her induced at approximately 41 weeks gestation without that being successful. The patient was discharged home after this attempt at induction but presented back in spontaneous labour 40 hours after discharge. On examination her cervix was only 1 cm dilated. An artificial rupture of membranes was done showing thick meconium. The baby was monitored through continuous electronic fetal monitoring.

Four hours after admission there was an acute profound fetal bradycardia which necessitated an emergency caesarean section. The baby was delivered 17 minutes after the onset of the acute bradycardia. The baby weighed 4000 grams and had Apgar scores of 1, 0, 0 and 3 at 1, 5, 10, and 15 minutes. The umbilical arterial pH was 6.75 and the base deficit was 17.8 and the lactate was 26. The baby required vigorous cardiopulmonary resuscitation including intubation, ventilation, chest compressions and intratracheal epinephrine. The baby received hypothermic cooling in the NICU. On day two of life the baby developed seizures. An MRI of the brain done on day 5 showed a restricted diffusion pattern in the putamen and the thalami. At subsequent child health follow ups and at 7 months the baby was noted to have some mild spasticity of the right arms and legs.

The fetal heart rate tracing was reviewed for this patient and there was no forewarning of the pending acute fetal bradycardia. The emergency caesarean section was done in an expedited manner. As such this case was classified as non-preventable and unavoidable.

### II. D.2

This case was reviewed for low Apgar scores and neonatal acidosis. A 32 year old G3P1 presented at 40 weeks gestation with spontaneous rupture of membranes and early labour. Her membranes ruptured 12 hours prior to presentation. She was induced with oxytocin and once labour was established she delivered precipitously. She received fentanyl for pain control 45 minutes prior to the baby's birth. There was a nuchal cord.

The baby's Apgars were 4, 4 and 7 at 1, 5 and 10 minutes. The cord arterial pH was 7.1 with a base excess of -8. The baby received positive pressure ventilation, was given Narcan and was admitted to the NICU for observation for 3 hours. The fetal heart rate tracing was examined. It appeared to be quite normal until about 1 hour prior to birth at which time there were brief periods where the fetal heart rate was lost.

In the final 25 minutes, the fetal heart rate was documented erratically. There appeared to be recurrent episodes of 30 seconds where fetal heart rate documentation was missing. There were no definitive decelerations. It was felt that the cause of the baby's depression at birth was likely to have

been a combination of a narcotic effect exacerbated by a tight nuchal cord. This case was classified as non-preventable and unavoidable.

### II. D.3

This case was reviewed for low Apgar scores and periventricular leukomalacia of the newborn. A 28 year old G2P0 was at 37 weeks and 6 days when she presented in early labour with spontaneous rupture of membranes. The presenting part was felt to have been high. She underwent an artificial rupture of membranes of forewaters in the operating room under controlled conditions and at that time it was realized that the fetus was in a breech presentation.

An ultrasound was done showing the head to be flexed and the baby was of average size, so upon further counselling with the patient, she opted towards a trial of labour. She progressed quickly; however, the breech delivery turned out to be quite difficult. Once the body was delivered, it was noted that there was double nuchal arms as well as a nuchal cord. Piper forceps were used to flex head.

The baby's Apgar scores were 0, 2 and 4 at 1, 5 and 10 minutes with an venous pH of 7.2 and a base deficit of 10 in the venous sample. Unfortunately no arterial sample was obtained. The baby required full resuscitation and was placed on a cooling protocol in the NICU for 3 days and was sent home on day 8. An MRI prior to discharge showed areas of infarction and periventricular leukomalacia.

On review of her progress in labour, she progressed from 8 cm to full dilatation in over an hour and a half. She pushed for 1 hour and 22 minutes. The fetal heart rate tracing was reassuring throughout the first stage of labour. Variable decelerations began 12 minutes prior to delivery in the second stage and by then the buttocks were already presenting at the perineum. There was excellent documentation of the progress in labour as well as the proceedings of the delivery. The patient appeared to have been counselled appropriately regarding the risk of a vaginal breech delivery. The management of the breech delivery was felt to have been appropriate.

Even though the outcome was unfortunate, this case was classified as non-preventable and unavoidable with management having met standards of care.

### II. D.4

This case was reviewed for a twin pregnancy with both babies having low Apgar scores in the context of pre-term birth. A 36 year old G3P2 lady was at 30 weeks gestation when she presented in spontaneous active labour. She had been known to have a monochorionic diamniotic twin pregnancy. There was evidence of a twin to twin transfusion during the prenatal course and the patient had undergone laser division of the placenta at 20 weeks.

On admission to hospital she was 9 cm dilated and small fetal parts were felt. An emergency caesarean section took place. Twin A did well with Apgar scores of 2, 5 and 8 at 1, 5 and 10 minutes with arterial pH of 7.22 and weighing 1161 grams. Twin B had Apgar scores of 3, 5 and 8 at 1, 5 and 10

minutes with an arterial cord pH of 7.19 with a weight of 1680 grams. Twin A did well in the nursery while Twin B developed respiratory distress syndrome and Klebsiella sepsis due to prematurity. The obstetrical care was felt to have been appropriate. This case was classified as non-preventable and unavoidable.

Once again, this case demonstrates that in a twin gestation with twin to twin transfusion, the larger twin tends to have a worse neonatal outcome than its smaller counterpart.

## II. D.5

This case was reviewed for birth trauma. A 15 year old G1P0 presented at 40 weeks gestation for induction of labour as she was suffering PUPPS. Induction was carried out with Cervidil followed by oxytocin. The second stage was complicated by poor fetal decent. The baby was noted to be in an occiput posterior at +1 station. A double setup trial of forceps was carried out. The application of the forceps was easy but two pulls of moderate intensity were required to deliver the baby.

The baby was noted to have mild facial palsy at birth. This complication was discussed with the patient prior to delivery. The facial nerve palsy is a recognized complication of forceps delivery. The management was appropriate and this case was classified as non-preventable and unavoidable.

## II. D.6

This case was reviewed because of neonatal pneumothorax and cephalhematoma and admission to the NICU. A 28 year old G1P0 presented in spontaneous active labour at 41 weeks gestation. She was monitored through intermittent auscultation. She got to full dilatation; however, in the second stage of labour, decelerations were noted and so continuous electronic fetal monitoring with a scalp electrode was initiated. At that time the baby was noted to be at +3 station but was occiput posterior. The fetal heart rate showed bradycardia down to 90 bpm so she was taken to a case room where she underwent an assisted vaginal delivery with a vacuum.

The baby's birth was 45 minutes after the decelerations were auscultated. The baby's Apgar scores were 6 and 8 at 1 and 5 minutes with a cord arterial pH of 7.15 and weighed 3993 grams.

On review of the proceedings of the vacuum delivery, it appears that the application was easy. The baby required two pulls and there was one pop off. There was thick meconium noted at birth but no meconium below the vocal cords of the newborn. The baby developed pneumothorax and was noted to have a cephalhematoma. The baby spent 6 days in NICU for lethargy, felt to be secondary to the cephalhematoma and the pneumothorax.

The Apgars scores as well as the pH levels do not indicate moderate or severe acidosis. The case was hence classified as non-preventable and unavoidable.

## II. D.7

This case was reviewed for neonatal acidosis and admission to NICU. A 32 year old lady, G1P0 was at 40 weeks gestation under the care of a midwife who presented in spontaneous labour. She progressed to full dilatation; however, during the second stage of labour, there was fetal tachycardia of 180 bpm and loss of variability.

Obstetrics was consulted and it was decided to take her to the case room for a caesarean section. There was a 25 minute delay for her to be assessed by the on-call obstetrician as the obstetrician was preoccupied with another emergency. The caesarean was done thereafter and the baby had Apgar scores of 5 and 7 with a cord pH of 7.08.

The hospital standards committee as well as the MPHSC reviewed the tracing during the 25 minute delay and it was felt that there was no acute deterioration in the fetal heart rate over this time span and it was felt that the 25 minute delay did not result in a worse outcome in this case. The case was hence classified as non-preventable and unavoidable.

## II. D.8

This case was reviewed for birth trauma. A 23 year old G5P0TA4 presented at 41 weeks gestation in early labour but was found to be hypertensive with a blood pressure of 160/117 mmHg. She was treated with antihypertensive agents and transferred to the tertiary centre where augmentation of labour took place.

She had a normal first and second stage of labour and had a normal vaginal delivery of a baby weighing 3700 grams with Apgar scores of 3 and 6 at 1 and 5 minutes and an anterior cord pH of 7.16.

Following birth the baby was noted to have Erb's palsy. A review of the chart showed that the nursing notes documented a normal vaginal delivery. Unfortunately there was no delivery note written by the attending physician.

While this particular palsy normally occurs after a delivery complicated by shoulder dystocia, in this particular case, there was no evidence or documentation of any shoulder dystocia. Erb's palsy has rarely been documented as a result of the fetal position in utero. The case was classified as non-preventable and unavoidable.

## II. D.9

This case was reviewed for meconium aspiration and fetal acidosis. A 24 year old G3P2 presented to her community nursing station at 37 weeks gestation with possible spontaneous rupture of membranes and early labour. She was transferred to the tertiary centre where the fetal heart rate

appeared to be non-reassuring at 5 cm dilatation. She underwent an emergency caesarean section with a baby born with Apgars of 7 and 6 at 1 and 5 minutes with an arterial cord pH of 6.98 and a base excess of -18. There was thick meconium and the baby was admitted to the NICU for meconium aspiration. The baby was intubated and remained in the NICU for two weeks and suffered multi-organ dysfunction and failure.

A review of the tracing showed that there were no accelerations and no decelerations with acceptable variability. Just prior to birth, the tracing showed reduced variability and the base line dropped to about 110 BPM. There was an attempt at fetal scalp sampling but this was unsuccessful. Her caesarean was carried out under a spinal anaesthetic which occurred 30 minutes after the attempt of fetal scalp sampling and the baby was born 30 minutes later.

The MPHSC felt that this tracing, while atypical and concerning, was not overtly ominous. The committee was satisfied with the timeline of the events and so the case was classified as non-preventable and unavoidable.

## II. D.10

This case was reviewed for meconium aspiration and admission to the NICU. A 33 year old G4P2 lady presented at 37 weeks gestation with contractions and spontaneous rupture of membranes. Variable decelerations were noted on the fetal heart strip that were quite deep and severe and so she was taken to the case room where a caesarean section was undertaken.

She delivered a baby weighing 2489 grams with Apgar scores of 2, 5 and 4 at 1, 5 and 10 minutes with a cord arterial pH of 7.1 and a base excess of -10. The baby had positive pressure ventilation and there was meconium aspiration syndrome. The baby subsequently developed pulmonary hypertension and required jet ventilation and was quite hypoxic. E. coli sepsis was also documented. The timeline for the events of management in hospital were reviewed and appeared to be satisfactory. The timeline for the intervention was also satisfactory. This case was classified as non-preventable and unavoidable.

## II. D.11

This case was reviewed for cord prolapse and low Apgar scores. A 35 year old lady, G2P1 presented at 40 weeks gestation in spontaneous labour. She was 4 cm on admission. Her labour was further augmented. She progressed in a timely manner to full dilatation. When she was at full dilatation, an artificial rupture of membranes took place, which unfortunately was complicated by a cord prolapse. The baby's station was at -2 at the time of artificial rupture of membranes.

A crash caesarean section was carried out and the baby was delivered 17 minutes later with Apgar scores of 2, 4 and 6 at 1, 5 and 10 minutes and an arterial cord pH of 7.02. The baby had to be intubated for 40 minutes after birth and spent a day in NICU.

There were some concerns raised by the MPHSC given that the artificial rupture of membranes occurred at station -2. Upon further discussion, it was felt that it was a reasonable treatment option to perform a rupture of membranes at full dilatation in a multigravida at station -2. While it was clear that the cord prolapse occurred after rupture of membranes, the intervention at full dilatation was felt to have been acceptable under these circumstances, thus it was classified as non-preventable and unavoidable.

## II. D.12

This case was reviewed for cord prolapse and low Apgar scores. A 29 year old G1P0 was at 41 ½ weeks gestation was admitted for an induction of labour with Prostaglandin and Oxytocin. She progressed appropriately to full dilatation but her second stage of labour was prolonged. She pushed for three hours and the baby was noted to be in an LOT position at +1 station. There was an attempt at manual rotation of the baby to an occiput anterior position, but this was complicated by an unexpected cord prolapse.

She was transferred immediately to the operating room and a crash caesarean section was carried out. The baby had Apgar scores of 3, 5 and 8 at 1, 5 and 10 minutes with an umbilical arterial pH of 6.98.

It was felt by the MPHSC that the caesarean section was done in a timely manner. Discussion took place on whether a manual rotation should have been done in a case room. The committee decided that such an intervention was appropriate and that the cord prolapse was unexpected, particularly that the baby was at 0 station to +1.

This case was finally classified as non-preventable and unavoidable.

### III. Unknown/Unclassifiable:

#### III. D.1

This case was reviewed for low Apgar scores, neonatal acidosis, and hypoxic ischemic encephalopathy. A 41 year old G1P0 had gestational hypertension and was treated with anti-hypertensive therapy in the third trimester. She was admitted at 40 weeks gestation for induction of labour. She received Prostin gel to help ripen the cervix; however, 3 ½ hours later she had rupture of membranes and was found to be 9 cm. Two hours later she delivered through spontaneous vaginal delivery.

The baby weighed 3255 grams and had Apgar scores of 1, 2, and 6 at 1, 5 and 10 minutes. The umbilical arterial pH was 7.08 with a base deficit of 10.4 while the umbilical vein pH was 7.13. The baby received positive pressure ventilation. The neonatal team arrived about two minutes after the birth of the baby. Resuscitation took place and the baby was placed on CPAP. At 30 minutes the baby was noted to have hypotonia and poor respiratory effort so the baby was intubated and ventilated. By 10 hours of neonatal age, the baby developed seizures and was placed on hypothermia protocols and was given anticonvulsants. An MRI done at 60 hours of age showed evidence severe central and peripheral hypoxic ischemic encephalopathy.

Unfortunately the fetal heart rate tracing could not be reviewed as it was not available to the hospital committee or to the MPHSC. A review of the notes showed there was no indication in the mother's chart of any obvious concerns regarding the fetal heart rate tracing. Needless to say, this baby was born with severe acidosis. Given the absence of tracing and the severe brain damage that ensued, the committee was unable to properly classify this case and hence this case was classified as unknown/unclassifiable.

# Statistical Summary

## Causes of Stillbirth

A total of 15,847 deliveries occurred in Manitoba in 2011 with the MPHSC reviewing 433 cases. The following tables represent the cases reviewed by the MPHSC that occurred in 2011.

Antepartum	Total
Unknown / Undetermined	23
Genetic	8
Placental Abruption (Traumatic, Hypertensive, Spontaneous)	6
Placental Insufficiency Complications / Hypoxia / Oligohydramnios	6
Cord Accident	5
Metabolic	5
Congenital	4
Sepsis (bacterial/viral)	4

Source: MPHSC Database

Intrapartum	Total
Fetal-Maternal Hemorrhage	3
Unresponsive Bradycardia / Intrapartum Asphyxia	2
Twin-Twin Transfusion Complication	1
Cord Accident	0
Placental Abruption	0
Uterine Rupture	0

Source: MPHSC Database

## Causes of Neonatal Mortality

Cause	Total
Congenital Anomalies (without documented genetic anomaly)	25
Genetic Anomalies (with or without congenital anomalies)	9
Perinatal Hypoxia / Acidosis / Asphyxia / HIE / Abruption	8
Chronic Placental Insufficiency / SGA / UGR (early or late onset)	0
Twin-Twin Transfusion Complications (shock, hydrops)	2
Prematurity with Sepsis / Septic Shock / NEC	7
Prematurity with RDS, HMD, Respiratory Collapse	7
Extreme Prematurity Complications	25
Viral Infections (herpes)	2
Traumatic Consequences (Hemorrhage)	1
Unexplained	1

Source: MPHSC Database

## Cases of Neonatal Morbidity

The following table represents neonatal morbidity cases that were reviewed by the MPHSC that occurred in 2011.

Neonatal Morbidity	Total
Acidosis / Low 5 Minute Apgar Score	96
Encephalopathy / Seizures	2
Respiratory Distress Syndrome	15
Meconium Aspiration / Persistent Pulmonary Hypertension of Neonate / Pneumonia / Pneumothorax / Sepsis	18
Transient Tachypnea of the Newborn	11
Trauma	41
Hypoglycemia / Hyperglycemia / Hyperbilirubinemia / Hypercalcemia	3
Bradycardia	1
Substance Withdrawal	3
Abnormalities / Genetic Disorders	24
Prematurity (Other than RDS)	3
ABO Incompatibility / Rh Disease / Hydrops / Fetal Maternal Hemorrhage	3
Other (includes IUGR, Prolonged NICU Stay)	5

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 2011.

Maternal Morbidity	Total
Hemorrhage – APH / PPH / Abruption	2
Hypertension Related Morbidity	
Eclampsia	5
Severe Pre-Eclampsia with Complications	4
Infectious Morbidity / Sepsis / Septic Shock	1
Thrombotic Morbidity	3
Peripartum Hysterectomy / Uterine Rupture	3
Unplanned Laparotomy	2
Unplanned Emergency Transfer from Community Hospital (PTL / SPROM / Anaesthetic Issues / Fetal-Neonatal Problems)	22

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 2011.

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
<b>Manitoba</b>	<b>16,257</b>	<b>3,192 (19.6%)</b>	<b>2,030 (12.5%)</b>	<b>1,162 (7.1%)</b>

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
<b>Manitoba</b>	<b>15,925</b>	<b>3,342 (21.0%)</b>	<b>2,107 (13.2%)</b>	<b>1,235 (7.8%)</b>

Source: Discharge Abstract Database

<b>2011</b>				
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
<b>Manitoba</b>	<b>15,847</b>	<b>3,343 (21.1%)</b>	<b>2,122 (13.4%)</b>	<b>1,221 (7.7%)</b>

Source: Discharge Abstract Database

# Appendix

## HOSPITAL PERINATAL REVIEW DATA SHEET

<p><b>Perinatal Mortality (≥ 500 grams):</b></p> <p>___ stillbirth and check one box below:</p> <p><input type="checkbox"/> antenatal</p> <p><input type="checkbox"/> intrapartum</p> <p><input type="checkbox"/> unknown</p> <p>___ neonatal death under 29 days of age</p> <p>___ Age at death (in days; "0" if less than 24 hours)</p> <p><b>Perinatal Morbidity (≥ 1000grams) check all that apply:</b></p> <p>___ Five minutes Apgar score ≤ 5</p> <p>___ Seizures</p> <p>___ Meconium aspiration with low Apgars (≤7)</p> <p>___ Significant birth trauma (specify) _____</p> <p>___ Baby transfer to ICU (reason if not listed above) _____</p> <p>except for the following:</p> <ul style="list-style-type: none"> <li>- For observation when no observation unit is available</li> <li>- TTN</li> <li>- Congenital Anomalies (if certain only reason for admission)</li> <li>- Hypoglycemia</li> <li>- Psychosocial</li> </ul> <p>___ Other (specify) _____</p>	<p><b>Maternal Mortality:</b> ___ Direct Obstetric</p> <p>___ Indirect Obstetric</p> <p>___ Non-obstetric</p> <p><b>Maternal Morbidity:</b></p> <p>___ Uterine rupture</p> <p>___ Caesarean or peripartum hysterectomy</p> <p>___ Fistula involving the female genital tract</p> <p>___ Admit to Intensive Care Unit (specify) _____</p> <p>___ Thrombo-embolic</p> <p>___ Eclampsia</p> <p>___ Other (specify) _____</p>
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<p><b>Mother's Name:</b> _____</p> <p><b>Mother's Hospital #:</b> _____</p> <p><b>Mother's Birth Date (dd/mm/yyyy):</b> _____</p> <p><b>Mother's Age (at time of birth):</b> _____</p> <p><b>Gravida:</b> _____ <b>Para:</b> _____</p> <p><b>BMI:</b> _____</p> <p><b>Mother's Residence:</b> _____</p> <p><b>Gestational Age (on admission to hospital):</b> _____</p> <p><b>Gestational Age (at birth):</b> _____</p> <p><b>Baby's Name:</b> _____</p> <p><b>Baby's Hospital #:</b> _____</p> <p><b>Sex of Baby:</b> ___ Male ___ Female</p> <p><b>Baby's Birth Date (dd/mm/yyyy):</b> _____</p> <p><b>Baby's Birth Weight (grams):</b> _____</p> <p><b>Placenta Weight (grams):</b> _____</p> <p><b>Hospital of Birth:</b> _____</p> <p><b>Transfer from:</b> _____ <b>to:</b> _____</p>	<p><b>Antenatal Care: Number of visits (Circle appropriate number)</b></p> <p>0. None</p> <p>1. &lt; 4</p> <p>2. &gt; 4</p> <p>3. Unknown</p> <p><b>Gestational Age at Initiation of Prenatal Visits:</b> _____</p> <p><b>Mode of delivery (Circle appropriate)</b></p> <p>1. Spontaneous</p> <p>2. Operative vaginal</p> <p>3. Caesarean Section – 1°</p> <p>4. Caesarean Section – Repeat</p> <p>5. VBAC after a Trial of Labour</p> <p>6. Caesarean section after a Trial of Labour</p> <p>7. Breech delivery</p> <p>8. Twin delivery</p> <p>9. Induction: Mode: _____</p> <p><b>Apgar score</b> at One minute _____ Five minutes _____</p> <p><b>Cord pH – Arterial</b> _____ <b>Umbilical Vein</b> _____</p> <p><b>Date of Death (dd/mm/yyyy)</b> _____</p>
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## Maternal and Perinatal Health Standards Committee

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### Committee Members (2011)

Dr. N. Riese, Chair, General Practice  
Dr. J. Braun, General Practice  
Dr. T. Buchel, General Practice  
Ms C. Nykiforuk, Midwife  
Dr. D. Peabody, Paediatrician  
Ms D. Ridd, Manitoba Health Representative  
Dr. C. Schneider, Obstetrician & Gynecologist

### Administrative Staff (2011)

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

### Current Administrative Staff (2015)

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.