Indexed as:

Chow (Litigation guardian of) v. Wellesley Hospital

Between
Michael Chow, a minor, by his litigation guardian, Theresa Chow, and the said Theresa Chow personally, David Chow, Elizabeth Tam, Danny Chow and Bonnie Chow, plaintiffs, and The Wellesley Hospital, Dr. John Provatopoulos, Dr. Jeremy Wong, Dr. Michael Buss, Nadira Kanhai, Donna Gallacher and Margaret Wilson, defendants

[1999] O.J. No. 279

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Court File No. 92-CQ-017535

Ontario Court of Justice (General Division)
Toronto, Ontario

Lissaman J.

Heard: September 9, 1997 to September 3, 1998.
(trial time approximately 110 days)
Judgment: February 12, 1999.

(154 pp.)

Medicine -- Liability of practitioners -- Negligence or fault -- Causation -- Failure to provide care to patient -- Doctor's duty to consult other doctors -- Obstetrical or gynaecological care -- Residents or interns -- Duty of care to fetus -- Damages -- General damages -- General damages for personal injury -- Future care and treatment -- Loss of future income.

Action by an infant against two doctors for damages for personal injuries suffered during birth. Chow went to hospital in premature labour. Her obstetrician, Wong, attended to her. The fetus had a slow heart beat and variable decelerations indicative of interference with fetal oxygenation. Wong and a second year resident, Provatopoulos, prepared to deliver the baby. As the child's head emerged, Wong saw that the umbilical cord was wrapped around the child's neck. Wong clamped

and cut the cord. The child was pale, limp and gasping. Provatopoulos began resuscitation the child, while Wong delivered the placenta. When the child was 8 minutes old, Zachary, a neonatologist skilled in resuscitation, was called. Zachary revived the child. The child was ultimately diagnosed with hypoxic brain damage. He was blind and mute, a quadriplegic, and had cerebral palsy. He required constant care and supervision. The child brought an action for damages against Wong and Provatopoulos. Prior to trial, proceedings were discontinued against the Hospital and three nurses involved in the birth.

HELD: Action allowed. Chow was awarded general damages of $261,000, future attendant care damages of 3,169,894, and damages for future lost income. As the principal obstetrician, Wong had a duty to properly assess possible problems arising out of the birth. Wong was negligent in not calling Zachary to attend the delivery when faced with risks including prematurity and fetal distress. He was also negligent in failing to draw a blood sample from the umbilical cord, and in relying on Provatopoulos as the attending doctor following the delivery of the child. Provatopoulos was negligent in failing to take action in the face of demonstrated fetal distress in a pre-term emergency. The doctors failed to meet the standard of care, and their failure largely contributed to the child's injuries. Wong's negligence was assessed at 75 percent, and Provatopoulos's at 25 percent. The parents were not entitled to an award for future care to be provided to the child. The parents had an obligation to care for the child, and the cost of doing so was reflected in the award for future attendant care.

Statutes, Regulations and Rules Cited:

Family Law Reform Act.
Ontario Rules of Civil Procedure, Rule 53.09.

Counsel:

R. **Sommers,** Q.C. and R. Roth, for the plaintiffs.
B. Tait, Q.C., S. Fraser and J. Langford, for the defendants.

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1 LISSAMAN J.:-- This is an action for damages arising out of the birth of Michael Chow who was born on March 23, 1991 at the Wellesley Hospital in Toronto, Ontario. Prior to the commencement of this trial, proceedings were discontinued against the Wellesley Hospital and against Nadira Kanhai, Donna Gallacher and Margaret Wilson, the three nurses involved in Michael Chow's birth. The defendants in this case, Dr. Jeremy Wong, Dr. John Provatopoulos and Dr. Michael Buss, were the Wellesley Hospital doctors involved in the birth of Michael Chow (before and after).

2 This trial started on September 9, 1997 and argument concluded on September 3, 1998. Some 110 days of trial time was used. It is incumbent upon me to say at this time how indebted I am to Counsel and the court staff who contributed to the relative smooth running of a lengthy and difficult trial.

3 I must also say that I completely appreciate the trauma and stress this case has caused to the various participants. I am referring in this context to the plaintiffs and to the defendant doctors against whom very serious allegations of negligence have been made.

4 The case at bar is one where allegations of negligence against the treating physicians are very much in issue. Damages are also in issue, except where the parties have settled various heads for which I am most grateful. The damage issues in contention are listed as follows: 1. Cost of attendant care for Michael Chow during an identified time period;

2. Life expectancy;
3. Lost years deduction;
4. General Damages;
5. Income Loss.

5 Before proceeding any further with these reasons, I would like to provide a glossary of terms used often throughout the trial and this judgment:

(a) ANEMIA - Any condition in which the number of red blood cells, the amount of hemoglobin, and the volume of packed red cells are less than normal; clinically, generally pertaining to the concentration of oxygen-transporting material in a designated volume of blood. Frequently manifested by pallor of skin and mucous membranes, shortness of breath, palpitations of the heart, lethargy.

(b) ASPHYXIA - Impaired or absent exchange of oxygen and carbon dioxide on a ventilatory basis; combined hypercapnia and hypoxia or anoxia.

(c) BRADYCARDIA - Slowness of the heartbeat. Mild fetal bradycardia: a fetal heart rate less than 120 bpm. Marked fetal bradycardia: a fetal heart rate less than 100 bpm.

(d) CEREBRAL PALSY - A non-progressive syndrome process involving the musculo-skeletal system and specifically affected motor power and balance thought to be due to insult to the developing brain during pregnancy, at the time of birth, or shortly thereafter.

(e) DECELERATION, VARIABLE - Transient fetal bradycardia usually denoting compression of the umbilical cord which may occur at any time in relation to a uterine contraction.

(f) EDEMA - Excessive accumulation of fluid in the body tissues.

(g) ENCEPHALOPATHY - Any disorder of the brain.

(h) HYPOXIC ISCHEMIC ENCEPHALOPATHY - Brain damage due to lack of oxygen and blood flowing to the brain.
(i) HYPOVOLEMIA - A decreased amount of blood in the body.
(j) HYPOXIA - Decrease below normal levels of oxygen in inspired gases, arterial blood, or tissue, short of anoxia. Anemic hypoxia: resulting from a decreased concentration of functional hemoglobin or a reduced number of erythrocytes; it is caused by hemorrhage or anemia of various types or by poisoning.
(k) ISCHEMIA - An inadequate flow of blood to a part of the body caused by constriction or blockage of the blood vessels supplying it oxygenated blood fails to reach tissue due to hypotension, arterial obstruction.
(l) NUCHAL CORD - Umbilical cord around the neck.
(m) OXYTOCIN - A hormone that causes contractions - used for the induction or stimulation of labor, in the management of postpartum hemorrhage and atony.
(n) RINGER'S LACTATE - Injection/infusion solution.
(o) STAT - At once.
(p) TACHYCARDIA - Rapid beating of the heart.
(q) TACHYPNEA - Rapid breathing.
(r) VARIABILITY - The beat to beat changes in fetal heart rate as recorded on a graph.

6 I first propose to decide the liability issue and then proceed to assess damages.

7 The following statements are matters of record and are uncontested:

1. Dr. Theresa Chow consulted Dr. Wong on March 2nd, 1990. She was 29 years old at the time and had been unable to conceive. Tests were done and Dr. Wong determined she could conceive. Her first pregnancy resulted in a miscarriage on June 1, 1990.
2. On August 28, 1990, Theresa saw Dr. Wong again. She was pregnant. He recorded that her last menstrual period started on July 9, 1990 and that her expected date of confinement ("EDC") would be April 15, 1991.
3. Throughout the pregnancy, Dr. Wong was satisfied that Theresa was healthy. In his opinion, the pregnancy was very low risk.
4. Based on an ultrasound taken September 6, 1990, Dr. Wong revised the EDC. Theresa remembers the revised EDC being April 25, 1991; Dr. Wong, however, wrote April 23, 1991 in his chart. After questioning Theresa Chow about her intercourse during July, Dr. Wong determined that the most likely time of delivery would be April 20, 1991.
5. On March 22, 1991, sometime between midnight and 1:00 am, Theresa noticed some liquid. By the morning, the bed was wet. She thought the

water had broken. She called Dr. Wong that morning and he advised her to go to the Wellesley Hospital. Upon admission to the hospital, Theresa reported some contractions which started early morning, then stopped.

6. Dr. Wong examined Theresa at 15:45 and found her cervix to be 2-3 centimeters dilated and 80 percent effaced. The nitrazine test was positive, indicating she was leaking amniotic fluid. The amniotic fluid at this assessment was clear and there was no bloody show present. Dr. Wong examined the fetal heart rate tracing and was of the opinion that, at 15:50, it demonstrated a normal, reactive tracing, with good beat to beat variability and acceleration of the fetal heart. Following this assessment, Dr. Wong left the hospital.
7. Before he left, Dr. Wong ordered Oxytocin to be administered in order to augment Theresa's contractions. The Oxytocin drip commenced at 18:50.
8. Seven hours following his initial assessment of Theresa, Dr. Wong returned to the hospital. His next assessment was at 22:40. Theresa was then 4-5 centimeters dilated and 100 percent effaced. The Oxytocin was running and the amniotic fluid was clear with no bloody show present.
9. Dr. Wong reviewed the fetal heart monitor tracing for the period preceding his assessment and was satisfied that the tracing looked fine: reactive, a lot of accelerations and good beat to beat variability. The Oxytocin was increased as Dr. Wong thought the contractions were only moderately strong. It was decided that Theresa would get an epidural anesthetic before increasing the Oxytocin. Dr. Wong approved this plan and then left the hospital for home.
10. At 23:10, a continuous epidural was administered by Dr. Buss, a first year resident in anesthesia.
11. Subsequent to the administration of the epidural to Theresa, Nurse Gallacher noted that the fetus had developed bradycardia (a slowing of the fetal heart) and paged Dr. Provatopoulos to attend the patient. Also observed were variable decelerations which indicated a potential interference with the adequate oxygenation of the fetus.
12. At 23:38, Dr. Provatopoulos, a second year resident in obstetrics, examined Theresa. She was 8-9 centimeters dilated. He applied a scalp clip to better monitor the fetal heart.
13. Nurse Gallacher testified that at 23:38 she continued to have concerns about the baby's condition because of recurring variable decelerations of the fetal heart. She was concerned about a lack of fetal oxygenation and brought these concerns to Dr. Provatopoulos' attention.
14. At 00:12, Dr. Provatopoulos reviewed the fetal heart rate tracing.
15. At 00:20, the fetal heart rate monitor in Theresa Chow's labor room ran out of paper.

16. At 00:30, Dr. Provatopoulos examined Theresa again. She was fully dilated and the baby was deliverable. Dr. Wong was called. Theresa was taken to the O.R. and hooked up to the new monitor at 00:36.
17. Between 00:36 and 00:38, there was a fetal heart monitor tracing which recorded variable decelerations. Thereafter, until delivery, at 00:57, there was nothing intelligible on the tracing.
18. Dr. Wong arrived at 00:40. Theresa started pushing at 00:53. Once the baby's head was out, Dr. Wong noted that the umbilical cord was wrapped tightly around the baby's neck. He put two clamps on the umbilical cord and cut it very quickly. Michael was delivered at 00:57.
19. Dr. Wong was of the opinion that he had delivered a healthy baby.
20. At birth, Dr. Wong described Michael as being pale with gasping respirations. He was flaccid, or limp, with no tone.
21. Dr. Wong took Michael to the bassinet and turned him over to Dr. Provatopoulos and Nurse Kanhai.
22. Dr. Provatopoulos initiated resuscitation by supplying oxygen by mask. Nurse Kanhai noted at 00:58 that Michael only made a slight effort for breathing. She also noted "colour pink, no cyanosis" and that his heart rate was normal. Dr. Provatopoulos' evidence was that, at one minute of life, the baby had "greatly" improved. Despite this, at one minute of age, Dr. Buss was paged.
23. Dr. Buss arrived at 8 minutes of age according to the chart. Dr. Buss recorded that he was called to attend a "flat" baby. A flat baby is a baby that requires active resuscitation.
24. In his note, Dr. Buss wrote that the baby was intubated at 10 minutes due to irregular breathing and grunting. At trial, Dr. Buss testified that he intubated Michael in order to free his hands for other things, and as a result of his uncertainty as to whether the baby would sustain his respiratory pattern.
25. At eighteen minutes of age, a stat call was made to Dr. Zachary because of a depressed newborn. A stat call is one that conveys that urgent, immediate response is required.
26. At 01:26 (approximately 30 minutes of age), Dr. Buss gave Michael a bolus of 20 milliliters of Ringer's Lactate. The baby's tone improved after this volume was provided.
27. At his discovery, Dr. Buss testified that he was concerned because the baby had low blood pressure when Dr. Zachary arrived. The chart describes that at 01:26, the blood pressure was 31/17. Dr. Buss described in his note a blood pressure of 40/20. Both are low readings.
28. Following his arrival at approximately 01:43, Dr. Zachary carried out further resuscitation efforts, including drawing blood and giving further

volume - 15 cc's of normal saline and 30 cc's of fresh frozen plasma. Blood gas readings disclosed the presence of metabolic acidosis with a pH of 7.24 and a base excess of - 11.7. Dr. Zachary noted that Michael's perfusion improved after he gave volume.

29. Following his assessment and review of test results, Dr. Zachary determined it was necessary to transfer Michael to a tertiary care hospital.

30. At Mount Sinai, further examinations and tests were performed, including CT scans on March 23 and April 2, 1991. Following assessments, Michael was discharged with the diagnosis of hypoxic ischemic encephalopathy (brain damage).

31. Michael has been left with permanent injuries which may be defined as extreme brain damage together with gross impairment of his motor abilities, i.e., he is quadriplegic. In addition to these handicaps Michael Chow is blind and mute. He has cerebral palsy and will always be dependent on others for his needs and well.

PLAINTIFFS' ALLEGATIONS OF NEGLIGENCE AGAINST THE DOCTORS

A. Allegations Against Dr. Wong

8 Counsel on behalf of the plaintiffs make the following allegations regarding the performance of Dr. Wong as a specialist in obstetrical medicine:

a) Gestational Age

9 In charting the gestational age, counsel for the plaintiffs allege that Dr. Wong made a mathematical error. Between February 19th and March 5th, 1991, there were 14 days. On adding 14 days to February 19th, Dr. Wong entered 331/2 weeks, instead of 33. This extra half week was carried forward on the March 19, 1991 visit where, instead of recording 35 weeks, he recorded 351/2. Correcting this mathematical error, Theresa entered Wellesley Hospital to deliver her baby when she was 35 weeks, 3 days gestation, and not the 36 weeks that Dr. Wong advised the Wellesley Hospital staff upon Theresa's admission.

10 The Canadian National Guidelines for Neonatal Resuscitation (Ottawa: Canadian Institute of Child Health, 1987), set forth criteria for identifying a neonate at risk. Prematurity is one of the criterion. These guidelines identify early gestational age as a risk when less than 36 weeks, as opposed to the generally accepted term of less than 37 weeks in the American textbook and the World Health Organization guidelines. Michael was premature, however, even by Canadian National Guidelines. Dr. Gagnon was of the opinion that, if Michael was less than 36 weeks gestation, there should have been a transfer to and delivery at a hospital capable of delivering a higher level of care than Wellesley Hospital.

b) Oxytocin Administration

11 Concerned about the risk of infection, Dr. Wong ordered Oxytocin to be administered to Theresa in order to stimulate contractions at about 18:50.

12 It is submitted that the rate at which Dr. Wong ordered Oxytocin to be given was double the amount recommended by the hospital's protocol for Oxytocin administration.

13 It is submitted that, despite the presence of fetal distress, the Oxytocin was continued to be administered to Theresa. There is no notation in any of the three portions of the chart available and required for the documentation of cessation of Oxytocin, that it was in fact stopped. Nurse Gallacher did not state that she turned off the Oxytocin.

14 It is submitted that the stoppage of Oxytocin was not recorded in the chart because it did not happen.

15 Dr. Steinberg testified that it was inappropriate to continue using Oxytocin, as that could only have the potential of further reducing blood flow and thereby reducing the oxygen flow that this baby might get.

c) Failure to Call Dr. Zachary, the Neonatologist to Attend the Delivery

16 It is submitted that Dr. Wong was aware, when he reviewed the tracing at 00:45, that from 23:38 onwards there was evidence of persisting variable decelerations with reduced variability.

17 It is submitted that Dr. Wong failed to comply with his own standards of practice whereby he would summon the pediatrician to be present at birth when two or more risk factors were present. In this case, the risk factors were:

* premature rupture of membranes prior to labour;
* prolonged rupture of membranes;
* prematurity; and
* real or potential fetal distress evident on the fetal heart monitor tracing.

18 In 1991, Dr. Wong knew that any one of these intrapartum risk factors could indicate that asphyxia in a newborn was a potential problem.

19 Instead of summoning Dr. Zachary, a specialist in newborn care who he knew was available, Dr. Wong chose to rely on Dr. Provatopoulos, a second year resident in obstetrics.

20 Dr. Bernstein testified that it is better to have the resuscitation team there and not need them that to have to wait for them when you do need them:

> This is the standard of care, I think, when you have fetal distress or fetal stress in a high risk situation.

21 In Dr. Smith's opinion, it was Dr. Wong's responsibility to call upon additional expertise which the hospital provided. Dr. Wong, after all, was supervising Dr. Provatopoulos. In his words:

> This was not an unexpected resuscitation and the standard of care for Wellesley Hospital, and indeed for any hospital in downtown Toronto in 1991 would require a pediatrician - one would attempt to have a pediatrician present at birth of a premature infant particularly one where there is some question as to the fetal heart rate.

22 The plaintiffs submit that Dr. Wong failed to recognize or react appropriately to the evidence of fetal distress depicted in the fetal heart monitor tracing. He failed to recognize the likelihood that Michael would require resuscitation. He failed to alert Dr. Zachary, as he ought to have in the circumstances, to be present at the delivery to provide appropriate resuscitation to a depressed baby.

d) Failure to Obtain Cord Blood for Analysis

23 It is the function of the obstetrician to obtain a blood sample from the umbilical cord after the baby is born. Dr. Wong did draw cord blood in this instance. However, he failed to send this blood for testing and for an immediate evaluation of the baby's status. He failed to do so despite the fact that Michael was depressed, pale, had poor tone, and not breathing properly at birth. Analysis of the cord blood, argue the plaintiffs, would have provided significant and very useful information as to the acid base status of the baby at the time of birth. It is, thus, submitted that Dr. Wong fell below the standard of care in failing to obtain cord blood gas analysis following his delivery of a depressed infant requiring active resuscitation.

e) The Stoppage of the Paper Tracing at 00:20 - Failure to Properly Monitor

24 The fetal heart monitor tracing stopped at 00:20 when the monitor ran out of paper. It ran for two minutes from 00:36 to 00:38 and thereafter was impossible to interpret. For 35 out of the last 37 minutes prior to delivery, the physicians responsible for Michael failed to ensure that the tracing was continued. This was a critical phase and the absence of the tracing deprived them of information necessary to reach decisions regarding the potential need for resuscitation expertise or early intervention.

25 The plaintiffs submit that, without the paper tracing, it was impossible to assess the adequacy of the fetal heart variability up until the time of delivery, unless someone was observing the digital readout on a second-by-second basis, and was timing the fluctuations (an unlikely scenario for which there is no evidence, argue the plaintiffs). Without the paper tracing, it was impossible to know the frequency of variable decelerations after 00:20 or their duration. Without the paper tracing, it was impossible to determine whether there were any late decelerations after 00:20. It was impossible to know the duration of any bradycardia that may have occurred.

26 It is submitted that Dr. Wong failed to exercise reasonable care in fulfilling his duty to

properly monitor the fetus and to inform himself of anticipated problems at birth, by permitting the paper tracing to remain stopped during the critical final 30 minutes of labour.

f) Cord Compressions, Tight Nuchal Cord, Immediate Clamping

27 Dr. Wong knew that the timing of the clamping of the cord would have a direct affect on the amount of blood that will be inside the baby within the first few minutes. What he did not know, but ought to have, was that cord complications could lead to depression at birth in a number of ways, the most likely being caused by hypoxia through intermittent occlusion.

28 Dr. Wong testified that, had he known in 1991 that compression of the umbilical cord could result in significant hypovolemia, he would have told Dr. Provatopoulos to check for hypovolemia in light of the pallor of the baby. He also would have told Dr. Provatopoulos to draw blood from the placenta and give it to the baby to relieve hypovolemia. This is the approach Dr. Bernstein, the plaintiffs' expert, believes ought to have been followed.

29 According to the plaintiffs, Dr. Wong ought to have known that a tight nuchal cord could cause hypovolemia. Produced as evidence was a 1989 textbook, namely R.K. Creasy and R. Resnik, eds., Maternal-Fetal Medicine: Principles and Practice, 2nd ed. (Philadelphia: W.B. Saunders Co., 1989), and a 1985 article by A. Shepherd et al, "Nuchal Cord as a Cause of Neonatal Anemia" (1985), 139 AJDC 71, both of which stated that cord compressions may affect fetal blood loss and cause hypovolemia.

30 Dr. Wong was also unaware the extent of the blood loss that could result from early clamping (i.e., 30 ml. blood per kg. body weight).

31 It is submitted by the plaintiffs that Dr. Wong, having undertaken to provide care and skill in the delivery of Michael, was obliged to know and recognize the risks of, and appropriate responses to, a delivery presented with evidence of cord compression, tight nuchal cord, and early clamping. He was the senior physician and it was entirely inappropriate for him: (a) not to call Dr. Zachary to be in attendance; (b) to stand aloof from and not "interfere with" the resuscitation process because Dr. Buss and Dr. Provatopoulos "were more qualified than him"; and (c) to place his patient's well-being in the hands of young, inexperienced doctors whom he had no basis to know whether they possessed the competence necessary for the resuscitation of a depressed newborn.

32 It is submitted that Dr. Wong fell below the standard of care in failing to be informed of the consequences of cord compression, tight nuchal cord, and early clamping of the umbilical cord. As an obstetrician undertaking to deliver babies, and under a duty of care to oversee their transition to extrauterine life, Dr. Wong was obliged to have the necessary knowledge, skill, training and ability to fulfil that duty.

g) The Apgar Scores

33 Although Dr. Wong was attending to the delivery of the placenta, he claims that he was watching the resuscitation and was able to assess the one minute Apgar score. He claims that he was able to see the baby "pinking up" and trying to breathe (something the plaintiffs claim was impossible as Dr. Provatopoulos was holding a mask over Michael's face).

34 Dr. Wong testified that, while suturing a tear, he was watching the resuscitation and assigned a five minute Apgar score. It is submitted by the plaintiffs that this would have been physically impossible for Dr. Wong to do.

h) Michael's Condition at Birth

(i) Pallor - Failure to Respond Appropriately to its Presence

35 It is submitted that Dr. Wong failed to advise the other doctors of his observation of pallor at birth. He never suggested to his residents that the baby may have lost blood because he was pale (though he understood this) and never suggested that volume expanders be given.

36 It is submitted that Dr. Wong failed to recognize the significance of Michael's persistent pallor. Accordingly, he did not diagnose or treat, in an appropriate and timely manner, the hypovolemia from which the plaintiff's allege Michael was suffering nor did he recognize Michael's critical need for volume to boost his inadequate blood circulation. The plaintiffs submit that this failure to recognize or respond to the persisting pallor fell below the standard of care.

(ii) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

37 It is submitted that Dr. Wong lacked the skill and knowledge regarding the resuscitation of a depressed newborn. He believed that resuscitation only required administering oxygen to the baby and making certain the airway was clear. He believed that a neonatal resuscitation could be done by any physician in these regards.

38 With the exception of attempting to oxygenate the baby, Dr. Provatopoulos did none of the other resuscitative steps described and understood by Dr. Wong to be what should be done when a depressed pale infant is encountered (outlined in Creasy and Resnik, supra). Dr. Wong gave no guidance. Dr. Wong testified that he thought the baby was doing fine.

39 It is submitted that Dr. Wong was negligent and failed in his duty to Michael to apply appropriate knowledge, skill, and ability in a timely manner to resuscitate Michael.

40 Dr. Wong had no knowledge of Dr. Provatopoulos' experience or skill in resuscitation and yet he failed to supervise Dr. Provatopoulos (and later Dr. Buss) in their resuscitation efforts. Despite this, Dr. Wong failed to request Dr. Zachary's attendance at delivery.

41 The plaintiffs submit that Dr. Wong had substantial and significant deficiencies in his medical

knowledge which prevented him from fulfilling his duty and responsibilities to his patient.

42 Dr. Wong testified that he would have taken the appropriate steps, as outlined by Dr. Bernstein, to relieve hypovolemia had he been aware in 1991 that compression of the umbilical cord could cause hypovolemia. The plaintiffs assert that Dr. Wong ought to have known this information in 1991. In failing to keep himself informed of this information, he failed in his duty to care and provide for the well being of the babies he delivered.

43 Finally, the plaintiffs submit that Dr. Wong failed to provide the called for diagnostic skill and treatment in a timely manner. Had he done so, Michael's outcome would have been completely different and he would be a normal child today.

B. Allegations Against Dr. Provatopoulos

44 Counsel on behalf of the plaintiffs make the following allegations regarding the conduct of Dr. Provatopoulos:

a) Oxytocin Administration

45 No chart entry existed, stating that the Oxytocin was ever turned off. The plaintiffs submit that there was no chart entry either because it was never turned off or because Dr. Provatopoulos ordered it to be recommenced.

46 Counsel for the plaintiffs submit that Dr. Provatopoulos' conduct fell below the standard of care in failing to ensure that the Oxytocin was stopped after the initial bradycardia at 23:20, when he became concerned about the presence of fetal distress or possible fetal distress.

b) Failure to Call Dr. Zachary, the Neonatologist to Attend the Delivery

47 It is submitted that, in the face of genuine, ongoing concern that the baby was undergoing fetal distress, Dr. Provatopoulos acted below the standard of care in failing to bring these concerns to Dr. Wong's attention for his advice and direction. Instead, according to Dr. Wong, when Dr. Provatopoulos telephoned and spoke with him at midnight, Dr. Provatopoulos told him that the fetal heart had recovered and there was good beat to beat variability. It is submitted that it was incumbent on Dr. Provatopoulos to advise Dr. Wong of his concerns about the presence of fetal distress evidenced by the tracing or to arrange himself to have Dr. Zachary attend at the delivery in light of his concerns. Dr. Provatopoulos was well aware that it is the duty and responsibility of a resident to make his staff obstetrician aware of such concerns.

48 Dr. Provatopoulos, aware as he was of the presence of fetal stress or distress throughout the last 11/2 hours of labour, was in breach of the standard of care in failing to summon Dr. Zachary for the delivery. It is submitted that Dr. Provatopoulos was negligent in that he was not aware, as he ought to have been, of his limitations. This awareness should have prompted him to call for

additional help from people with the appropriate expertise that he may have not had.

49 Dr. Provatopoulos testified that he asked for Dr. Buss to be paged to attend at the resuscitation because the baby was not making a regular breathing effort and he felt, in the long run, the baby might need to be intubated. Dr. Wong testified that a few minutes after the resuscitation began, Dr. Provatopoulos had concerns. The baby remained flaccid and he wanted Dr. Buss to be called because the baby might need to be intubated.

50 The plaintiffs submit that Dr. Provatopoulos failed to recognize or react appropriately to the evidence of fetal distress depicted in the fetal heart monitor tracing. Dr. Provatopoulos failed to communicate his concerns of fetal distress to Dr. Wong. He failed to recognize the likelihood that Michael would require resuscitation and failed to alert Dr. Zachary, as he ought to have in the circumstances, to be present at the delivery in order to provide appropriate resuscitation to the depressed baby.

c) The Stoppage of the Paper Tracing at 00:20 - Failure to Properly Monitor

51 As mentioned above, the fetal heart monitor tracing stopped at 00:20 when the monitor ran out of paper. Dr. Provatopoulos examined Theresa at 00:30 and, thus, had been aware that the paper had stopped. He did not do anything about it.

52 It is submitted that, by permitting the paper tracing to remain stopped during the critical final 30 minutes of labour, Dr. Provatopoulos failed to exercise reasonable care in fulfilling his duty to properly monitor the fetus and to inform himself of anticipated problems at birth.

d) Dr. Provatopoulos' Care

(i) Situation at 00:30 B Failure to Deliver Baby

53 Dr. Steinberg testified that, given his concern that the fetal heart monitor tracing indicated Michael was experiencing fetal distress, he would have done everything possible to shorten the time of delivery. By 00:30, the baby was easily deliverable from a technical point of view.

54 Dr. Provatopoulos shared Dr. Steinberg's concerns about the presence of fetal distress yet took no steps to expedite the delivery. According to the plaintiffs, Dr. Provatopoulos' actions were particularly egregious in light of the fact the tracing had stopped and no effort was directed to restarting it.

(ii) Assessment of the Baby's Well Being by Scalp Stimulation

55 Dr. Farine agreed that the standard of care required that, if Dr. Provatopoulos elected not to deliver the baby at 00:30, he was obliged to assess fetal well being at that time, namely through scalp stimulation.

56 Dr. Provatopoulos, at his examination for discovery, testified that he stimulated the baby's

scalp at 23:38. At no time during discovery does he suggest that he did so again at 00:30. However, at trial, Dr. Provatopoulos purported to remember doing a scalp stimulation at 00:30. Neither Nurse Gallacher or Dr. Wong were told about this stimulation or the results of such.

57 It is the plaintiffs' submission that Dr. Provatopoulos did not perform a scalp stimulation at 00:30 and did not assure himself, as he was obliged to, that if he was going to defer delivering Michael at that time, he had to confirm that the baby was not undergoing problems. Dr. Provatopoulos fell below the standard of care at 00:30 in failing to deliver the baby or, in the alternative, failing to determine the baby's well being at the time.

(iii) Fetal Scalp Blood Sampling

58 An alternative means of ascertaining the baby's status at 00:30 would have been to obtain a fetal scalp blood sample for laboratory analysis.

59 Dr. Wong acknowledged that a fetal scalp blood sampling could have been done had he told Dr. Provatopoulos to do so, or had Dr. Provatopoulos decided to do it on his own. Such would have provided information about the acid base status and the adequacy or inadequacy of the baby's oxygenation.

60 Dr. Steinberg was of the opinion that with the pattern presented of persistent cord occlusion, it would have been appropriate to do a scalp sampling to better assess how the baby was doing. No scalp sampling was performed.

e) Michael's Condition at Birth

(i) Pallor - Failure to Respond Appropriately to its Presence

61 Dr. Provatopoulos claims that it was he who suggested that Dr. Buss give Ringer's Lactate to Michael as a volume expander. Notwithstanding this claim, the plaintiffs submit that Dr. Provatopoulos only gave volume after Dr. Zachary advised doing so at 30 minutes of age. According to the plaintiffs, throughout the time he was in charge of the resuscitation, Dr. Provatopoulos neither assessed nor recognized the need for volume, nor did he provide it. Indeed, Dr. Provatopoulos stated that he did not even notice the baby was pale until the period between the time blood was drawn (01:26) and Dr. Zachary's arrival (01:45). He had no explanation as to why he had not previously noted that that baby was pale.

62 It is submitted that Dr. Provatopoulos failed: (1) to recognize the significance of Michael's persistent pallor; (2) to diagnose or treat, in an appropriate and timely manner, the hypovolemia from which the plaintiffs allege Michael was suffering; and (3) to recognize Michael's critical need for volume to boost his inadequate blood circulation. It is submitted that this failure to recognize or respond to the persisting pallor fell below the standard of care.

(ii) The Presence of Hypovolemia/Shock

63 It is submitted that Dr. Provatopoulos was negligent in not being concerned about hypovolemia or failing to act on any concerns he might have had with respect to the possibility of hypovolemia being present in Michael. All the literature on this issue make it clear that time is of the essence. There is no time to wait if resuscitation (including restoring the circulating volume) is to prevent permanent brain damage from developing due to untreated or inadequately treated hypovolemia.

(f) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

64 The plaintiffs assert that Dr. Provatopoulos was negligent and breached his duty to apply appropriate (and timely) knowledge, skill and ability in his efforts to resuscitate Michael in that he failed: (1) to intubate Michael, as he ought to have; (2) to obtain blood analysis; (3) to measure Michael's pulse or blood pressure; and (4) to recognize hypovolemia himself despite professing to recognize the need to suspect it in circumstances when a baby is depressed.

65 Counsel for the plaintiffs argue that Dr. Provatopoulos failed to consider differential diagnoses in the face of persisting evidence of inadequate response to their resuscitative efforts. Instead, he was rigid in his diagnostic approach when he ought to have been conducting repeated assessments and evaluations. He failed to consider or appreciate that Michael's heart rate was out of keeping with the persistent pallor and failed to reconsider his treatment plan despite this finding.

66 Also submitted is that Dr. Provatopoulos failed to respond appropriately to his ongoing concerns of fetal distress in utero (disclosed by the fetal heart monitor tracing) by failing to arrange to have Dr. Zachary present at the delivery.

67 Dr. Provatopoulos, the plaintiffs argue, underestimated or failed to appreciate the presence of Michael's depressed condition. He stated that Michael was improving and responding well to their resuscitative efforts whereas it was patently obvious to Dr. Zachary and Nurse Kanhai that Michael was a sick baby.

68 According to the plaintiffs, instead of providing positive pressure ventilation to Michael as he ought to have done, Dr. Provatopoulos simply placed the oxygen mask over Michael's face. It is submitted that Dr. Provatopoulos failed to identify and treat Michael's low blood pressure in order to permit Michael's brain to be adequately perfused. The mere provision of oxygen is not enough to ensure adequate perfusion of the brain if there is inadequate volume and blood pressure to transport oxygenated blood to the brain.

C. Allegations Against Dr. Buss

69 Counsel on behalf of the plaintiffs make the following allegations regarding the conduct of Dr. Buss:

a) Michael's Condition at Birth

(i) Pallor - Failure to Respond Appropriately to its Presence

70 It is submitted that Dr. Buss failed to recognize the significance of Michael's persistent pallor or to diagnose or treat in an appropriate and timely manner, the hypovolemia from which Michael was suffering and his critical need for volume to boost his inadequate blood circulation. It is submitted that his failure to recognize or respond to the persisting pallor fell below the standard of care.

(ii) The Presence of Hypovolemia/Shock

71 Dr. Buss claimed that he looked for hypovolemia in Michael and ruled it out. However, according to the plaintiffs, Dr. Buss admitted to not understanding in March 1991 that neonates who are premature and asphyxiated near the end of labour are especially likely to be hypovolemic. In addition, Dr. Buss, while attending to treat Michael, was under the mistaken belief that Michael was at term (i.e., 40 weeks gestation). At trial, Dr. Buss conceded that he had had scant exposure to premature neonates in 1991, the time of Michael's birth.

72 It is submitted by counsel for the plaintiffs that Dr. Buss was not candid in his testimony when he stated that he looked for and ruled out the presence of hypovolemia. That testimony is belied by the evidence of Dr. Provatopoulos and Dr. Zachary and is contradicted by the evidence of defense expert doctors Gagnon, Hannah and Kay. It is submitted that Dr. Buss was negligent in not treating hypovolemia appropriately.

b) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

73 The plaintiffs argue that Dr. Buss was negligent and failed in his duty to Michael to apply appropriate (and timely) knowledge, skill, and ability in his efforts to resuscitate Michael in that he failed: (1) to obtain blood analysis; (2) to recognize and determine the presence of hypovolemia; (3) to initiate volume replacement early enough, or in sufficient amounts and repeated infusions.

74 Dr. Buss, the plaintiffs submit, failed to consider differential diagnoses in the face of persisting evidence of inadequate response to his resuscitative efforts. Instead, he remained rigid in his diagnostic approach when he ought to have been conducting repeated assessments and evaluations. Like Dr. Provatopoulos, Dr. Buss failed to consider or appreciate that Michael's heart rate was out of keeping with the persistent pallor and failed to reconsider their treatment plan despite this finding. According to counsel for the plaintiffs, Dr. Buss failed to have necessary medical knowledge or ignored the teachings from the textbooks he relied on for training in resuscitation.

75 The plaintiffs argue that Dr. Buss' delay in providing volume fell below the standard of care. A competent resuscitator would have determined this need by five to seven minutes following the

birth. Dr. Buss underestimated or failed to appreciate the presence of Michael's depressed condition. Dr. Buss claimed that Michael was improving and responding well to his resuscitative efforts whereas it was obvious that Michael was a sick baby.

76 In addition, the plaintiffs suggest that Dr. Buss failed to reassess Michael so as to come to the realization that Michael needed more volume. He also failed to identify and treat Michael's low blood pressure in order to permit Michael's brain to be adequately perfused. In the end, the plaintiffs, along with Dr. Smith, criticize Dr. Buss for not intervening in a more timely fashion and for failing to properly assess and react to the baby's condition.

D. Allegations Against All Defendants

a) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

77 The plaintiffs submit that all defendants failed to:

* recognize and respond to the presence of persistent pallor (immediately identified to be present at birth by Dr. Wong, and by Dr. Buss to persist up until the time Ringer's Lactate was finally provided) despite oxygenation and the significance of that finding;
* communicate with each other in a manner that might have identified concerns or alerted one another of the need to be concerned;
* diagnose the presence of hypolovemia and the need to address, early on, the circulation aspect of the ABC of resuscitation;
* recognize the urgency of the situation they undertook to treat;
* initially apply common sense that the pallor, which had a simple explanation and a simple treatment, had to be addressed;
* have the experience, skill, and training required to recognize and respond to Michael's needs; and
* provide the skill of diagnosis and treatment in a timely fashion. Had they done so, Michael's outcome would have been completely different and he would be a normal child today

II. DEFENDANTS' RESPONSE TO PLAINTIFFS'S ALLEGATIONS

78 The defendants' counsel have made submissions by way of response to the submissions made by plaintiffs' counsel and these submissions are as follows:

A. Response to Allegations Against Dr. Wong

79 Counsel on behalf of the defendants make the following arguments in response to the

allegations made by the plaintiffs regarding the conduct of Dr. Wong:

a) Gestational Age

80 According to Dr. Shia Salem, the modern data yielded a gestational estimation of 7 weeks and 1 day. Applying Dr. Wong's gestational wheels to that figure yields an expected date of confinement of April 20th and demonstrates that, on the date of birth, March 23, 1991, the baby was exactly 36 weeks gestation. Thus, the modern data demonstrates independently that Dr. Wong, in fact, chose an appropriate expected date of confinement.

b) Oxytocin Administration

81 Dr. Steinberg alone made an issue of the absence of a chart note confirming the Oxytocin was turned off. No factual evidence exists to support the plaintiffs' theories that the Oxytocin was not turned off or that it was restarted.

82 Even if it was the case that the Oxytocin was not stopped or was recommenced, the defendants rely on the evidence of Dr. Hannah to argue that the continued use of Oxytocin would only be a concern if it was causing too frequent or too prolonged contractions. No one has suggested that Theresa Chow's contractions were abnormal in any way. Dr. Hannah also confirmed that turning off the Oxytocin would be something he would expect a nurse to do on her own initiative. If this was done, no order would have had to be written down.

c) Failure to Call Dr. Zachary, the Neonatologist to Attend the Delivery

83 Dr. Solimano, one of the authors of the National Guidelines for Neonatal Resuscitation, explained in considerable detail his satisfaction with the qualifications of both Nurse Kanhai and Dr. Provatopoulos and with the availability of Dr. Buss on short notice. Dr. Boulton was similarly satisfied with the qualifications of the three resuscitators and stated that the standards for preparedness at the time of delivery were met. In her view, there was no call to have a pediatrician or neonatologist present. In fact, according to Dr. Boulton, it would be a misuse of resources to ask a neonatologist to be present in every situation like the one in question. She also made it clear that her opinion in this respect would not alter if the baby was of 35 instead of 36 weeks gestation. Dr. Skidmore testified that, at his institution, Women's College Hospital, they would not have alerted the members of the resuscitation team even if the baby was 34 weeks gestation.

d) Failure to Obtain Cord Blood for Analysis

84 Not specifically addressed by defense.

e) The Stoppage of the Paper Tracing at 00:20 - Failure to Properly Monitor

85 The fetal heart rate monitor in Theresa Chow's labour room ran out of paper at 00:20. Shortly thereafter, around 00:30, both Nurse Gallacher and Dr. Provatopoulos examined Theresa. It is

argued by the defendants that, since Theresa was about to be moved to the O.R., Nurse Gallacher would not necessarily put fresh paper in a machine that would be left behind when the patient moved to another room. It is also submitted that Dr. Provatopoulos heard the fetal heart monitor working in a normal way even though the tracing part was out of paper and not working.

86 It is generally accepted that it took six minutes to move Theresa to the O.R. and get her hooked up to the new monitor at 00:36. There is then two and a half minutes of tracing from the scalp clip, including one or two variable decelerations with swift recovery followed by one minute of tracing with good variability. Dr. Wong attributed the decelerations to the fact that Theresa was pushing.

87 When Dr. Wong entered the O.R., he examined Theresa and removed the scalp clip in order to prepare her for delivery. There is no explanation in the evidence why the internal tracing stopped other than the removal of the scalp clip. If it is indeed the cause, it exactly fits with Dr. Wong's interpretation of that tracing. All this time, Theresa was receiving one-on-one attention from Nurse Gallacher and the two doctors.

88 Several of the witnesses state that a tracing is not particularly needed when a patient is receiving one-on-one attention. Dr. Hannah was of the opinion that it is more important for a nurse to listen to the fetal heart beat and report to the doctor any sign of trouble. Dr. Farine was adamant that a trained professional could not miss the sound of an abnormal heart rate.

89 Between 00:51 and 00:57, tracings were taken from the external monitor on Theresa Chow's abdomen. No bradycardia occurred during this time. Dr. Farine stated that, if there was entrapment of blood, as the plaintiffs claim, he would expect a bradycardia. In his view, the heart rate in the final tracing was not compatible with the entrapment theory. Dr. Gagnon expressed a similar opinion.

f) Cord Compressions, Tight Nuchal Cord, Immediate Clamping

90 Not specifically addressed by the defense.

g) The Apgar Scores

91 Both Dr. Wong and Dr. Provatopoulos assigned a one minute Apgar of 5. Each gave 2 for the heart rate above 100, 1 for colour, 1 for respiratory effort and 1 for reflex irritability. The description recorded by Nurse Kanhai at 00:58 was entirely consistent with their scores.

92 Dr. Wong assigned a five minute Apgar score of 7, including 2 for both colour and respirations, but still nothing for tone. He thought the baby was getting better.

h) Michael's Condition at Birth

(i) Pallor - Failure to Respond Appropriately to its Presence

93 Dr. Wong described Michael's colour at birth as dusty. According to the defendants, the baby was trying to breathe and Dr. Wong saw him gasp. Initially, Michael had no tone and was flaccid. On the Newborn Physical Examination Record, he noted that the baby was pale at birth.

94 While waiting to deliver the placenta, Dr. Wong watched Dr. Provatopoulos and Nurse Kanhai working on Michael who was about three or four feet away. They were administering oxygen by applying a mask and squeezing a bag. He saw Michael pinking up and trying to breathe. He felt Michael was improving as the five minute Apgar score demonstrated.

(i) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

95 Not specifically addressed by the defense.

B. Defendants' Response to Allegations Against Dr. Provatopoulos

96 Counsel on behalf of the defendants make the following arguments in response to the plaintiffs' allegations regarding the conduct of Dr. Provatopoulos:

a) Oxytocin Administration

97 Dr. Provatopoulos was emphatically clear that upon his arrival at 23:26, he noted that all the steps Nurse Gallacher said she performed had indeed been done - including turning off the Oxytocin. His subsequent phone call to Dr. Wong confirmed that all these steps had been taken. Dr. Provatopoulos acknowledged that he did not write down what he considered to be a routine procedure. He simply made sure it was done and confirmed that it remained off whenever he walked into the room.

b) Failure to Call Dr. Zachary, the Neonatologist to Attend the Delivery

98 Same as response to plaintiffs' allegation against Dr. Wong.

c) The Stoppage of the Paper Tracing at 00:20 - Failure to Properly Monitor

99 Same as response to plaintiffs' allegation against Dr. Wong.

d) Dr. Provatopoulos' Care
(i) Situation at 00:30 - Failure to Deliver Baby

100 At 23:26, Dr. Provatopoulos conducted a vaginal examination and reviewed the heart rate tracing. He found her to have made good progress to 8 to 9 cms. dilation. He did not regard the tracing as ominous; both short and long term variability were very good. He noted good recovery from the variable decelerations and assessed the possible bradycardia as an episode of picking up the mother's heart rate.

101 Upon examination at 00:30, Theresa Chow was fully dilated. According to the defense, the fetal heart monitor machine was producing an audible signal of the fetal heart beat and a visible digital electronic reading. Counsel for the defendants make this argument notwithstanding the fact that the fetal heart monitor machine had ran out of paper at 00:20. Dr. Provatopoulos again tried unsuccessfully to reach Dr. Wong by telephone (his first attempt was at 00:15). Dr. Wong happened to call in at about 00:30 and was told by the nurses that Theresa Chow was dilated and that they were going to take her to the delivery room. Dr. Hannah stated that in light of the heart rate tracing alone, he would not have been sufficiently concerned that there was any great rush to deliver the baby.

(ii) Assessment of the Baby's Well Being by Scalp Stimulation

102 According to the defense, scalp stimulation is a very simple and harmless means of testing the health of the fetus. It may arise as a normal part of a vaginal examination if the scalp is accessible. The examining doctor simply watches either the monitor itself or the tracing while the examination is being conducted or the scalp clip is being installed, in order to note a resulting acceleration of the fetal heart rate.

103 The defense contends that Dr. Provatopoulos screwed an electrode into the fetal scalp in order to improve the quality of the tracing. During both the vaginal examination and the installation of the scalp clip, he stimulated the baby's scalp and was rewarded on the tracing with nice accelerations on both occasions. He marked the accelerations. The accelerations suggested that the fetus was healthy and reactive and the autonomic nervous system, the brain mechanisms controlling blood-pressure, heart rate and breathing were intact and functioning normally.

(iii) Fetal Scalp Blood Sampling

104 Dr. Steinberg argued that concern over the fetal heart rate tracing ought to have led Dr. Provatopoulos to run a pH test on a sample of fetal scalp blood in order to reassure himself as the acid/base balance of the blood. However, in response to this allegation, Dr. Bernstein testified that "there wasn't any strong indication for that". Dr. Hannah agreed with Dr. Bernstein that there was not any point in taking fetal scalp blood when Theresa Chow was approaching full dilation at 23:38. Indeed, an article by T.M. Goodwin, L. Milner-Masterson and R. Paul, entitled "Elimination of Fetal Scalp Sampling on a Large Clinical Service" (1994) 83:6 Obstetrics and Gynecology 971, states that "there may be little role for fetal scalp blood sampling in the diagnosis and management of intrapartum fetal distress" (p. 973).

e) Michael's Condition at Birth

(i) Pallor - Failure to Respond Appropriately to its Presence

105 Dr. Provatopoulos thought Michael was blue at birth and continued to be blue when he assessed him in the bassinet warmer. Although he heard the baby gasp, Dr. Provatopoulos stated that the baby was not making a regular respiratory effort. He applied CPAP assisted ventilation

using a bag and mask. After 30 seconds, the baby pinked up immediately and began to have regular respiratory effort. Nurse Kanhai's note at 00:58 confirms the baby's improvement "colour pink, no cyanosis".

106 Although Michael had greatly improved in the first minute, his breathing efforts were not yet sustained. Dr. Provatopoulos felt it would be helpful to have an anesthetist attend.

107 According to the defense, Dr. Provatopoulos, then, provided positive pressure ventilation with a bag and mask. Michael's chest was expanding in response to the ventilation. Dr. Buss testified that Michael was being provided oxygenation and had good perfusion. No evidence existed as to circulatory collapse.

108 Dr. Provatopoulos assigned Michael a five-minute Apgar score of 7.

(ii) The Presence of Hypovolemia/Shock

109 The defense contends that the plaintiffs' experts exaggerated the slight paleness which the defendants acknowledged and made it into the serious and obvious pallor associated with hypovolemic shock.

110 The doctors applied a pulse oximeter to Michael's heel and were reassured by its reading of normal oxygen saturation of the baby's blood. Such demonstrated good perfusion. Dr. Boulton testified that, if Michael was hypovolemic or not well perfused, this equipment would often not pick up the baby's pulse or would give very erratic readings. Michael's recorded oximeter readings were consistently in the 96 to 100 percent range.

111 Then, according to counsel for the defendants, the doctors applied a blood pressure cuff that was attached to an automatic machine, set to cycle approximately every three minutes. The first reading was 40/20 which Dr. Buss considered to be in the lower range of normal blood pressure. Even after this reading, though, Dr. Buss did not believe Michael was hypovolemic. He claimed that he did not have the rest of the picture. According to Dr. Buss, there was no consistent tachycardia, no tachypnea, no white pallor or any other sign of hypovolemic shock. He decided to give a conservative amount of fluid to see what it would do. He acted out of an abundance of caution.

112 The plaintiffs rely on the fact that Dr. Provatopoulos' explanation for the Ringer's Lactate was that it was standard protocol for hypovolemia in order to argue that hypovolemia was present and the doctors were negligent in their treatment of such. However, the defense argues that Dr. Provatopoulos made it clear that he was simply talking about was a slight chance or suspicion of hypovolemia and not actually a diagnosed condition.

113 Both Dr. Skidmore and Dr. Boulton agreed that, in light of the improved tone after the administration of Ringer's Lactate, Michael was not hypovolemic. He would not have responded to "essentially what was a drop in the bucket in terms of fluid." Dr. Solimano accepted Dr. Buss'

decision to give a modest amount of fluid as a reasonable thing to do. He did not consider it mandatory and echoed the opinion of Dr. Boulton that a larger volume could be potentially harmful.

114 At 01:26, there was a blood pressure reading of 31/17. This reading, argues the defense, was out of keeping with all other blood pressure information. Dr. Skidmore testified that he would not place any significance on individual low readings. The results are only important to provide a trend.

115 Dr. Boulton stressed that it is her experience that fluids are given in the first few minutes of life generally when there is a very acute, very serious, situation such as a baby with no heart rate (or a very low one) and is not responding to ventilation or cardiac compression. Although Michael was blue and floppy at birth, he improved over time.

116 Dr. Boulton pointed out that the small amount of Ringer's Lactate given to Michael would not have stayed in the blood stream very long and the majority of it had probably seeped into other tissues by the time Dr. Zachary arrived. Dr. Zachary's finding that Michael was pink and perfused at 45 minutes of life was further evidence, according to Dr. Boulton, that hypovolemia was unlikely. Dr. Buss' election to administer bolus over 10 minutes was consistent with the medical teaching that you do not push bolus. Dr. Boulton stated that "if he [Michael] responded, I wouldn't give any more."

117 According to the defense counsel, Dr. Macnab, for the plaintiffs, tried to explain away the apparent effectiveness of Dr. Buss' treatment by putting forward a theory which he characterized as "like an on/off switch". Dr. Macnab justified his thesis by reference to his own clinical experience and his experiments with piglets. Dr. Boulton had never heard of this before. She stated that, in a case of severe hypovolemia, you would have to restore a significant amount of circulating volume before you would see any effect. She was unable to believe that 8 mls. per kilo would make any difference if Michael was hypovolemic.

118 The defendants contend that nowhere does Dr. Zachary ever diagnose Michael with hypovolemia. Dr. Zachary considered the pH low but the PC02 was normal. As a result, he concluded that the baby had metabolic acidosis. When asked in-chief if there were any apparent signs of hypovolemia, Dr. Zachary replied that he would have liked to see a better blood pressure and that is why he gave extra volume. If there had been hypovolemia, the tissue perfusion would be inadequate. There was no evidence of such in his clinical investigation. On cross-examination, Dr. Zachary reiterated that he gave volume to improve blood pressure and try to correct his metabolic acidosis.

119 The defense contends that the doctors were acting on the low blood pressure and not a diagnosis of hypovolemia. The fact that the treatment for low blood pressure corresponded with the treatment for a slight chance of hypovolemia confused the matter. Dr. Boulton explained that the stress of labour was the most common scenario for explaining an early low blood pressure. Dr. Skidmore stated that there was no hypovolemic shock at any stage. If there had been sufficient hypovolemia to cause brain damage, the Ringer's Lactate would not have changed things at all. Dr.

Solimano agreed with Dr. Skidmore.

120 Dr. Solimano pointed out that the majority of babies with hypoxic ischemic encephalopathy and who had asphyxia at birth have hypervolemia (an increased amount of blood in the system) rather than hypovolemia. He also made reference to the fact that neither Dr. Buss or Dr. Provatopoulos had diagnosed hypovolemia and the doctors at Mount Sinai for many hours had done nothing to treat such a condition. He concluded that there was no evidence of hypovolemia.

f) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

121 Within minutes, Michael was making breathing efforts on his own. Dr. Provatopoulos testified that Michael would breathe on his own for one or two minutes and then have a rest period for perhaps 10 to, at the most, 30 seconds. At that time, the doctor would apply CPAP and bag the baby. Due to these irregularities, it was felt that it might be better to intubate Michael in order for the doctors to "free [their] hands for other things."

122 Dr. Boulton, the Ontario Chair for Neonatal Resuscitation, flatly contradicted experts for the plaintiffs who advocated nearly immediate intubation. She stated that current teaching stresses bag and mass ventilation. Dr. Buss intubated in order to secure the airway so that he could get on with his assessment and the rest of his management. She considered the management of the first 10 minutes of life as very appropriate. While legitimate, there was no actual need to intubate Michael.

123 Dr. Solimano agreed with Dr. Boulton and stated that the best indications are a normal heart rate and chest expansion. Michael had both.

124 Dr. Zachary arrived at 45 minutes of life. He immediately assessed Michael who was pink and being manually bagged with 100 percent oxygen. The baby's colour meant he had good oxygenation. He recorded a heart rate of 160, which he considered neither bradycardic nor tachycardic. Dr. Zachary removed the breathing tube at 1 hour of life. Michael was pink and breathing regularly. No further artificial breathing was provided.

125 Dr. Provatopoulos was applauded for his management of the resuscitation.

C. Defendants' Response to Allegations Against Dr. Buss

126 Counsel on behalf of the defendants make the following arguments in response to allegations by the plaintiffs regarding the conduct of Dr. Buss:

a) Michael's Condition at Birth
(i) Pallor - Failure to Respond Appropriately to its Presence

127 Dr. Buss arrived between 1:00 and 1:05 to find Dr. Provatopoulos providing positive pressure ventilation with a bag and mask. Michael's chest was expanding in response to the

ventilation. His pallor was pink with a subtle degree of pale. Dr. Buss used the word subtle because he realized that both the other doctors felt the baby was completely pink by 5 minutes. Dr. Buss continued his examination because of the subtle paleness. He was considering the possibility of anemia. He confirmed equal air-entry in both lungs, normal heart sounds, and the heart rate varying from 140 to 180. He detected no abnormality of the anterior fontanel and no irregularity of the windpipe or abdomen. The femoral pulses in the groin were normal. Michael was being provided oxygenation and had good perfusion. No evidence existed as to circulatory collapse.

128 Dr. Buss assigned a five minute Apgar score of 5.

(ii) The Presence of Hypovolemia/Shock

129 Same as response to plaintiffs' allegation against Dr. Provatopoulos.

b) The Resuscitation - Failure to Recognize or Respond Appropriately to Inadequate Circulation

130 Same as response to plaintiffs' allegation against Dr. Provatopoulos.

131 Dr. Buss was applauded for his management of the resuscitation.

III. PLAINTIFFS'S SUBMISSIONS REGARDING CAUSATION

132 Counsel on behalf of the plaintiffs make the following arguments regarding the cause of Michael Chow's injuries:

133 Theresa Chow's pregnancy was normal throughout. Both she and her baby were healthy when they came to Wellesley Hospital on March 22, 1991. The fetal heart monitor tracing was reassuring and indicative of a healthy fetus until 21:40. Thereafter, the tracing showed variable decelerations with reduced beat to beat variability. Variable decelerations are often reflective of compression of the umbilical cord. When the cord is compressed, the blood flow is interrupted and there is a reduction of oxygen to the fetus.

134 At delivery, the cord was found to be tightly around Michael's neck. Dr. Wong was unable to slip the cord over Michael's head to deliver him and so he immediately clamped and cut the cord prior to delivery. Michael was, however, allegedly born with a normal, healthy brain.

135 Dr. Wong was aware that early cutting of the umbilical cord could have detrimental effects on the baby. Dr. Buss, however, was not aware that early cord clamping could result in a depressed neonate. He did not possess this knowledge despite the fact that such was taught in the textbook he relied on as part of his training in the resuscitation of newborns, namely R.D. Miller, ed., Anesthesia, 2nd ed. (New York: Churchill Livingstone, 1986). According to this text:

> The larger the placental volume, the smaller the neonate's blood volume. Early

> cord clamping can deprive the neonate of up to 30 ml. of blood per kg. of body weight.
>
> If the neonate is flaccid, pale, limp, and/or cyanotic, the umbilical cord should be clamped and cut and the neonate handed off to be resuscitated. Remember, the neonate probably is hypovolemic since the umbilical cord was clamped early (p. 1737).

Dr. Wong agreed that once an umbilical cord is clamped, no blood can be transported from the placenta to the fetus. Thus, the timing of the clamping of the cord has a direct effect on the amount of blood that will be in the body within the first few minutes after it is born. Dr. Wong testified that he quickly cut the cord to deliver Michael. Dr. Provatopoulos stated that Dr. Wong clamped the cord and delivered the baby quickly within ten seconds, well before the initial, one fourth of the placental transfusion, that would otherwise have been received by Michael, could take place.

136 Counsel's argument is supported by the following medical evidence. According to Dr. Macnab,

> ... when the baby is entangled in the umbilical cord, the obstetrician has to cut the cord in order to deliver the infant and this prevents the baby having the normal transfusion of blood which occurs from the placenta through the cord as the baby is held below the mother after delivery. This means that the normal transfusion effect to give haemoglobin from the placenta to the baby can't occur.

It is well recognized, submit the plaintiffs, that these cord problems can contribute to hypovolemia, or lack of circulating volume.

137 Following Dr. Zachary's arrival, 45 minutes after Michael was born, a complete blood count was done and Michael's hemoglobin was found to be 93. A hemoglobin of 93 is considered "quite anemic." Normal hemoglobin is 160-180. Dr. Macnab calculated the blood loss in Michael, in accordance with this hemoglobin count, to be an approximately 50 percent blood loss. Dr. Perlman, an expert in neonatology, called by the plaintiffs, was of the same opinion.

138 This argument is also supported by Dr. Gagnon, defense expert, who stated:

> The fact that the baby was anemic at the time of the delivery suggested that the baby had lost half of its blood volume sometime before delivery. To have a hemoglobin of 90 or 93 in a newborn baby, which normally is about 160 to 175, the baby had to lose probably 40 to 50 percent of its blood volume.

Dr. Boulton, for the defense, agreed that the fact that Michael was anemic at birth means that he had lost hemoglobin or red blood cells at some point.

139 It is argued that the blood loss in Michael's case could not be attributed to a fetal-fetal transfusion since there was no twin. Feto-maternal hemorrhage was ruled out by the negative Kleihauer-Betke test result. It is important to note that the order for this test demonstrated that Dr. Provatopoulos was aware of the blood loss and that he attempted to determine whether any fetal cells were present in Theresa's blood which would confirm a fetal maternal hemorrhage had occurred. The results of that test were negative and ruled out this suspicion. The possibility of a blood loss into the amniotic fluid is unsupported by any evidence. The nursing chart established that the amniotic fluid was clear with no bloody show. The possibility of a bleed behind the placenta or the presence of a concealed abruption is also not supported by the evidence. The possibility that this was not a blood loss, but rather the result of a hemolytic process, is negated by Dr. Zachary. He performed a test for nucleated red blood cells with results that were normal.

140 The blood had to go somewhere, though. The plaintiffs argue that, by process of elimination, the only place it could have gone was within the placenta.

141 Dr. Boulton agreed that, after a birth, there is generally a transfusion of blood from the placenta into the baby. It is well documented that, if this transfusion is prevented, the percentage of blood volume that would otherwise be received from the placenta will not be received by the baby.

142 Dr. Farine, for the defense, agreed that the possible explanations for Michael's anemia, other than blood loss, were disproved by testing.

143 In M. Xanthou and R. Bracci, eds., Neonatal Haematology and Immunology (Amsterdam: Excerpta Medica, 1990), Zipursky et al argue at page 3 that a newborn may receive an infusion of placental blood equivalent to 50 percent of its blood volume within 30 seconds. In a chapter entitled "Hematology" in G. Avery et al, eds., Neonatology: Pathophysiology and Management of the Newborn, 4th ed. (Philadelphia: J.B. Lippincott, 1994) 952, Dr. Zipursky et al further explains:

> Severe bleeding as a result of an obstetric accident or complication of delivery often results in the birth of a pale, limp infant. Respirations, which usually commence spontaneously, are often irregular and gasping ... Cyanosis is minimal and the infant's pale colour is not improved by oxygen administration. The peripheral pulses are weak or absent, and blood pressure is reduced (p. 959).

144 In another authoritative textbook on hematology, namely D. Nathan and F. Oski, eds., Hematology of Infancy and Childhood, 3rd ed. (Philadelphia: W.B. Saunders Co., 1987), Dr. Oski states at page 30:

> In general an acute loss of 20 percent of the blood volume is sufficient to produce signs of shock and will be reflected in a fall in hemoglobin levels within three hours of the event.

Dr. Boulton and Dr. Solimano refused to accept that a blood loss of 20 percent would cause

hypovolemic shock. Dr. Boulton rendered the opinion that babies will tolerate a drop in blood volume of about 25 percent before they become symptomatic at all.

145 The position of Dr. Boulton and Solimano, that the anemia was long standing, is refuted by the fact that Michael's reticulocyte (young red blood cells) count at birth was normal. In the result, the anemia could not have been long standing because baby's red blood cell production mechanism had not shown that it had increased within 24 hours of the loss of blood to compensate for the loss of blood.

146 It is submitted that this absence of elevated red blood cells negates the suggestion that Michael's blood loss occurred 24 to 36 hours prior to delivery as posited by Dr. Solimano.

147 Dr. Solimano's proposition of a series of mysterious, undetectable events in the 24 to 48 hours prior to birth is further refuted by Dr. Barnes, defense expert. It is Dr. Barnes' opinion that Dr. Solimano's hypothesis is not consistent with the CT scan findings because of the evolution of the edema from the first to the second scan. Dr. Barnes rejected that a series of repeated insults produced Michael's brain damage a day prior to delivery. No clinical events correlate with such alleged prior insults. He testified:

> We have no known series of events prior to that time. I will tell you in my experience and you will find in the literature, for the profound type of hypoxic ischemic injury and for the most severe of the partial prolongs, the events are usually pretty obvious.
>
> So if we're looking for something prior to let's say spontaneous rupture of membranes the maternal history is usually obvious: vaginal bleeding, automobile accident, other risk factors, hypertension, toxemia. But the most obvious thing that the mother will report is a loss of fetal movements that may not return or a loss of fetal movements that may come back but they're not as strong as they were.

Theresa Chow experienced no loss of fetal movements at any time.

148 Dr. Solimano also posited that Michael's brain injury was a gradual occurrence which got progressively worse with each insult. At some point a condition of hypovolemia developed which would have a much greater effect on Michael's vulnerable brain.

149 Dr. Barnes rejected this theory as well. According to him, in this case, there was no evidence on the first or last CT scan in terms of a pattern of injury that would indicate there was a preceding injury.

150 It is submitted by the plaintiffs that, even if the court gives credence to Dr. Solimano's

theory, the defendants are nonetheless fully liable for all Michael's damages if failure to diagnose and treat the hypovolemia in a timely fashion contributed to the outcome.

151 Additional evidence exists in this case which negates Dr. Solimano's theory. Dr. Buss testified that at birth he felt Michael's fontanels and they were soft and normal. If a newborn had brain damage at birth from such a preexisting injury, the fontanels would be bulging. As pressure within the brain builds, the brain will swell, pushing the fontanels against the bony plates of the skull, resulting in bulging or tension.

152 In addition, the cerebral profusion pressure determines whether there is adequate perfusion to the brain. When cerebral perfusion pressure is reduced below a certain level there is a likelihood of brain damage occurring. Lupton et al have determined that cerebral profusion pressures greater than 30 millimetres of mercury may be considered normal (see Lupton et al, "Brain Swelling in the Asphyxiated Term Newborn: Pathogenesis and Outcome" (1988) 82:2 Pediatrics 139 at 140).

153 It was calculated that, when Michael's blood pressure was 40/20, his mean blood pressure of 26 yielded a cerebral perfusion pressure of 16 (using Lupton's 10 mm. Hg value) or 24 (using Minns 2 mm. Hg value). When Michael's blood pressure was 31/17, the cerebral perfusion pressure was 13 or 21. In all instances, Michael's cerebral perfusion pressure was inadequate.

154 The usual time frame when seizures occur is within 24 hours of the time of the insults sufficient to cause brain damage. In Michael's case, seizures were manifest at 18 hours of age. Had Michael sustained his brain injury prior to birth, Dr. Smith argued that seizures would have occurred much earlier. Dr. Smith, plaintiffs' expert, expressed the opinion that the timing of the seizures and the evolution of the CT scans is perfectly in keeping with damage occurring at the time of birth or shortly thereafter.

155 Dr. Alvord, for the plaintiffs, reviewed the three CT scans in this case. In his opinion, the first CT scan, taken at 19 hours of life, showed no significant edema. He concluded:

> ... the brain damage apparent on the film is consistent with hypoxic damage sustained during delayed neonatal resuscitation.
>
> ... the brain damage apparent on the films was not due to any disease process existing prior to birth. The brain was well formed with no evidence of abnormality on day 0, becoming very abnormal at 10 days and sharing the expected resorption of necrotic tissue at 5 months. ...

In Dr. Alvord's opinion, the only explanation as to why Michael sustained brain damage is hypoxic ischemic injury. This was the discharge diagnosis at Mount Sinai Hospital. Dr. Solimano, Dr. Skidmore, and Dr. Gagnon all accepted this diagnosis as the correct one.

156 Dr. Flodmark, a world authority in the field of neuroradiology, stated that the first CT scan disclosed that no significant edema was present. In his opinion, this was a normal scan. The normal appearance of this CT scan excludes any congenital malformation of the brain. Dr. Flodmark posits that the CT scan is consistent with a hypoxic ischemic injury that happened less than 24 hours before the CT scan was performed at 19 hours of age.

157 Dr. Barnes, for the defense, explained his conclusion that Michael's type of injury is characteristically related to hypoxia/hypofusion:

> ... the partial prolonged hypoxic ischemic injury subtype is part of the widely accepted and used classifications of hypoxic ischemic injury. It refers to...one or more episodes of hypoxemia, meaning blood going to the brain or hypo perfusion, meaning even though there was adequate oxygen in the blood, the blood flow may be inadequate to the brain to get it there.

158 Dr. Macnab's opinion as to the direct cause of Michael's hypoxic ischemic brain injury was this:

> I'm quite certain that this was due to a reduced ability in Michael's situation for him to carry oxygen to the brain. Although he was being given oxygen, he did not have sufficient blood pressure for that blood to flow through the brain to carry oxygen to brain tissue and to remove the waste products from the brain that would have developed in the form of acids and other waste products while he was waiting for the transfusion of volume which returned his brain blood flow to normal. This limited flow through the brain occurred as a consequence of his low blood pressure and the low blood pressure is associated with anemia, and anemia under these circumstance [sic], where we have no clinically obvious bleeding, is likely due to failure of the placenta to be able to transfuse Michael at the time of birth because the cord had to be divided in order for him to be delivered, compounded, in addition, by the fact that the cord was around his neck and there is a well-recognized situation where there is cord compromise during delivery, that blood loss can occur from the infant back to the placenta.

Dr. Perlman was of the opinion that if Michael's condition had been recognized and treated properly, he would be a healthy normal child today. Dr. Smith was of the opinion that "there is no question that the damage suffered by this infant was contributed to in a major way by the failure to provide prompt and effective resuscitation." Dr. Bernstein testified that he believed Michael was born with a healthy brain but did not get enough blood and oxygen to his brain for a time shortly after birth. This is why Michael's brain damage occurred.

159 Finally, the plaintiffs' argue that the consequence of repeated cord compressions, tight nuchal cord, and immediate clamping of the umbilical cord resulted in a substantial percentage of the baby's blood volume (in the order of 40 - 50 percent) being trapped in the placenta. This resulted in

the reduction of hemoglobin, anemia, and inadequate blood volume (hypovolemia). The low blood volume was not diagnosed or treated in a timely or appropriate manner by doctors Wong, Provatopoulos, or Buss. An undetected and uncorrected hypovolemia, with associated inadequate oxygenation and perfusion of Michael's brain, resulted in his brain sustaining hypoxic ischemic encephalopathy (i.e., brain damage due to inadequate blood circulation to and oxygenation of the brain).

IV. DEFENDANTS' SUBMISSIONS REGARDING CAUSATION

160 Counsel for the defense argue strenuously that, although Michael Chow has suffered tremendous injuries, they were not sustained by any negligent acts of their clients. The position of the defense with respect to the allegations against the doctors is as follows:

161 Counsel for the defendants agree that Theresa Chow had an apparently normal pregnancy. She came to Wellesley hospital on March 22, 1991 with ruptured membranes and contractions that later ended. One of the possible causes of the rupture and contractions, argues the defense, could be the activities of the fetus. In other words, it is possible that the fetus somersaulted and rotated on its axis in utero, potentially tightening the cord and causing the kind of problem blamed for Michael's condition.

162 Dr. Skidmore, for the defense, argued that the possibility of strangulation in utero may directly impede blood flow to the brain and would explain why Michael's brain was affected rather than his other major organs. He stated that the initial measurement of hemoglobin, taken at 50 minutes, could not be the result of a blood loss 5 or 10 minutes before birth. Instead, he suggested the loss occurred approximately 24 hours prior to delivery, at the time of Theresa Chow's membrane rupture and premature labour. Dr. Boulton, for the defense, testified that this kind of incident is one of the known antecedents of cerebral palsy.

163 Defense expert, Dr. Solimano, explained the dangers for a fetus when the membranes rupture and the baby no longer has the insulation previously provided by the amniotic fluid. The result can be a silent event of cord compression following the sudden decent of the fetus as a result of the funnel effect produced by the draining of the fluid. He also indicated the possibility of an undetected bleed behind the placenta which could result in blood loss and major brain injury 24 hours before delivery.

164 Dr. Farine is of the opinion that the anemia subsequently found in Michael must have occurred before labour. More than 90 percent of the cases of cerebral palsy occur prior to labour. He dismissed the plaintiffs' theory of entrapment because the final heart rate tracing did not show a bradycardia in the very end of labour. While there might have been some entrapment, he argued that it could not have been significant enough to explain the baby's condition. He gave four reasons against the entrapment theory: (1) such an event is very uncommon. In the study referenced by Dr. Perlman, only 45 out of 800,000 deliveries had hypovolemia; (2) the anemia was out of proportion to what could be attributed to entrapment. He had never heard of a 50 percent entrapment; (3) if

there had been a major entrapment, the fetal heart rate should have been much worse towards the end; the final tracing was not compatible with the entrapment theory; and (4) that Michael pinked up negates entrapment.

165 Dr. Gagnon agreed with Dr. Farine. Dr. Skidmore conceded that the entrapment may have played a role in the anemia. However, he had never encountered the theory of placental blood entrapment as an explanation for hypovolemia. He was unable to accept Dr. Perlman's calculation of a 50 percent blood loss. This would have caused severe shock. Moreover, if such a massive blood loss existed, the 20 cc's of Ringer's Lactate would have disappeared virtually immediately without clinical improvement. Dr. Skidmore testified that Michael had lost enough blood to cause anemia but not enough to cause shock. He suggested a stress to the fetus longer than 18 to 24 hours prior to delivery but not a prolonged or chronic insult because the nucleated red blood cells were reported as normal. His professional opinion was that, in light of the hemoglobin reading, the blood loss must have occurred between 24 and 48 hours prior to delivery - most likely when Theresa Chow's membranes ruptured and she went into premature labour.

166 Although he did not purport to interpret the scans himself, relying on information from experts Dr. Alvord and Dr. Flodmark, Dr. Solimano analyzed Michael's condition. Dr. Solimano stated that it is very unusual to be able to detect brain swelling in the first 24 hours. If edema was present on the first scan, it would strongly suggest to him that the injury was in utero.

167 In addition, the apparent consensus between Drs. Alvord and Flodmark regarding an edematous injury to the cerebral hemispheres, helped him determine the time the brain injury occurred. Basically, he argued that edema in the cerebral hemispheres tends to be associated with "a more subacute injury, that is an injury over a longer period of time and which may have occurred not necessarily as a discrete event but perhaps a number of events ..."

168 Dr. Skidmore accepted the ultimate diagnosis of Michael's condition as hypoxic ischemic encephalopathy. However, he pointed out that this diagnosis provides no information as to the timing of the insult. It was his belief that the encephalopathy was present at birth and that the process started in utero, probably in the 24 hours before birth.

169 Dr. Solimano drew together various data to demonstrate the likelihood of one or more insults at about 24 hours prior to birth. In his opinion, Michael was not hypovolemic. The physicians at Mount Sinai restricted his fluid intake. This action suggested that they were worried that the baby could not tolerate normal I.V. fluid volume. He was confident that Michael's kidneys were not injured in the sense of renal failure although they were probably effected by ischemia.

170 The plaintiffs rely on an article by Lupton et al in order to persuade Dr. Solimano that the edema in the brain peaks anywhere between 36 to 72 hours. Dr. Solimano pointed out that the article does not in fact identity when the injuries reported upon actually occurred, but merely notes when they were first discovered near birth. Dr. Solimano maintained his opinion that the peak for edema is 72 hours after the insult. He argued that the most likely scenario involved insults in the 24

hour before birth. Dr. Solimano pointed out, and Dr. Macnab agreed, that the peak of any evidence of brain swelling in Michael's case would have been when the fontanel was described as full or bulging. That was at 34 hours of life. Add 24 hours and the peak would fall in the range of 36 to 72 hours which Dr. Macnab advocated on the basis of the Lupton article.

171 Referring to the 20 percent red cell loss that has been attributed to early cutting of the cord, Dr. Solimano stated that a baby does not suffer any problems with that. He re-explained the elasticity of the intravascular space and the wide range of normal hemoglobins, between 200 and 120 as further evidence that a baby does not go into shock because it receives up to 20 percent less blood.

172 Dr. Boulton testified that, if the baby lost 50 percent of its blood volume, it would not be pale, it would have been "absolutely profoundly white". Such a baby would require massive efforts at resuscitation before it could be turned around at all. It would have produced a baby with a very low heart rate at birth with no attempts at respiration, no response to stimulation, white and like a rag doll. It would have required resuscitation at a very high level which was not called for in Michael's case.

173 The defense contends that the only piece of medical literature that suggests even the possibility of a blood loss in the 50 percent range advocated by the plaintiffs' counsel is an article concerning two Belgium babies. The babies bore no significant resemblance to Michael from at least one minute of age. At least some of the treatments of those two babies were not initiated until much later than the 30 minutes in which this lawsuit is concerned. Both those babies responded well to resuscitation, indicating the absence of any pre-existing injury which defense experts posit.

174 Doctors Solimano, Gagnon, Farine and Boulton had never heard about a blood entrapment of 50 percent. They had only heard of the potential for entrapment for up to 20 - 25 percent of the fetus' blood. And, in those cases, "usually the baby would do fine" (Farine).

175 In addition to the above, counsel for the defense also posit two more possible explanations for the cause of Michael Chow's injuries:

a) Sepsis - Infection

176 The membrane rupture as early as 1 a.m. on March 22, 1991 meant that there was a possible risk of infection through Theresa Chow's cervix known as chorioamnionitis. The doctors, alert to this risk, took swabs of Michael and his cord at three minutes of birth to determine the presence of that infection. At 2:10, a sample of the baby's blood was sent for assessment of possible sepsis. Similarly, blood chemistry requisitioned around 3:00 and 4:45 recorded sepsis in the place provided for diagnosis.

177 Dr. Wong told Dr. Zachary that the most likely cause of Michael's difficulties was sepsis. He denied that Dr. Zachary suggested asphyxia as an alternative explanation. The defense contends

that, it was only later, after the lab work concerning sepsis came back in the negative, that Dr. Zachary wrote asphyxia as possible cause on Michael's Wellesley chart.

178 Moreover, all three neonatologists for the defense were of the opinion that Dr. Zachary had used the word, "asphyxia", improperly when signing the chart and that Michael's condition was misdiagnosed.

179 Regardless whether Dr. Zachary was correct in his analysis or not, according to Dr. Boulton, this would not rule out an asphyxial event in utero.

b) Hemoglobin - Anemia

180 According to Dr. Zachary's notes, the first complete blood count (CBC) yielded a hemoglobin reading of 93. No record exists as to when this information arrived. Hemoglobin is an expression of the relationship between the number of red cells contained in a given volume of blood. According to Dr. Boulton, a hemoglobin of 93 is perfectly adequate in terms of delivering oxygen to the brain of a newborn and would not cause damage. Around 1 hour of life, Michael was given a small dose of Ringer's Lactate. Since it contains no red cells, it would tend to dilute the hemoglobin a little. If a test was taken at birth, it would not have been lower than 93.

181 Dr. Boulton also explained that the presence of anemia does not mean that a baby also has hypovolemia (reduced total volume) in her or his circulatory system. Even if blood has been lost by an undetected bleed, the fetus can reconstitute its blood volume by drawing water from other parts of the body into the blood stream, gradually returning the blood volume to normal while the hemoglobin is gradually diluted. Such a baby can present quite normally in labour without anemia being detected.

182 Dr. Skidmore was unable to accept that the plaintiffs' entrapment theory could explain a hemoglobin below the normal range. Nor would he accept that the tight cord theory could effect hemoglobin on such a short time as 50 minutes to an hour. In support, he referred to an article by Shepherd, supra, which Dr. Perlman had produced. Out of 437 babies, only 5 apparently developed anemia that might be related to a nuchal cord. The anemia in those cases was only detected 12 to 24 hours after birth.

183 Dr. Macnab argued that the dilution of the hemoglobin largely occurs within three hours. The defense disagreed, though, with this position, arguing that the medical texts simply do not say this.

184 Dr. Solimano, then, explained the body's reaction to blood loss. Simply put, the body cannot make red cells fast enough and so it moves liquid into the blood vessels from other body tissues. The vascular space contracts and blood is diverted away from the skin, in favour of central organs such as the brain. If there had been a loss of as much as 40 - 50 percent of the red cells, signs of shock would be expected. In the absence of shock, a slower blood loss over several hours or days is the apparent explanation. It was Dr. Solimano's conclusion that the reduced hemoglobin reading

was a result of both a loss of red cells and an increase in plasma volume, causing a diluted hemoglobin.

185 The above submissions are put forward by the defendants as possible explanations for Michael Chow's tragic injuries.

V. LEGAL SUBMISSIONS - THE LAW OF NEGLIGENCE

A. Plaintiff's Submissions

186 The submissions of the plaintiffs' counsel, with respect to the law of negligence as applicable to the case at bar, are as follows:

a) Standard of Care

187 According to the plaintiffs, a physician is liable for malpractice when he or she fails to exercise the degree of care and skill that could be reasonably be expected of a reasonable, prudent doctor. As Schroeder J. stated in Crits v. Sylvester et al (1956), 1 D.L.R. (2d) 502 (Ont. C.A.):

> Every medical practitioner must bring to his task a reasonable degree of skill and knowledge and must exercise a reasonable degree of care. He is bound to exercise that degree of care and skill which could reasonably be expected of a normal, prudent practitioner of the same experience and standing, and if he holds himself out to be a specialist, a higher degree of skill is required of him than one who does not profess to be so qualified by special training and ability.
>
> I do not believe that the standard of care required of a medical practitioner has been more clearly or succinctly stated than by Lord Hewart C.J. in R. v. Bateman (1925), 41 T.L.R. 557 at p. 559: "If a person holds himself out as possessing special skill and knowledge and he is consulted, as possessing special skill and knowledge, by or on behalf of a patient, he owes a duty to the patient to use due caution in undertaking the treatment. If he accepts the responsibility and undertakes the treatment and the patient submits to his direction and treatment, accordingly, he owes a duty to the patient to use diligence, care, knowledge, skill and caution in administering the treatment ... The law requires a fair and reasonable standard of care and competence (p. 508).

188 With respect to a physician who holds her - or himself out as a specialist, the duty of a physician is set out in Wilson v. Swanson (1956), 5 D.L.R. (2d) 113 (S.C.C.):

> The test of reasonable care applies in medical malpractice cases as in other cases of alleged negligence. As has been said in the United States, the medical man must possess and use, that reasonable degree of learning and skill ordinarily

> possessed by practitioners in similar communities in similar cases, and it is the duty of a specialist such as the appellant, who holds himself out as possessing special skill and knowledge, to have and exercise the degree of skill of an average specialist in his field (p. 124).

189 The extent of a doctor's duty is established in Tacknyk v. Lake of the Woods and Brown, [1982] O.J. No. 170 (Ont. C.A.):

> The obligation of a surgeon to his patient cannot and does not stop with the successful completion of the operation itself. A continuing duty rests upon the surgeon to provide adequate post-operative care or to give adequate advice or direction as to such care. The extent of that duty will vary widely. It is now clear that the standard of care is a matter for the court and not for medical experts, although their view will be taken into consideration in setting the appropriate standard ... The degree of care the surgeon must provide and the extent of the advice he must give, will depend on a long list of variables. They may include the gravity of the operation, the age and general health of the patient, the particular problems of the patient, the nature of the post operative medication and treatment required, the degree of isolation of the patient, the availability and proximity of medical care and hospital facilities, and the degree of risk to which the patient is susceptible either from post-operative complications or subsequent medications and treatment (p. 11).

190 This standard is not lowered simply because the requisite doctor is an intern or in some way inexperienced. In Fraser v. Vancouver General Hospital, [1952] 2 S.C.R. 36, the Supreme Court of Canada, per Rand J., held that an intern:

> must use the undertaken degree of skill, and that cannot be less than the ordinary skill of a junior doctor in appreciation of the indications and symptoms of injury before him, as well as an appreciation of his own limitations and of the necessity for causation in anything he does (p. 46).

Similarly, in Dale v. Munthali (1977), 16 O.R. (2d) 532, aff'd (1978), 21 O.R. (2d) 554 (Ont. C.A.), Holland J. stated that "[t]he standard to be applied to Dr. Munthali should not be lower by reason of his inexperience" (pp. 538-9).

191 Doctors are also under a duty to diagnose. According to Rowbotham J. of the Alberta Court of Queen's Bench in Layden et al v. Cope et al (1984), 52 A.R. 70:

> It is not sufficient in my view for a medical practitioner to say of the two or three probable diagnoses I have chosen diagnosis (A) or diagnosis (B) or (C).' It must be expected that the practitioner would choose diagnosis (A) over (B) or (C) because all the facts available to that practitioner and all of the methods available

> to check the accuracy of those facts and that diagnosis had been exercised with the result that diagnosis (A) remains as the most probable of all. ...
>
> In other words, every avenue of diagnosis should be explored before accepting the most probable of all. This need to explore alternatives would seem to me to be even more important in a situation when it becomes increasingly evident that the original diagnosis may have been incomplete and erroneous (pp. 75-6).

This duty was also described in Scott v. Mohan, [1993] A.J. No. 592 (Alb. Q.B.):

> In making a diagnosis a doctor is required to obtain a thorough history, including the heeding of the patient's complaints during treatment, take appropriate tests, utilize the available scientific equipment facilities and tests; and consult and obtain professional referrals where necessary. All these should be examined to determine the quality of the diagnosis.
>
> All the medical practitioners who testified agreed the approach to diagnosis is a three step process. First, the doctor is required to make a differential diagnosis. This means he is required to consider all possibilities based on the history taken, the clinical exam performed and the test results obtained. From this step, the doctor is required to arrive at the second step of or presumptive or working diagnosis and design the treatment accordingly, unless a definitive diagnosis, the third step is obtained. Where there is a definitive diagnosis, the duty then arises to test specifically the ailment diagnosed with the best care and skill available in the circumstances.
>
> In the event a definitive diagnosis is not achieved, the doctor is required during the working diagnosis step to monitor the results of the treatments prescribed for the symptoms and complaints identified and to continue development of a history by clinical tests and examinations to determine if a definitive diagnosis can be obtained or return to the first step of differential diagnosis. Where treatment, ongoing history, clinical examination and tests do not support the working diagnosis there is a duty to reconsider the matter by further differential diagnosis or consultation and referral.

192 There also exists a duty to thoroughly investigate a patient's condition and to properly inform oneself of this condition. The court in Wilson v. Swanson, supra, adopt the decision of Rann v. Twitchell (1909), 82, Vt. 79 at 84 on this point:

> He is not to be judged by the result, nor is he to be held liable for an error in

> judgment. His negligence is to be determined by reference to the pertinent facts existing at the time of his examination and treatment, of which he knew, or in the exercise of due care, should have known. It may consist in a failure to apply the proper remedy upon a correct determination of existing physical conditions, or it may precede that and result from a failure to properly inform himself of these conditions. If the latter, then it must appear that he had a reasonable opportunity for examination and that the true physical conditions were so apparent that they could have been ascertained by the exercise of the required degree or care and skill (p. 120).

193 With respect to the defendants' argument that they simply exercised their judgment and, having done so, they are insulated from a finding of negligence, the plaintiffs point to the principles regarding errors in judgment, as set out by the House of Lords in Whitehorse v. Jordan and another, [1981] 1 All E.R. 267:

> Surprising though it is at this late stage in the development of the law of negligence, counsel for Mr. Jordan persisted in submitting that his client should be completely exculpated were the answer to question (b), Well, at the worst he was guilty of an error of clinical judgment'. My Lords, it is high time that the unacceptability of such an answer be fully exposed. To say that a surgeon committed an error of clinical judgment is wholly ambiguous, for, while some such errors may be completely consistent with the due exercise of professional skill, other acts or omissions in the course of exercising clinical judgment' may be so glaringly below proper standards as to make a finding of negligence inevitable ...
>
> But doctors and surgeons fall into no special category, and, to avoid any future disputation of a similar kind, I would have it accepted that the true doctrine is enunciated, and by no means not for the first time, by McNair J. in Bolam v. Friern Hospital Management Committee [1957] 2 All E.R. 118 at 121 ... in the following words ...:
>
> > ... where you get a situation which involves the use of some special skill or competence, then the test as to whether there has been negligence or not is not the test of the man on the top of the Clapham omnibus because he has not got this special skill. The test is the standard of the ordinary skilled man exercising and professing to have that special skill.'
>
> If a surgeon fails to measure up to that standard in any respect (clinical

> judgment' or otherwise), he has been negligent and should be so adjudged (pp. 276-7) [Emphasis in original].

194 In addition, with respect to medical charts, and the inferences that can be made where no notation exists in a chart, the decision of Haines J. in Kolesar v. Jeffries (1976), 9 O.R. (2d) 41 (Ont. H.C.) is applicable:

> On a ward with a great many patients the medical record becomes the common source of information and direction for patient care. If kept properly, it indicates on a regular basis the changes in the patient's condition and alerts staff to developing dangers. And it is perhaps trite to say that if the hospital enforced regular entries during each nursing shift, a nurse could not make an entry until had first performed the services required of her. In Kolesar's case the absence of entries permits of the inference that nothing was charted because nothing was done (pp. 47-8).

195 The plaintiffs cite Lord Reid, in McGhee v. National Coal Board, [1973] W.L.R. 1 (H.L.), with respect to the failure of doctors to treat the patient in a timely manner. On page 8, Lord Reid held:

> In my view, a failure to take steps which would bring about a material reduction of the risk involves, in this type of case, a substantial contribution to the injury.

Finally, the plaintiffs argue that a failure to take steps which materially increase the risk of harm developing is likewise, under the principles enunciated in Athey v. Leonati, (1997), 31 C.C.L.T. (2d) 113 (S.C.C.) (see discussion below), a negligent act contributing to the injury rendering a defendant liable.

b) Causation

196 The leading authority on the issue of causation is the Supreme Court of Canada decision in Snell v. Farrell (1990), 4 C.C.L.T. (2d) 229. The following principles were enunciated in this decision:

> * In many malpractice cases, the facts lie particularly within the knowledge of the defendant. In these circumstances, very little affirmative evidence on the part of the plaintiffs will justify the drawing of an inference of causation in the absence of evidence to the contrary. This has been expressed in terms of shifting the burden of proof (p. 244).
> * This does not mean ... that the peculiar means of knowledge of one of the parties relieves the other of the burden of adducing some evidence with regard to the facts in question, although very slight evidence will often suffice (cited at p. 245) [Emphasis in original].

* Causation need not be determined by scientific precision. It is ...:

> essentially a practical question of fact which can best be answered by ordinary common sense rather than abstract metaphysical theory (cited, in part, at p. 244).

* The legal or ultimate burden remains with the plaintiff, but in the absence of evidence to the contrary adduced by the defendant, an inference of causation may be drawn although positive or scientific proof of causation has not been adduced (p. 245).
* It is not therefore essential that the medical experts provide a firm opinion supporting the plaintiff's theory of causation. Medical experts ordinarily determine causation in terms of certainties whereas a lesser standard is demanded by the law (pp. 245-6).

197 In addition, the Supreme Court of Canada recently reiterated the Canadian position on the law of causation and damages in Athey v. Leonati, supra. It is as follows:

* Causation is established where the plaintiffs proves to the civil standard on a balance of probabilities that the defendant caused or contributed to the injury (p. 119).
* The "but for" test is unworkable in some circumstances, so the courts have recognized that causation is established where the defendant's negligence "materially contributed" to the occurrence of the injury ... A contributing factor is material if it falls outside the de minimus range ... (p. 120).
* The causation test is not to be applied too rigidly. Causation need not be determined by scientific precision ... Although the burden of proof remains with the plaintiff, in some circumstances an inference of causation may be drawn from the evidence without positive scientific proof (p. 120).
* It is not now necessary, nor has it ever been, for the plaintiff to establish that the defendant's negligence was the sole cause of the injury. There will frequently be a myriad of other background events which were necessary preconditions to the injury occurring ... As long as a defendant is part of the cause of an injury, the defendant is liable, even though his act alone was not enough to create the injury. There is no basis for a reduction of liability because of the existence of other preconditions: defendants remain liable for all injuries caused or contributed to by their negligence (p. 120).
* This proposition has long been established in the jurisprudence. Lord Reid stated in McGhee v. National Coal Board, supra, at 1010:

> It has always been the law that a pursuer succeeds if he can shew [sic] that fault of the defender caused or materially contributed to his injury. There may have been two separate causes but it is enough if one of the causes arose from fault of the defender. The pursuer does not have to prove that this cause would of itself have been enough to cause him injury.
>
> The law does not excuse a defendant from liability merely because other causal factors for which he is not responsible also helped produce the harm ... It is sufficient if the defendant's negligence was a cause of the harm (pp. 120-1).

B. Defendant's Submissions

198 Counsel for the defendants make the following submissions regarding the law of negligence, as applicable to the case at bar:

a) Standard of Care

199 Counsel for the defense argues that three cases in 1956 settled the outline of standard of care for a doctor. Similar to the plaintiffs, the defense point to the test of reasonable care, as outlined by the court in Wilson v. Swanson, supra (see page 76 of this judgment). Counsel for the defense look to the argument of Rand J. in Wilson v. Swanson as authority for the proposition that:

> What the surgeon by his ordinary engagement undertakes with the patient is that he possesses the skill, knowledge and judgment of the generality or average of the special group or class of technicians to which he belongs and will faithfully exercise them. In a given situation some may differ from others in that exercise, depending on the significance they attribute to the different factors in the light of their own experience. ...
>
> There is here only the question of judgment; what of that? The test can be no more than this: was the decision the result of the exercise of the surgical intelligence professed? Or was what was done such that, disregarding it may be the exceptional case or individual, in all the circumstances, at least the preponderant opinion of the group would have been against it? If a substantial opinion confirms it, there is no breach or failure. ...
>
> An error in judgment has long been distinguished from an act of unskilfulness [sic] or carelessness or due to lack of knowledge. Although universally-accepted

> procedures must be observed, they furnish little or no assistance in resolving such a predicament as faced the surgeon here. In such a situation a decision must be made without delay based on limited known and unknown factors; and the honest and intelligent exercise of judgment has long been recognized as satisfying the professional obligation (pp. 119-20).

200 Counsel for the defendants point out that Schroeder J.A. of the Ontario Court of Appeal has expressed a similar view. For instance, in Crits v. Sylvester, supra, he stated:

> Every medical practitioner must bring to his task a reasonable degree of skill and knowledge and must exercise a reasonable degree of care. He is bound to exercise that degree of care and skill which could reasonably be expected of a normal, prudent practitioner of the same experience and standing, and if he holds himself out as a specialist, a higher degree of skill is required of him than of one who does not profess to be so qualified by special training and ability (p. 508).

Schroeder J.A. went on, at page 509, to adopt Lord Denning's decision in Roe v. Minister of Health et al; Wolley v. Same, [1954] 2 Q.B. 66 at 83 and 86, as a recognized part of Ontario law:

> ... "It is so easy to be wise after the event and to condemn as negligence that which was only a misadventure. We ought always to be on our guard against it, especially in cases against hospitals and doctors. Medical science has conferred great benefits on mankind, but these benefits are attended by considerable risks. Every surgical operation is attended by risks. We cannot take the benefits without taking the risks. Every advance in technique is also attended by risks. Doctors, like the rest of us, have to learn by experience; and experience often teaches in a hard way. Something goes wrong and shows up a weakness, and then it is put right." ...
>
> ...
>
> ... "But we should be doing a disservice to the community at large if we were to impose liability on hospitals and doctors for everything that happens to go wrong. Doctors would be led to think more of their own safety than of the good of their patients. Initiative would be stifled and confidence shaken. A proper sense of proportion requires us to have regard to the conditions in which hospitals and doctors have to work. We must insist on due care for the patient at every point, but we must not condemn as negligence that which is only misadventure."

And finally, in Gent v. Wilson, [1956] O.R. 257, Schroeder J.A. added:

> Each case must, of course, depend upon its own particular facts. If a physician has rendered treatment in a manner which is in conformity with the standard and recognized practice followed by the members of his profession, unless that practice is demonstrably unsafe or dangerous, that fact affords cogent evidence that he has exercised that reasonable degree of care and skill which may be required of him (pp. 265-6).

201 Counsel for the defense cite the Supreme Court of Canada decision of Lapointe v. Hôpital le Gardeur, [1992] 1 S.C.R. 351, as the present law surrounding the standard of care in Canada:

> Hence the general rule must be the principle of assessment in abstracto. That principle requires that the attitude of a party being sued be evaluated in relation to that which a competent professional would have had at the same time and in the same place (p. 362).

In addition, Madam Justice L'Heureux-Dubé held at 363:

> Given the number of available methods of treatment from which medical professionals must at times choose, and the distinction between error and fault, a doctor would not be found liable if the diagnosis and treatment given to a patient correspond to those recognized by medical science at the time, even in the face of competing theories. As expresses more eloquently by André Nadeau in "La responsabilité médicale" (1946), R. du B. 153, at p. 155:
>
> > [TRANSLATION] The courts do not have jurisdiction to settle scientific disputes or to choose among divergent opinions of physicians on certain subjects. They may only make a finding of fault where a violation of universally accepted rules of medicine has occurred. The courts should not involve themselves in controversial questions of assessment having to do with diagnosis or the treatment of preference.
>
> Or, as summarized by Brossard J. in Nencioni v. Mailloux, [1985] R.L. 532 (Sup. Ct.), at p. 548:
>
> > [TRANSLATION] ... it is not for the court to choose between two schools of scientific thought which seem to be equally reasonable and are founded on scientific writings and texts. ...

202 Lord Scarman of the House of Lords articulated in Maynard v. West Midlands Regional Health Authority, [1985] 1 All E.R. 635:

> ... It is not enough to show that there is a body of competent professional opinion which considers that theirs was a wrong decision, if there also exists a body of professional opinion, equally competent, which supports the decision as reasonable in the circumstances. It is not enough to show that subsequent events show that the operation need never have been performed, if at the time the decision to operate was taken, it was reasonable in the sense that a responsible body of medical opinion would have accepted it as proper. I do not think that the words of the Lord President (Clyde) in Hunter v. Hanley 1955 SLT 213 at 217 can be bettered:
>
> > In the realm of diagnosis and treatment there is ample scope for genuine difference of opinion and one man clearly is not negligent merely because his conclusion differs from that of other professional men ... The true test for establishing negligence in diagnosis or treatment on the part of a doctor is whether he has proved to be guilty of such failure as no doctor of ordinary skill would be guilty of if acting with ordinary care ...'
>
> I would only add that a doctor who professes to exercise a special skill must exercise the ordinary skill of his specialty. Differences of opinion and practice exist, and will always exist, in the medical as in other professions. There is seldom any one answer exclusive of all others to problems of professional judgment. A court may prefer one body of opinion to the other, but that is no basis for a conclusion of negligence (p. 638).

Although Maynard was not mentioned in Lapointe, it is well recognized law in Canada (see, for example, Belknap v. Greater Victoria Hospital Society (1989), 1 C.C.L.T. (2d) 192 (B.C.C.A.) at 220-1; Brett v. Ontario (Board of Directors of Physiotherapy) (1991), 77 D.L.R. (4th) 144 (Ont. Div. Ct.) at 152-3).

203 In ter Neuzen v. Korn (1995), 127 D.L.R. (4th) 577, the Supreme Court of Canada confirmed for common law Canada its previous decision in relation to the Quebec civil law in Lapointe, supra. Mr. Justice Sopinka stated at 590-1:

> It is generally accepted that when a doctor acts in accordance with a recognized and respectable practice of the profession, he or she will not be found to be negligent. This is because courts do not ordinarily have the expertise to tell professionals that they are not behaving appropriately in their field. In a sense, the medical profession as a whole is assumed to have adopted procedures which are in the best interests of patients and are not inherently negligent. ...

204 Applying the above law to the case at bar, the defense submits that that is clear and coherent

evidence that demonstrates the existence of a responsible body of medical opinion which supports the conduct and decisions of the defendant doctors with respect to their treatment of Mrs. Chow and Michael. Divergences in opinion does not demonstrate that anyone is necessarily wrong. They merely demonstrate divergent, but responsible, points of view. Accordingly, the defense posits that the defendants, in acting in accordance with the principles and interpretations approved by a responsible part of the medical profession, cannot be found negligent.

b) Causation

205 The defense cite the Supreme Court of Canada decision of Laférriere v. Lawson, [1991] 1 S.C.R. 541, as the law of causation in Canada. Gonthier J. states at 609:

> Causation in law must be established on the balance of probabilities, taking into account all the evidence: factual, statistical and that which the judge is entitled to presume.
>
> In some cases, where a fault presents a clear danger and where such a danger materializes, it may be reasonable to presume a causal link, unless there is a demonstration or indication to the contrary.

Counsel for the defense point to the decision in Snell v. Farrell, supra, to reiterate that "[t]he legal or ultimate burden remains with the plaintiff" (p. 330). Whether an inference of causation may be drawn is a matter of weighing the evidence (p. 330).

206 In the case at bar, the defense submits that neither side has proven all of its contentions with scientific precision. Neither Snell nor Athey direct a judge to infer causation when both sides have adduced plausible explanations as to what occurred, argues counsel for the defendant doctors. In addition, the defense submits that causation does not prove liability, only negligence does. Thus, it remains that if the treatment undertaken by the defendants in response to whatever the injurious event was, is found to be consistent with appropriate medical practices, it must be labelled as not negligent. This is the case even if it failed to prevent the damages flowing from the event or events for occurring or worsening.

VI. FINDINGS AS TO LIABILITY

207 I now intend to make my findings with respect to the plaintiffs' allegations and they are as follows:

A. Standard Of Care

a) Allegations Against Dr. Wong

208 After considering the argument by both the plaintiffs and the defendants, and the case law in

this area, it is my finding that Dr. Wong, as the principal obstetrician, was under a duty to properly assess possible problems arising out of the birth of Michael Chow. He failed to meet his standard of care in this regard and this failure largely contributed to the injuries of Michael Chow.

209 With respect to the allegation that Dr. Wong failed to correctly calculate Theresa Chow's expected date of delivery, I am not in a position to decide whether or not a mistake was actually made. However, in light of expert witness evidence, I do find that Michael Chow was, at 36 weeks, a preterm baby and ought to have been treated as such.

210 I can not agree with the plaintiffs' claim that Dr. Wong was negligent in failing to ensure that the Oxytocin was discontinued in the presence of fetal distress. As pointed out by the defendants, no factual evidence exists to support the plaintiffs' theory that the Oxytocin was not turned off or that it was restarted. Even if such was the case, I rely on Dr. Hannah's evidence that the continued use of Oxytocin would only have been a concern if it caused too frequent or too prolonged contractions. No one has suggested that Theresa Chow's contractions were abnormal in any way. I do not make any finding of negligence surrounding the administration of Oxytocin. Moreover, even if Dr. Wong failed to meet the standard of care regarding the administration of Oxytocin, no evidence exists connecting this negligence to the injuries of Michael Chow.

211 I do find, though, that Dr. Wong was negligent in not calling Dr. Zachary, the neonatologist/pediatrician, to attend the delivery of Michael Chow. According to Dr. Smith, Dr. Wong "failed to take appropriate action in the face of demonstrated fetal distress in a pre-term pregnancy." Dr. Smith's evidence was that it was highly predictable that Michael Chow would be depressed at birth and need "immediate and skilled resuscitation". He argued that skilled practitioners in neonatal resuscitation (a pediatrician or anesthetist, preferably both) should have been alerted and in the delivery room and ready to deal with a depressed baby. Dr. Smith's evidence was that the first eight minutes of resuscitation were clearly ineffective. The question as to whether immediate intubation would have been required is now moot as, according to Dr. Smith, Michael Chow was denied his crucial need for resuscitation in the first minutes of life.

212 The plaintiffs submit that Dr. Wong failed to comply with his own standards of practice whereby he would summon the pediatrician to be present at the birth if two or more risk factors were present. In this case, four risk factors were present: (1) premature rupture of membranes prior to labour; (2) prolonged rupture of membranes; (3) prematurity; and (4) real or potential fetal distress evident on the fetal heart monitor tracing. Failure to call Dr. Zachary constituted negligence in that Dr. Wong knew that any one of these intrapartum risk factors could indicate asphyxia and potential problems in a newborn.

213 According to Dr. Boulton's evidence, the Canadian National Guidelines for Neonatal Resuscitation (1989) require:

> A minimum of two persons skilled in assessment, initial care (position, warmth, stimulation) suction, O2 administration, ventilation with bag and mask and

> cardiac compression should be immediately available for every birth. One of these people should be skilled in intubation and administration of medications and fluids (citing Guidelines).

In relying on Dr. Provatopoulos, a second year resident in obstetrics, as the attending doctor, Dr. Wong not only failed to meet his own self-imposed standards of practice, but he also went against national standards. Far from being "skilled" in intubation, Dr. Provatopoulos had, at the relevant time, limited training, skill, and knowledge regarding neonatal resuscitation.

214 Dr. Boulton disputed Dr. Provatopoulos' lack of experience in neonatal resuscitation. Her evidence was that he was familiar with the American Heart Association guidelines for neonatal resuscitation and "had experience in neonatal resuscitation (including intubation) during a one month rotation in a tertiary NICU" [emphasis added]. On this point, Dr. Hannah stated that "it is the evidence of Dr. Provatopoulos that he had hands on experience in neonatal resuscitation both as a junior intern and as an obstetric resident." In addition, according to Dr. Solimano:

> Dr. Provatopoulos was at the end of his second year as a resident on obstetrics and gynecology. He had spent two months in a neonatal intensive care unit in past years. He had attended 50-100 resuscitations requiring administration of oxygen and ventilation with a bag and mask. He had intubated babies at least a dozen times. He had taken courses such as ACLS and ATLS. He had not taken the AAP/AHA Neonatal Resuscitation Program (NRP); in 1991 this program was very new in Canada, having been introduced in mid-1989 it was just starting to be implemented in Ontario. So, not having taken NRP in 1990-1 was far more common than having taken it.

215 Despite Dr. Boulton, Dr. Hannah, and Dr. Solimano's endorsement of Dr. Provatopoulos' expertise, it is my finding that a one or two (depending on the evidence) month rotation in neonatal resuscitation does not a "skilled" doctor make. I find as fact that Dr. Provatopoulos' limited training did not meet the notion of "skilled" required by the national guidelines. If this was what was meant by "skilled" in the guidelines then the standard of care would be so low as to make the guidelines superfluous: simply some training, regardless how limited, would qualify someone to be considered "skilled". I find that Dr. Wong was negligent in not having Dr. Zachary, a neonatologist skilled in neonatal resuscitation and intubation, attend the delivery. As the evidence of Dr. Smith demonstrated, this was not an unexpected resuscitation and the standard of care for Toronto hospitals in 1991 would require a pediatrician to be present at the birth of a premature infant, particularly one where there was some question as to the fetal heart rate.

216 According to the plaintiffs, it is the function of the obstetrician to obtain a blood sample from the umbilical cord after the baby is born. Although cord blood was drawn, it was never sent for analysis. An analysis of the cord blood would have provided significant and useful information as to the acid base of the baby at the time of birth. Dr. Wong's failure to do this, especially in light of the

fact that Michael was depressed, pale, had poor tone and was not breathing properly at birth, constituted negligence on his part.

217 While mindful of the defense argument that the paper tracing in the fatal heart monitor was not needed when the patient was receiving one-on-one attention, the court is concerned that the lack of paper tracing may effect the expert evidence given in regard to Michael Chow's birth. For instance, Dr. Hannah indicated in his report that:

> ... there appears to be evidence of accelerative activity until the tracing is discontinued at 0020. The tracing is restarted at 0036 for a very brief period of time (less than 3 minutes) and I find it difficult to interpret after that period of time.

In addition, comments were made by Dr. Farine regarding there being "no indication for anemia in the fetal heart rate tracing" and there being no blood entrapment in the placenta because the final heart rate tracing did not show bradycardia at the very end of labour. How, though, would Dr. Farine be able to make these comments regarding the tracing when, in fact, the tracing stopped before the end of labour? The reliance of these doctors on the fetal heart rate tracing for their diagnoses concerns me and I am cautious about accepting any expert finding that does not take this failure to properly monitor into account.

218 The plaintiffs argue that Dr. Wong knew that the timing of the clamping of the cord would have a direct affect on the amount of blood that will be inside the baby within the first few minutes. What he did not know, and the plaintiffs submits he ought to have known, was that cord complications could lead to depression at birth in a number of ways, the most likely being caused by hypoxia through intermittent occlusion. Dr. Farine, defense expert, agreed with the plaintiffs' experts, Drs. Perlman and Smith, that cord compression in the last few minutes of labour could cause a shift in blood volume from the fetus to the placenta. Dr. Macnab stated in his report that:

> The umbilical cord is documented to have been tightly around his neck at birth. The nature of blood flow from the placenta is such that the vessels carrying oxygenated blood to the baby are more vulnerable to constriction from pressure than those carrying blood back from the baby to the placenta. Under these circumstances, a tight cord can result in a net and progressive loss of blood from the baby's circulation. In addition, a tight cord around the neck necessitates the cord being clamped and cut by the obstetrician to allow delivery of the infant. The cord is thus clamped and cut earlier than usual and the baby misses the physiological transfusion which normally occurs from the placenta to the infant through the cord after the baby is born. Early clamping of the cord is a recognized cause of decreased blood volume in infants. A combination of the cord around the neck and the early clamping explains the anemia observed in light of the other investigations done and the absence of visible blood loss at the

> time of birth. Moreover, the baby's failure to respond to resuscitation and clinical condition (low blood pressure at approximately 30 minutes of age, improvement of blood pressure with transfusion of fluid, plasma and ultimately blood cells, a relatively rapid heart beat at the time of birth, poor peripheral circulation and pallor) are both suggestive of a reduced circulating volume in the vascular system and of anemia.

219 Dr. Wong testified that, if he had known that cord compression could result in hypovolemia, he would have told Dr. Provatopoulos to check for such in light of the pallor of the baby. He also would have told Dr. Provatopoulos to draw blood from the placenta and give it to Michael to relieve hypovolemia. This is the approach that Dr. Bernstein believes ought to have been followed. Both the 1989 Creasy and Resnik textbook, supra, and the 1985 Shepherd article, supra, stated that cord compressions may effect fetal blood loss and cause hypovolemia. The court finds that Dr. Wong fell below the standard of care in failing to be informed of the consequences of cord compression, tight nuchal cord, and early clamping of the umbilical cord. As an obstetrician undertaking to deliver babies, and under a duty of care to oversee their birth, Dr. Wong was obligated to have the necessary knowledge, skill, training and ability to fulfil that duty.

220 With respect to the allegation by the plaintiffs regarding Dr. Wong's one minute and five minute Apgar scores, I am going to refrain from making any findings with respect to such allegations. Suffice it to say that it would have been difficult for Dr. Wong to assess the baby's condition if he was attending to the mother.

221 The plaintiffs also submit that Dr. Wong failed to recognize the significance of Michael's persistent pallor. This was a critical part of the plaintiffs' argument against the doctors, and one which the defense spend a great deal of time arguing whether Michael was pale or pink. The evidence is that Michael was pale and flaccid at birth. However, he "pinked up" within 30 to 60 seconds following the administration of oxygen. The absence of tone persisted. That is why Dr. Buss, an anesthetic resident, was called to assist in the resuscitation of Michael.

222 It is submitted that Dr. Wong lacked the skill and knowledge regarding resuscitating a depressed newborn. Dr. Wong gave no guidance to Dr. Provatopoulos. He testified that he thought the baby was doing fine. The plaintiffs maintain that Dr. Wong was negligent and failed in his duty to Michael to apply appropriate knowledge, skill, and ability in a timely manner to resuscitate Michael.

223 In my view, a rather robotic approach to Michael Chow's birth was taken i.e., Dr. Wong, in spite of signs to the contrary, was confident that he was delivering a healthy baby. He closed his mind to obvious signs that all was not well. He delivered Michael Chow, whom he considered to be healthy, and, then, abdicated his continued responsibility to Dr. Provatopoulos, who by any reasonable standards was relatively inexperienced. In my view, signs were present for Dr. Wong to have had doctors Provatopoulos, Buss and Zachary in the delivery room at the moment of birth.

b) Allegations Against Dr. Provatopoulos

224 Dr. Provatopoulos, too, behaved in a somewhat mechanical way with respect to Michael Chow's birth and resuscitation. In the face of genuine, ongoing concern that the baby was undergoing fetal distress, Dr. Provatopoulos failed to bring these concerns to Dr. Wong's attention or to request advice and direction. In light of these concerns, Dr. Provatopoulos ought to have arranged for Dr. Zachary to attend at the delivery. Instead, when the "penny dropped," remedial care was already too late.

225 It is a fact that, at one minute of age, Dr. Provatopoulos felt it was necessary to page Dr. Buss, an anesthetist, when he realized at a very early stage that he had a "flat baby on his hands." It was Dr. Smith's evidence that the fetal heart monitor tracing should have alerted Dr. Provatopoulos that a depressed baby was likely to occur and Dr. Buss should have been present at the moment of birth, not eight minutes after the fact. At 01:15, a stat call was made to Dr. Zachary, a pediatrician who is not being proceeded against. He arrived at approximately 45 minutes of life. Dr. Smith's evidence was that the pediatrician ought to have been there at the moment of Michael Chow's birth. Noticeable improvement occurred in Michael's condition after Dr. Zachary took over.

226 In addition to Dr. Smith's evidence, the plaintiffs called Dr. Bernstein, a highly respectable obstetrician, whose evidence was that the fetal heart monitor tracing demonstrated about a dozen variable decelerations with decreased variability. Dr. Bernstein's opinion was that

> ... there was fetal stress, and possibly distress. This degree of fetal stress is not uncommon prior to delivery at the end of labour, due to a loop of umbilical cord around the neck, and is generally well tolerated by a fetus, however, we must be aware that this fetus is only 36 weeks gestation with likely less tolerance than a full term fetus.

Accordingly, Dr. Bernstein's criticism of the Michael Chow's delivery and resuscitation were as follows:

> My criticism of this case is directed at the failure of the staff to provide appropriate personnel for resuscitation of a high risk birth (a preterm fetus -- 36 weeks, experiencing severe variable decelerations). Anesthesia and pediatrics did not arrive for 10 and 25 [actually 45] minutes respectively after birth. During this time, attempts with a mask could not prevent the asphyxia. Intubation should have been carried out 10 minutes earlier.

227 The evidence of Dr. Smith and Dr. Bernstein was confirmed by Dr. Macnab. According to Dr. Macnab,

> The standards of care expected in a Canadian hospital for neonatal resuscitation and immediate care were not met, inappropriate actions occurred ..., there was a

> delay in restoration of normal blood pressure by intravenous infusion and correction of the anemia by transfusion and as a direct result cerebral blood flow and oxygen delivery to the brain were comprised and adequate brain oxygenation did not occur, brain metabolism was impaired and permanent hypoxic damage resulted.

228 The plaintiffs submit that Dr. Provatopoulos was negligent and failed in his duty to Michael to apply appropriate (and timely) knowledge, skill and ability in his efforts to resuscitate Michael in that he failed to: (1) intubate Michael, as he ought to have; (2) obtain blood analysis; (3) measure Michael's pulse or blood pressure; and (4) recognize hypovolemia himself despite professing to recognize the need to suspect it in circumstances when a baby is depressed.

229 In regard to these allegations, I find that Dr. Provatopoulos was very rigid in his diagnostic approach when he ought to have been conducting repeated assessments and evaluations. He failed to consider or appreciate that Michael's heart rate was out of keeping with the persistent pallor and failed to reconsider their treatment plan despite this finding. Dr. Provatopoulos also underestimated or failed to appreciate the presence of Michael's depressed condition. He stated that Michael was improving and responding well to his resuscitative efforts. Despite this, Dr. Zachary was called at eighteen minutes of age for a depressed newborn.

c) Allegations Against Dr. Buss

230 It is alleged that Dr. Buss failed to recognize the significance of Michael's persistent pallor or treat, in an appropriate and timely manner, the hypovolemia from which the plaintiffs argue Michael was suffering. Dr. Smith criticized Dr. Buss for not intervening in a more timely fashion: "He did everything that I would have done, however he did it much too slowly." Dr. Smith also criticized Dr. Buss for failing to properly assess and react to the baby's condition.

231 With respect to these allegations, I find that Dr. Buss was not negligent in his treatment of Michael Chow. He arrived at the hospital at 8 minutes of age, according to the chart, to attend to a depressed newborn. Dr. Buss intubated Michael at 10 minutes of age due to Michael's irregular breathing. At approximately 30 minutes of age, Dr. Buss gave Michael a bolus of Ringer's Lactate, the result being an improvement in Michael's tone.

232 Dr. Buss is criticized for not resuscitating Michael in a more timely manner. According to the plaintiffs, a competent resuscitator would have determined this need five to seven minutes following birth. In this case, though, Dr. Buss did not arrive into the delivery room until eight minutes of age. He intubated two minutes later. This, in my opinion, was timely treatment.

233 The plaintiffs also claim that Dr. Buss underestimated or failed to appreciate the presence of Michael's depressed condition. This may have been due to Dr. Buss' scant exposure to premature neonates at the time of Michael's' birth. According to the plaintiffs, Dr. Buss did not have the understanding in March 1991 that neonates who are premature and asphyxiated near the end of birth

may be hypovolemic. He was, at the time of Michael's birth, nine months into his first year residency in anesthesia, with the first six months being spent training in adult anesthesia. However, in defense of Dr. Buss, he did call Dr. Zachary to be present as soon as he had some concerns about Michael's low blood pressure.

234 It is my opinion that Dr. Buss' contribution to Michael's injuries is negligible, if any. Even Dr. Smith conceded that Dr. Buss did everything properly. The liability, I believe, lies with Dr. Wong and Dr. Provatopoulos who, instead of calling Dr. Zachary immediately, relied on Dr. Buss, a first year resident, to oversee Michael's resuscitation, a doctor who was not skilled in treating premature newborns. Having found no negligence on the part of Dr. Buss, the action against him must fail and accordingly be dismissed. The cost consequence of such dismissal may be addressed by Counsel in due course.

D) Summary of Liability

235 In essence, my biggest criticism of Michael Chow's delivery was the lack of adequate personnel present at birth, especially in light of Michael's prematurity and the fetal heart rate monitor tracing showing fetal stress and maybe distress. I believe Dr. Zachary's attendance at the birth would have helped limit Michael's injuries. For this I rely on the evidence of doctors Smith, Bernstein and Macnab, as noted above.

236 In contrast to the evidence of doctors Smith, Bernstein and Macnab, witnesses for the defense, doctors Skidmore, Solimano and Hannah, argued that: (a) adequate personnel was present at Michael's birth; (b) Michael prematurity was insignificant; and (c) the tracings from the fetal heart monitor were nothing to be concerned about.

237 Specifically, Dr. Solimano argued that Dr. Provatopoulos and Nurse Kanhai were qualified and "[t]he times at which Drs. Buss and Zachary were called were appropriate." He did not find that the variable decelerations lasting less than 1 minute with rapid recovery were indicative of fetal distress. His evidence regarding Michael's prematurity was as such: "[t]he fetus was expected to be appropriately grown."

238 In addition, Dr. Hannah stated in his evidence that:

> Dr. Provatopoulos reviewed the fetal heart tracing at approximately 15 minutes past midnight and noted the recurrence of the variable decelerations, but felt that the absence of any loss of short term variability provided reassurance to him that the fetus was not in any significant distress.

Regarding Michael Chow's prematurity, Dr. Hannah argued that "[a]t 36 weeks gestation, the fetus was only one week short of being full term (the usual criterion for the lower limit of full gestation being 37 weeks)." Although Dr. Hannah did not claim any particular expertise in neonatal resuscitation, he felt that "adequate provision was made by those responsible for the birth of the

infant Chow for the availability of resuscitation by individuals trained and skilled in its performance." Moreover, he found there was no breach of any standard of care in the provision of emergency resuscitation in the first 10 minutes of Michael Chow's life.

239 Dr. Skidmore, a practicing neonatologist at Women's College Hospital in Toronto, looked to various guidelines for neonatal resuscitation for support that "at least one person skilled in neonatal resuscitation should attend every delivery." In addition, "skilled personnel should be readily available to assist in the resuscitation of a severely depressed and asphyxiated newborn." He believed this standard of care was met in the case of Michael Chow. According to Dr. Skidmore, "Dr. John Provatopoulos clearly states in his examination for discovery, that as a Rotating Intern, prior to his obstetrical training, he received instruction in and had applied the skills of neonatal resuscitation." Dr. Skidmore also stated that:

> ... In the absence of signs of foetal distress such as meconium passage, I see no reason to suspect that Michael's resuscitation would be difficult and therefore, to have one person immediately available at the delivery who could initiate resuscitation is, I believe, to be an appropriate standard of care.

As explained by Dr. Farine, fetal "stress" is normal while "distress" is abnormal. He argued that, in this case, the fetal heart monitor tracing was "never ominous ... Furthermore, the fetal heart rate tracing is notorious to be inaccurate and to over diagnosis fetal distress." In light of these factors, Dr. Farine felt that "there was no way to anticipate a compromised baby at delivery or a necessity to call in a speccial [sic] team for a neonate before delivery".

240 I find the above evidence of doctors Skidmore, Solimano, Hannah and Farine unconvincing. The fact that Michael was premature was significant in that a preterm baby is less ability to cope with stress. Warning signs, regardless how slight, did exist. These should have been taken more seriously by the attending doctors. And finally, Dr. Zachary ought to have been attending the birth. He should not have been given a stat call at home, resulting in valuable time being wasted en route to the hospital.

241 Finally, Dr. Skidmore, in his evidence, suggested that Michael Chow's injuries were caused in utero, prior to birth. As the cause of the injuries was virtually incapable of being identified, Michael Chow's attending physicians could not be held liable in negligence for the results of such occasion. I found no evidence at all to support this highly speculative proposition by Dr. Skidmore.

B. Causation

242 Causation, according to the Supreme Court of Canada in Athey v. Leonati, supra, is established whenever the plaintiff proves on a balance of probabilities that the defendant caused or contributed to the injury. The test for causation is not to be applied too rigidly; causation, in other words, need not be determined with scientific precision. Although the burden of proof remains with the plaintiff, in some circumstances an inference of causation may be drawn from the evidence

without scientific proof. In addition, it is not necessary to prove that the defendant's negligence was the sole cause of the injury, only that it was a contributing factor.

243 It is my opinion that, in this case, the failure of Dr. Wong and Dr. Provatopoulos to meet their standard of care greatly contributed to Michael Chow's injuries. Warning signs were visible. The failure of both doctors to take these warning signs seriously led, in whole or in part, to Michael being deprived of the expert attention he was entitled to. Although the cause of Michael Chow's injuries is not known for certain, what is known for certain is that Michael was pre-term, the membranes were ruptured, and variable decelerations were present on the fetal heart rate monitor tracing. Taking all those risk factors into account, the pediatrician ought to have been called and been present for the birth. Failure to do so greatly contributed to Michael's injuries. Timely treatment was not available as the attending doctors were always waiting for the next doctor to arrive: first, it was for Dr. Buss, the anesthetist; then, it was for Dr. Zachary, the neonatologist.

244 In a nutshell, Dr. Smith's evidence was that Dr. Wong and Dr. Provatopoulos "failed to take appropriate action in the face of demonstrated fetal distress in a pre-term pregnancy." He argued that it was highly predictable that Michael Chow would be depressed at birth and would need "immediate and skilled resuscitation ..." Skilled practitioners in neonatal resuscitation (a pediatrician or anesthetist, preferably both) should have been alerted and in the delivery room and ready to treat a depressed baby. Michael Chow was denied effective resuscitation in the first minutes of life. This denial contributed to Michael Chow's injuries and, for that, Dr. Wong and Dr. Provatopoulos are to held accountable.

245 Having found both Dr. Wong and Dr. Provatopoulos negligent, I must deal with the apportionment of liability between them. In my view, Dr. Wong, as the principal obstetrician, deserves most of the blame. He was in charge of Michael's birth and, as such, ought to have taken the warning signs more seriously and ensured that the proper staff was in the delivery room. His failure to do this, and his failure to properly instruct Dr. Provatopoulos in his treatment of Michael Chow, is, in my opinion, a failure to meet the standard of care and is a major contributing factor in the cause of Michael Chow's injuries. In addition, but to a lesser extent, Dr. Provatopoulos is negligent in that he failed to take the warning signs seriously and/or he failed to tell Dr. Wong about his concerns in order to obtain proper instruction. I assess Dr. Wong's negligence at 75 percent and Dr. Provatopoulos' at 25 percent.

246 Summing up, both Dr. Wong and Dr. Provatopoulos failed to meet the appropriate standard of care with respect to the birth and resuscitation of Michael Chow. This failure caused, or at the very least substantially contributed to, Michael Chow's brain damage and subsequent gross impairment of motor abilities.

VII. PECUNIARY GENERAL DAMAGES

a) Personal Support Services

247 One area of contention between the plaintiffs and the defendants with respect to damages is the cost of attendant care for Michael Chow and his present and future support service requirements.

248 At the time of trial, Michael was almost six and a half years old. His parents, both dentists and self-employed, were divorced and Michael lived primarily with his mother, spending every other weekend with his father. Michael's father remarried and now has two other children through his new family. Theresa Chow continues to work full-time in order to support herself and her share of Michael's expenses. Michael is cared by his parents, as well as a live-in nanny who is available five days a week with weekends off. Although Theresa and David Chow's marriage did not survive the tragic circumstances of their son's birth, they have cooperated with each other in the support and raising of Michael.

249 Due to his injuries, Michael requires constant attention and supervision throughout the day, as well as stimulation and feeding. Michael requires appropriate help when visiting his father. In addition, Michael's mother continues to look after him every other weekend on her own. This is both physically and emotionally demanding as she lives alone. Michael can not be left alone at night because he is unable to solicit help.

250 Michael started kindergarten in September 1996. Michael has been eligible to attend school on a full-time basis since 1997 and he may continue to do so until he is at least 18 years of age. According to the defendants, Michael may continue to remain in school until he is 21 years of age.

251 With respect to the future care award, the plaintiffs submit that, up until the time Michael attended school full-time (age 6), it should be assumed that fifty percent of the costs of the nanny would be extraordinary. These costs would total $260 per week and $6,760 annually in 1996-1997. In addition, the plaintiffs argue that 194 days at 24 hours per day and $15 per hour should be allocated to a health care aide who would care for Michael throughout the week-ends, sick days (12), summer holidays, school holidays, PA days, and statutory holidays. The total of this cost, including GST, would be $74,729. Adding an additional half-time pay for eight statutory holidays ($1,541), the total amount of costs while Michael was in kindergarten would be, according to the plaintiffs, $83,030.

252 In contrast, the defendants argue that, while half of the nanny's salary could be considered extraordinary, the remaining costs are simply ordinary parental care costs. As such, a deduction of 30 weeks ought to be made to account for this. In other words, the total nanny costs for 1996-7 ought to be $2,650. The defendants agree that Theresa Chow should receive assistance with Michael's care on the weekends. However, only six hours of care per weekend day should be allocated, according to the defendants, as opposed to the twenty-four hour care requested by the plaintiffs. This would mean that the total cost of weekend care (30 days/15 weekends for 6 hours/day at $15/hr + GST) would equal $2,889. In addition, a two week respite should be factored in, allowing 24 hour-a-day care at $15 per hour. The total cost for these two weeks would be

$5392.80. And so, in stark contrast to the plaintiffs' figure of $83,030, the defendants' total cost for attendant care in 1996-7 would total $10,931.80.

253 It is submitted that, once Michael starts grade one and is in school full-time, the costs of attendant care may stay the same or they may increase. The reason for the increase would be based on the possibility that Theresa Chow may choose a different model of care for Michael. Should she change the plan, hiring staff on an hourly basis will cost more than having a live-in nanny.

254 As of September 1997, Michael will be in school full days (8:15 am - 3:30 pm) for 177 days of the year. The plaintiffs allocate 7.5 hours a day at $15 per hour + GST for attendant care in the mornings and evenings, the total cost being $20,584 annually. Weekends and holidays (194 in total) are allocated 24 hour-a-day care. The total of this, plus half-time pay for statutory holidays, comes to $76,270. The plaintiffs have deducted the cost of after-school baby-sitting ($20 per week) for the period of 1998-2003. After that time, an additional annual cost of $342 will be included in the total. Accordingly, the plaintiffs submit that the yearly cost of Michael, while attending school on a full-time basis (age 6-18), will be $96,512 (1998-2003) and $96,854 (2004-2009).

255 The defendants disagree with many aspects of the above plan. To begin with, they argue that only four hours a day ought to be allocated for attendant care during school days (total: $11,363.40). While this amount is increased to six hours a day from age 13 to age 21 ($17,045.10), the difference between the defendants' and the plaintiffs' calculations are marked. In addition, for the 134 days Michael is not at school, only six hours and later eleven hours (age 13-21), as opposed to 24 hours, are factored into the total costs. As such, the defendants' total costs, including a two week 24 hour-a-day respite, would be $28,893 (1998-2003) and $44,747.40 (2004-2011).

256 The defendants argue that an increase in attendant care from age 13 to 21 is due to the fact that Theresa Chow would be expected to provide decreasing care to Michael during this time frame, had Michael not been so dependent on care. As such, the level of special care available to Michael is increased. In addition, the defendants argue that Michael is eligible to stay in the school system until he is 21 years of age and it is most likely that he will do so until that time.

257 It is the costs of attendant care after Michael is finished school that causes the most contention between the parties. The plaintiffs argue that, from age 19 onwards, Michael will require 24 hour a day care at $15 per hour + GST. Adding additional half-time pay for 8 statutory holidays, the annual total for attendant care would be $142, 139. In stark contrast, the defendants propose that the private health care organization, Intra Care Inc., provide 24 hour a day care to Michael at a cost of $150 a day (plus an additional half-time pay for the eight statutory holidays), totalling $55,350 per year.

258 An additional cost is factored in for cleaning services obtained by Theresa Chow once she is 65 years of age. At that time, costs for cleaning will be included as extraordinary costs. According to the plaintiffs, weekly cleaning from 2026 onwards would cost $70 per week, plus GST, equalling $3,895. The defendants argue that costs of cleaning ought to be calculated bi-weekly as, at this stage

in his life, Michael will likely be receiving loss of income benefits and some of that cost can be covered through this mechanism. In addition, it is the defendants position that daily housekeeping chores will be done by the live-in caretaker and they are provided under maintenance tasks. The defendants' total cost for cleaning after 2026 is $1,947.50 annually.

259 Calculating the cost of attendant care in accordance to the figures submitted by the parties, and using a life expectancy figure of 45.5 years of age (this will be discussed below in further detail), the total cost would be $4,954,295 (plaintiffs' figure) or $1,834,546.55 (defendants' figure).

260 Although I am grateful to the parties for preparing the above calculations, rather than choose one or the other, or a hybrid scheme, I propose to allow a certain amount of money for each defined period of time. With respect to the year 1996-1997, when Michael is in kindergarten, I will allow $40,000. From 1998 until 2011, a yearly amount of $60,000 seems fair. It is my contention that Michael will probably stay in school until he is 21 years of age. After that time, Michael is entitled to first-rate care. As such, 24 hour a day care at $15 per hour will be allowed, totalling $142,139 annually. I also agree with the plaintiffs' calculation as to cleaning services and I am prepared to award $3,895 annually for such.

b) Life Expectancy

261 The issue of Michael's life expectancy impacts on several damages issues, including the duration of the future care award and the number of years subject to the lost years adjustment regarding the loss of income award. All of the experts agreed that Michael has a reduced life expectancy. There was disagreement between the parties, though, as to how much this reduction would be.

262 In arriving at a life expectancy calculation, the experts took into account Michael's progress and abilities (physical and mental) in various areas. Mobility, for instance, is often one of the strongest predictors of life expectancy. The experts considered Michael to be "partially ambulatory" by virtue of his ability to take some steps while supported. With respect to feeding, Michael cannot feed himself and is totally dependent on his caregiver putting spoonfuls of food into his mouth. He swallows his food slowly and it usually takes about an hour for Michael to eat a meal. Dr. Humphreys, expert for the defense, was concerned that, as Michael's caloric requirements increase with the onset of puberty, Michael's caregivers will not be able to keep up with his nutritional needs. If such happens, Michael may require tube feeding. Dr. Humphreys cited feeding, along with mobility, as the most powerful prognosticators of life expectancy.

263 An article by Strauss et al, "Life Expectancy of Children with Cerebral Palsy" (1998) 18:2 Pediatric Neurology 143, lists manual dexterity as the first of six factors which must be taken into account when determining life expectancy of cerebral palsy patients. Dr. Berbrayer, for the plaintiffs, and Dr. Humphreys, for the defense, both argued that Michael lacks hand use. The second of Dr. Strauss' six significant predicators is epilepsy. It accounts for a 46 percent increase in the probability of earlier death. Michael suffers from epileptic seizures, which are controlled by the

medicine Tegretol.

264 Finally, with respect to Michael's mental retardation, Dr. Berbrayer testified that Michael is "significantly developmentally delayed." On the other hand, Michael does have some emotional and reactive behaviour. He is usually smiling and happy, he appears to enjoy music and sometimes taps his foot to the beat. He smacks his lips at the smell of food. To a large extent, however, Michael's speech is intelligible. His emotional responses to certain situations are inappropriate (e.g., his seizures are often followed by laughter). No intelligence testing has been done on Michael because his level of cognition makes performing a meaningful test almost impossible. Dr. Berbrayer lacked sufficient information to make any conclusion regarding Michael's intelligence level. However, he did agree that severe mental retardation can impact on life expectancy (39 percent increase in probability of earlier death) and that a person's ability to communicate their physical and emotional needs to a caregiver is a factor relevant to life expectancy.

265 In addition to the above, Michael also has severe cerebral palsy, increasing probability of death by 32 percent according to Strauss' article, and is quadriplegic (27 percent increase in probability). Michael also suffers from cortical blindness.

266 For the plaintiffs, Dr. Kordish suggested that Michael's anticipated life expectancy was approximately 46 to 52 years of age. Dr. Berbrayer, however, spoke of adult cerebral palsy patients in his practice who are living to be 50, 55, and 60 years of age. In Michael's case, Dr. Berbrayer thought Michael would

> probably fall into the middle category of patients which I see in my office and would probably live, barring any major complications, within the lower limits of normal up until the late 50s, 58 to 62 years of age.

In addition, the plaintiffs called Dr. Strauss, author of the above cited article, in reply to the evidence of Dr. Humphreys. Dr. Strauss argued that certain mathematical errors were made in Dr. Humphreys' calculation and that, applying the same approach as found in the article by Strauss, Michael's life expectancy would be anywhere from 57 to 63.6 years of age. The plaintiffs submit that, given Dr. Humphreys' testimony that Dr. Strauss' data is the most reliable and persuasive evidence on life expectancy, Dr. Strauss' own estimate ought to be favoured by the court. On that basis, Michael's median life expectancy would be 59 years.

267 The defense argues, however, that, more than any other witness, Dr. Humphreys was uniquely qualified to speak to Michael's life expectancy. He was one of the only doctors who had an opportunity to examine Michael. After reviewing the literature on life expectancy, including Strauss' article, Dr. Humphreys concluded that Michael's life expectancy at 37 years could be overly optimistic by as much as 10 years which would result in a life expectancy range of 27 to 37 years. The defendants asked that Dr. Strauss' opinion not be accepted. Not only does Dr. Strauss lack clinical experience with children who suffer from cerebral palsy, they argue, but he also never assessed Michael personally. The defense submits that Dr. Strauss' opinion is flawed because he

assumed Michael was better off than he actually was i.e., Dr. Strauss based his opinion on the fact that Michael could sit. The defense argues, however, that Michael's sitting ability is incompatible with his other abilities, such as lack of purposeful manual dexterity.

268 As mentioned above, determinations of life expectancy are crucial to the damage award. However, it is also my discretion, when faced with competing yet equally persuasive theories, to choose a life expectancy figure which is neither in the low range of 27-37 years or in the high range of 59-64 years of age. It is obvious that determining the anticipated life expectancy of a young child is somewhat arbitrary. As such, I take the average of the low and high figures (i.e., 45.5 years of age) as the life expectancy of Michael for the purposes of assessing damages in this case.

c) Lost Years Deduction

269 Applied to the case at bar, the "lost years" are those years in which Michael would be earning an income if uninjured, but will no longer be alive as a result of his injuries. The number of "lost years" varies with both the estimate of Michael's remaining life expectancy and the assumption as to when he would have retired. The plaintiffs' calculation of future lost earning capacity is based on the assumption that Michael would have worked until age 60 and then retired. With a calculated life expectancy in excess of 59 years, there would, according to the plaintiffs, be no need for any "lost years" deduction.

270 In the alternative, the plaintiffs rely on the Supreme Court of Canada decision in Toneguzzo - Norvell v. Burnaby Hospital (1994), 18 C.C.L.T. (2d) 209, to argue that there ought, if any, be a deduction of fifty percent for personal living expenses from the award for lost earning capacity during the "lost years". It was held in Toneguzzo that the plaintiff "is entitled to an award for the loss of earning capacity, not only for the years she will actually live, but for the years she would have lived had she not been injured at birth" (p. 218). According to the Court:

> It is established that a deduction for personal living expenses must be made from the award for lost earning capacity for the years she will actually live. This is necessary to avoid duplication with the award for cost of future care. The question is whether a similar deduction should be made from the award for lost earning capacity for the years after the plaintiff's projected death. In this case, the bulk of the earnings fall into the latter category.
>
> ...
>
> A number of considerations suggest that a deduction for personal living expenses should be made from the award for lost earning capacity during the "lost years". The first is the fact that the projected earnings could have been earned except on the supposition that the plaintiffs would have been alive to earn

> them. There can be no capacity to earn without a life. The maintenance of that life requires expenditure for personal living expenses. Hence the earnings which the award represents are conditional on personal living expenses having been incurred. It follows that such expenses may appropriately be deducted from this award. Against this, it is argued that if Jessica had been born a millionaire, her personal living expenses during the "lost years" would have been met from other sources. But this does not negate the fact that in order to earn income one must live and incur the attendant expenses.
>
> It can be argued that not to make a deduction for personal living expenses is to introduce into the award for lost earning capacity for the "lost years" a measure of overcompensation akin to the duplication which the law avoids in the case of an award for lost earnings during the plaintiff's actual lifespan. This deduction has been justified for the years before the plaintiff's actual projected death, on the ground that it avoids duplication between the award for cost of care and the award for lost earning capacity. But in fact, the "lived years" and the "lost years" cannot be so easily distinguished. The same reasoning applies to both: had the plaintiff been in a position to earn the monies represented by the award for lost earning capacity, she would have had to spend a portion of them for living expenses. Not to recognize this is to introduce an element of duplication and to put the plaintiff in a better position than she would have been in had she actually earned the monies in question.
>
> The logic of the making of a deduction for personal living expenses on the lost years in the case of a child is also supported by the argument that since Jessica's care is fully provided for under another head of the award, the award for lost earning capacity will serve but one purpose: to enrich her heirs. It will do little to improve her life (pp. 218-219).

In the end, McLachlin J. allowed a fifty percent deduction from the award for lost earning capacity. It is this figure, and the reasoning behind it, that the plaintiffs in this case rely on.

271 It must be noted that, in Dubé (Litigation Guardian of) v. Penlon Ltd. (1994), 21 C.C.L.T. (2d) 268, Zuber J. of the Ontario Court (General Division) accepted the principle enunciated by the Supreme Court in Toneguzzo. However, he did not read that case as prescribing a fifty percent deduction for all cases. Based on the evidence of Professor Carr, and the "personal living approach", Zuber J. concluded that a deduction of one-third for the lost years would be reasonable (p. 281).

272 In this case, the defendants rely on the Ontario Court (General Division) case of Marchand v. The Public General Hospital, [1996] O.J. No. 4420, and the evidence of Professor Pesando, to argue

up to a 88.8 percent deduction under the "savings approach." In contrast to the "personal living expenses" approach advocated by Professor Carr, which reflects the fraction of Michael's earnings that would have been spent to enable him to earn income, the defendants argue for the "savings approach". This latter approach reflects all personal living expenses so that only the portion of earnings that would have been saved remains in the calculation. The "savings approach", according to Professor Pesando, is the better one because it can be more precisely measured, once the income has been projected. In light of the circumstances of this case, Professor Pesando recommends reduction factors of 54 percent, 74.4 percent and 88.8 percent. The first figure corresponds with "personal living expenses (no personal taxes factored in)", the second with "personal living expenses (personal taxes factored in)", and the third is representative of the "savings approach."

273 The defendants' proposed reduction of 88.8 percent reflects a concern over Michael dying before the date he would have retired and, thus, leaving a windfall to his heirs. Courts have always been concerned with the risk of overcompensation and double recovery. The principle that living expenses be deducted from the claim of future lost income during the "lost years" is one such rule established by the courts to accommodate these concerns. As the purpose of tort compensation is to put the parties as nearly as possible in the position they would have been if the tort had not occurred, this does not involve the creation of an infant estate that only the parents will enjoy.

274 The defense relies on the position articulated in numerous British cases such as Pickett v. British Rail Engineering Ltd., [1980] A.C. 136 (H.L.) and Gammell v. Wilson, [1982] A.C. 27 (H.L.), to argue that a substantial reduction must be made in order to ensure that Michael's heirs are not over-compensated. In the case of Gammell, Lord Fraser of Tullybelton stated:

> ... it seems to me difficult to justify a law whereby the deceased's estate, which may pass to persons or institutions in no way dependent upon him for support, can recover damages for loss of earnings, or other income, which he would probably have received during the "lost years". It is particularly difficult to justify the law in cases such as the present, in each of which the deceased was a young man with no established earning capacity or settled pattern of life. In such cases it is hardly possible to make a reasonable estimate of his probable earnings during the "lost years" and it is, I think, quite impossible to take the further step of making a reasonable estimate of the free balance that would have been available above the cost of maintaining himself through the "lost years". The amount of that free balance is the relevant figure for calculating damages. The process of assessing damages in such cases is so extremely uncertain that it can hardly be dignified with the name of calculation; it is little more than speculation. Yet that is the process which the courts are obliged to carry out at present (pp. 71-72).

275 In response to the expressions of judicial unhappiness contained in the Gammell decision, Parliament enacted legislation the following year which added to the exclusion of exemplary

damages, a further exclusion of any damages for loss of income in respect of any period after the death of the deceased. Similarly, Ontario courts have interpreted legislation in this area as having intended to foreclose any claim for loss of future earnings by the personal representative of a deceased person (see: Balkos v. Cook (1990), 75 O.R. (2d) 593 (C.A.)).

276 While mindful of the above argument, I am concerned that, if I accept the defense's calculation of a 88.8 percent reduction, I would effectively eliminate a whole category of damages, namely that of "lost income." As such, I can not agree with the defendants' position. Instead, I find the reduction made in Toneguzzo to be the appropriate one to make, i.e., fifty percent. Although this amount is somewhat arbitrary and imprecise, calculations such as these can never be exact. One can never predict the cost and standard of living or the anticipated consumer choices or personal living expenses of a particular plaintiff. To try and predict exact living expenses, based on a fantastic version of what a plaintiff's life would have been like had she or he not been injured, takes the court into the realm of make-believe and makes a mockery of the judicial system.

277 In the words of Cunningham J. in Granger v. Ottawa General Hospital, [1996] O.J. No. 2129, Reasons for Judgment, Released June 14, 1996 (Ont. Ct. Gen. Div.), "... there is no precise way of measuring such a deduction and it is for a court on the basis of the evidence before it to apply what it considers to be an appropriate deduction" (p. 103). It is my finding that, in this case, a fifty percent deduction provides a fair balance between the defendants' concern with over-compensation and the plaintiffs' submission that Michael will live past retirement age and, thus, no deduction needs to be made.

d) Non-Pecuniary General Damages

278 On the issue of non-pecuniary general damages, the court is guided by a trilogy of Supreme Court of Canada decisions, namely Andrews v. Grand & Toy (1978), 83 D.L.R. (3d) 452, 3 C.C.L.T. 225, Thornton v. School District No. 57 (1978), 83 D.L.R. (3d) 480, 3 C.C.L.T. 257, and Arnold v. Teno (1978), 83 D.L.R. (3d) 609, 3 C.C.L.T. 272 [hereinafter the "Trilogy"]. These three cases outlined the purpose and principles behind awards for non-pecuniary losses. In Andrews, the Court explained:

> Andrews used to be a healthy young man, athletically active and socially congenial. Now he is a cripple, deprived of many of life's pleasures and subjected to pain and disability. For this, he is entitled to compensation. But the problem here is qualitatively different from that of pecuniary losses. There is no medium of exchange for happiness. There is no market for expectation of life. The monetary evaluation of non-pecuniary losses is a philosophical and policy exercise more than a legal or logical one. The award must be fair and reasonable, fairness being gauged by earlier decisions; but the award must also of necessity be arbitrary or conventional. No money can provide true restitution. Money can provide for proper care: this is the reason that I think the paramount concern of

> the Courts when awarding damages for personal injuries should be to assure that there will be adequate future care.
>
> However, if the principle of the paramountcy of care is accepted, then it follows that there is more room for the consideration of other policy factors in the assessment of damages for non-pecuniary losses. In particular, this is the area where the social burden of large awards deserves considerable weight. The sheer fact that there is no objective yardstick for translating non-pecuniary losses, such as pain and suffering and loss of amenities, into monetary terms. This area is open to widely extravagant claims ... (pp. 475-6).

279 The Court cautioned against awarding the monetary amounts awarded in the United States and pleaded for moderation in compensation dollars. Three theoretical approaches were outlined with respect to the problem of non-pecuniary loss. These three approaches were borrowed from A.J. Ogus' article, "Damages for Lost Amenities: For a Foot, a Feeling or a Function?" (1972), 35 Mod. L. Rev. 1. As explained by the Court, the first, "conceptual", approach "treats each faculty as a proprietary asset with an objective value, independent of the individual's own use or enjoyment of it" (p. 476). The second or "personal" approach "values the injury in terms of the loss of human happiness by a particular victim" (p. 476). And, finally, the "functional" approach:

> ... accepts the personal premise of the second, but rather than attempting to set a value on lost happiness, it attempts to assess the compensation required to provide the injured person "with reasonable solace for his misfortune". "Solace" in this sense is taken to mean physical arrangements which can make his life more endurable rather than "solace" in the sense of sympathy (p. 476).

280 The Court accepted this latter approach as the more reasonable. Writing for the Court, Dickson J., as he then was, argued:

> To my mind, this last approach has much to commend it, as it provides a rationale as to why money is considered compensation for non-pecuniary losses such as loss of amenities, pain and suffering, and loss of expectation of life. Money is awarded because it will serve a useful function in making up for what has been lost in the only way possible, accepting that what has been lost is incapable of being replaced in any direct way (p. 476).

Dickson J. went further to argue that damages for non-pecuniary loss, if viewed through the functional perspective, will be reasonable amounts, as long a plaintiffs is properly provided for in terms of future care. In the words of Dickson J.:

> The money for future care is to provide physical arrangements for assistance, equipment and facilities directly related to the injuries. Additional money to

> make life more endurable should then be seen as providing more general physical arrangements above and beyond those relating directly to the injuries. The result is a coordinated and interlocking basis for compensation, and a more rational justification for non-pecuniary loss compensation (p. 477).

281 Of course, award amounts, states Dickson J., are still "largely arbitrary and conventional" (p. 477). The Andrews case enabled the Court to establish a rough upward parameter on these awards. Yet, the Court cautioned that these figures "must be viewed flexibly in future cases in recognition of the inevitable differences in injuries, the situation of the victim, and changing economic conditions" (p. 477). In the end, Dickson J. adopted $100,000 as the appropriate award in the case of a young adult quadriplegic. Save in exceptional circumstances, this was held to be the upper limit of non-pecuniary loss in cases of that nature. Based on the reasoning set out in Andrews, the same amount was awarded in Thornton and Arnold.

282 In the case at bar, much effort was expended by both parties in their calculations of the emotional and physical capacities of Michael and in their determinations of what would be required to make Michael's life more endurable. Counsel for the plaintiffs attempted to show, for instance, Michael's enjoyment of things such as food, music, and playing with toys. Dr. Humphreys, on behalf of the defendants, noted that Michael will sit for 30 to 60 minutes and can roll from his back to his side. He turns his head readily to sounds, recognizes people close to him, and anticipates mealtime with excitement. Michael, his counsel argues, is able to sense and respond. He is aware of his surroundings and environment.

283 Michael's alertness and awareness of his surroundings lead counsel for the plaintiffs to argue that Michael's non-pecuniary damages ought to be higher or equal to those awarded the plaintiff in Granger, supra, namely $250.000 (the "Trilogy" amount, after taking inflation into account). The plaintiff in Granger was born with very severe neurological deficits. At six and a half years old, she continued to exhibit a fisted posture of both hands and was unable to raise her head in prone position. Her long term prognosis for neurologic recovery was extremely poor and she would always be dependent on others completely in every aspect of her life (p. 68).

284 Cunningham J. held that the plaintiff in Granger, supra, was entitled to the full trilogy amount with respect to non-pecuniary general damages. This award, he stated:

> ... is in addition to any amount provided for her future care and is an amount which is provided to make her life more endurable. No amount of money will repair the brain damage or remove her suffering As Dickson J. stated in Lindal v. Lindal, [1981] 2 S.C.R. 629 at 637:
>
> > Thus the amount of an award for non-pecuniary damage should not depend alone upon the seriousness of the injury but upon its ability to ameliorate the condition of the victim considering his or her particular situation. It

> therefore will not follow that in considering what part of the maximum should be awarded the gravity of the injury alone will be determinative. An appreciation of the individual's loss is key and the "need for solace will not necessarily correlate with the seriousness of the injury". (Cooper-Stephenson & Saunders, Personal Injury Damages in Canada (1981), at 373. In dealing with an award of this nature it will be impossible to develop a "tariff". An award will vary in each case "to meet the specific circumstances of the individual case" (Thornton at 284 S.C.R.).
>
> This functional approach therefore attempts to assess the compensation required to provide the injured person with reasonable solace for his or her misfortune (pp. 71-2).

285 It has been suggested very strongly that awarding the "Trilogy" amount of damages to Michael Chow would clearly be overcompensating. In cases such as these, where the trial judge necessarily has to be somewhat arbitrary in her or his decision, it seems to me that a trial judge should only award nominal amounts for general damages when she or he is absolutely certain that such monies will not be needed for the plaintiff's benefit. I intend in this regard to err on the side of caution and compensate Michael Chow in the full amount of non-pecuniary general damages dictated by the "Trilogy."

e) Loss of Earning Capacity

286 As stated in the article on damage assessment in obstetrical injuries by Colin L. Campbell, Q.C., as he then was,

> In addition to the cost of future care, a person injured as a result of the negligence of another is entitled to be compensated for the loss of the ability to earn income. In assessing the value of the plaintiff's lost earning capacity a court compares what the plaintiff could have earned but for the injury with what he or she will likely earn in the injured state. Unlike damages for the cost of future care, which are assessed with respect to the plaintiff's post-injury life expectancy, damages for loss of earning capacity are assessed for the period that, but for the injury, the plaintiff would have been expected to work - i.e., pre-accident working life expectancy.
>
> The calculation of the value of lost earning capacity is particularly difficult in the case of infants who, unlike adult plaintiffs, will have no established educational or employment history. The assistance of actuaries and economists will be required in arriving at an appropriate assessment (C. Campbell, "Assessment of Damages in Obstetrical Injuries," McCarthy Tétrault

TDO-LAW #7501229/v. 1 at 20).

287 In the case at bar, both the plaintiffs and the defendants brought forth experts who prepared calculations regarding Michael's loss of future earning capacity. As mentioned above, calculating Michael's future income loss is a very difficult endeavour as he has established no educational or employment history. Both Michael's parents are dentists. They testified that they would have encouraged Michael to enter dentistry and would have handed him their practices on their retirement at age 60.

288 Howard Rosen, a forensic accountant and plaintiffs expert, outlined six possible scenarios with respect to Michael's future loss earning capacity:

289 In the first scenario, Michael would have graduated and begun working as a dentist intern at the age of 25, earning approximately $30,000 (in 1997 dollars). At age 26, he would have worked as an associate in his father's practice, earning $75,000 (income earning capacity equivalent to Mr. Chow at the beginning of his career). At age 27, Michael would have purchased his father's established practice and Dr. David Chow would have retired. Michael would have maintained an income earning capacity similar to his father's current earnings of more than $400,000 per year. Assuming, Michael works until he is 60 years old, his loss of earnings, discounted at 2.5 percent to present value, less $516,700 (cost of purchasing his father's practice), would be $4,750,532.

290 In the second scenario, Michael's loss of future income earning capacity is based on the assumption that Michael would have earned the average of his mother's and father's income until his retirement at age 60. In other words, Michael would earn $30,000 his first year, $75,000 his second, $130,000 his third, $185,000 his fourth year, $240,000 in his fifth year, and $292,000 a year for the last thirty years of his practice.

291 The third scenario has Michael earning the equivalent of his mother, again retiring at age 60. This would mean that Michael would earn $100,000 in his third year of practice, $130,000 in his fourth, $160,000 is his fifth year and $185,000 per year for the last thirty of his practice.

292 The fourth scenario assumes Michael's future earning capacity will be equivalent to the average 1997 earnings of an Ontario dentist. In such a case, Michael would receive $30,000 and $75,000 in his first and second years, respectively. Then, he would earn $90,000 in his third year, $105,000 in his fourth, $120,000 in his fifth and $132,000 a year until he retires.

293 In scenario number five, Michael earning capacity would be equivalent to the average earnings of an Ontario University graduate employed in Toronto, namely $79,671, discounted to present value at 2.5 percent per annum. Retirement age in this scenario would be 65.

294 Finally, the last scenario is based on the assumption that Michael's future earning capacity would have been equivalent to the median of the highest quartile earnings of an Ontario University graduate employed in Toronto, $123,000 per annum, with retirement at 65 years of age.

295 Counsel for the plaintiffs argue that they must prove their case as to the future head of damages on the basis of a "substantial possibility." It is submitted that the evidence shows, at a minimum, there is a substantial possibility that Michael would have had annual earnings at least equivalent of those of his mother, if not those of his father.

296 Dr. Peter Pesando, Professor of Economics at the University of Toronto and defense expert, gave evidence that there is an established link between the level of education and future earnings. He argued:

> The strongest socioeconomic factor which influences the educational attainment of a child is the educational achievements of the parents. The higher are the educational achievements of the parents, the higher is likely to be the educational attainment of the child.
>
> I have been advised that Michael's parents (who are divorced) are both dentists. In light of this fact, I have been asked to assume that his premorbid earnings would equal the average of males in Canada with a university degree.

In light of this evidence, and a 1998 article by M. Corak and A. Heisz entitled, "Unto the Sons: The Intergenerational Income Mobility of Canadian Men" [unpublished], the plaintiffs submit that the most appropriate annual income for Michael would be $216,267. This amount is supported by the high earnings of David and Theresa Chow and the Corak and Heisz article which studied 400,000 father and son pairs in Canada. This study measured the influence of high wage earning fathers on their son's earnings and found that, when parental income is in the top percentile, there exists a higher likelihood for the son's income to be high also.

297 The defendants also rely on the evidence of Professor Pesando who argued that it is economically unsound to assume that Michael would be a dentist. Instead, Professor Pesando proposed that Michael either would have earned the average of male university graduates with a premium built in for the additional assumption that he would have worked in Toronto and the net positive contingency of fringe benefits, namely $64,697. Professor Pesando's alternate scenario had Michael earning $81,857 per year. This figure used Dr. Carr's ultimate figure as a starting point but then made three adjustments: (1) for non-participation; (2) for non-full-year-full-time contingencies; and (3) for the fact that peak earnings are not the same as average lifetime earnings. Professor Pesando's figure assumed that Michael would retire at 62 years of age, the typical retirement age of male workers in Canada.

298 The defendants argue that there is no economic or other basis to support the contention that a child will assume the career of his or her parent. The strongest socioeconomic link between parents and children, as mentioned above, is educational achievement. The only reliable exercise in prediction, submits the defense, stems from the fact that Michael's parents are both university-educated. Thus, the only thing that can be said with any certainty is that Michael would

have completed university. We will never know what Michael would have done with that university degree.

299 I tend to agree with the defense on this point. However, there still remains some contention between the plaintiffs and the defense experts regarding whether fringe benefits ought to be added to this figure and whether Michael would remain in Toronto to work. The plaintiffs' figure regarding university graduates is $123,379, while the defendants' adjusted figure is $81,857. Again, I prefer erring on the side of caution and I am going to take the plaintiffs' figure at $123,379. I believe there is a strong chance that Michael would have remained in Toronto, surrounded by his family. Whether or not he would have become a dentist, I cannot say with any certainty. The figure of the plaintiffs allows a little latitude for a mistake to be made in this area. As such, I will take that income level and a retirement age of 62 to be the figures determinative of Michael's loss of future earnings.

f) Other
(i) Contingencies

300 The plaintiffs' counsel argue that, although claims for future damages may invite the application of a contingency, such are not mandatory and must be balanced. As authority for this statement, the plaintiffs cite Dickson J. in Andrews. On page 245, he held:

> There are, however, a number of qualifications which should be made. First, in many respects, these contingencies implicitly are already contained in an assessment of the projected average earnings of the injured person, for one must assume that this figure is a projection with respect to the real world of work, vicissitudes and all. Second, not all contingencies are adverse .... Clearly the percentage deduction which is proper will depend on the facts of the individual case, particularly the nature of the plaintiff's occupation; but generally it will be small.

301 Also relying on the decision in Andrews, the defendants submit that a reduction ought to be made for contingencies relative specifically to the future lost income claim. According to Dickson J., such contingencies should reflect unemployment, accidents, illnesses and business depression. A reduction of 20 percent was made in Andrews, although few reasons were given for this particular amount. According to the defense, Professor Pesando's testimony points to the fact that average earnings are dropping after adjusting for inflation. In light of the totality of evidence, the defense argues that a significant reduction for contingencies must be made under the future earnings head of damages. It is submitted that the future lost income award ought to be reduced for contingencies in the amount of 20 percent.

302 In light of both the defense and the plaintiffs' arguments, I find that no reduction ought to be made for contingencies under the award for future lost income. These contingencies are already implicitly contained in my assessment of Michael's projected average earnings. As such, this award

will remain as outlined above.

(ii) The Discount Rate

303 The plaintiffs argue that the appropriate discount rate ought to be the 2.5 percent as mandated by R. 53.09 of the Rules of Civil Procedure. This Rule states:

> The discount rate to be used in determining the amount of an award in respect of future pecuniary damages, to the extent that it reflects the difference between estimated investment and price inflation rates, is 2.5 percent per year.

I agree with this submission as there is no evidence to suggest departing from this legislated figure.

(iii) Management Fee

304 Expert for the plaintiffs, Mr. Rosen, advocates a management fee of .125 percent per annum to manage the funds during Michael's lifetime. The defense disagrees with this position for two reasons. To begin with, according to the defense, real interest rates are far in access of the 2.5 percent discount rate prescribed by Rule 53.09. Counsel for the defendants point to the real interest rate of over 4 percent on the principal Real Return Bond of the Government of Canada which the defense argues is the best available measure of the real interest rate on long-term bonds. Assuming a .125 percent management fee is given, the net real return of 3.875 percent will be far in excess of the 2.5 percent. In other words, the defense argues that a professionally managed fund ought to be able to provide a real return of more than 2.5 percent net of management fees regardless. Thus, an additional award for management fees is not necessary. A professional fund manager would invest in primary securities such as bonds and mortgages. The spread between the yields on these investments would likely make the investment management fee "self financing."

305 I agree with the defense on this issue. A professional fund manager ought to be in charge of managing Michael's award. This manager ought to be able to earn his or her fee independent of the damage award. Accordingly, no additional management fee will be required or awarded.

(iv) Future Care to be Provided by Parents - FLA

306 Counsel for the plaintiffs argue that Michael's parents will be providing care, supervision and assistance to oversee Michael's needs for the rest of their lives. The value of the services they provided in the past have been agreed upon. However, future services, pursuant to the Family Law Reform Act, have yet to be assessed by the court.

307 The defense argues that no award should be made under this heading. It is asserted that no evidence was called on this issue whatsoever and the court ought not to make any award to the Chows for future care because there is nothing to base it on, the defense did not have an opportunity to challenge any concrete proposal. Moreover, to compensate the Chows under this heading would

be double counting.

308 I, again, have to agree with counsel for the defendants on this point. Parents have an obligation to care for their children. Although this obligation decreases somewhat as the child ages, this decrease is already reflected in the award for future attendant care. As such, no award will be made under this section.

(v) Use of Structures

309 Structured annuities are used to provide for the future care needs of a disabled plaintiffs and to provide a flow of funds in order to compensate for loss of earnings. Explaining this phenomenon, Colin Campbell has written:

> Prior to the amendments to the Courts of Justice Act and Rules affecting cases commenced after October 19, 1989 (discussed below) the Plaintiffs or their representatives were entitled as a right to have the Court assess a lump sum amount sufficient to enable the payment of future costs over the life time as needed. Indeed as part of the necessary amount to enable those payments was an amount to anticipate the income tax that would be payable on the income earned by the capital sum invested. The "Gross-Up" provision in Giannone v. Weinberg, [1989] O.J. No. 654, is but one example of the complexities of this calculation.
>
> To avoid this uncertainty to both parties many defendants were prepared to suggest the purchase of an annuity which could provide the required annual amount and by virtue of a specific provision in the Income Tax Act relating to disability payments avoid the payment of an amount which the Plaintiff would otherwise have to pay in income tax. As a result, no "gross-up" is required.
>
> A number of Plaintiff's counsel have suggested that this saving represents a "windfall" to the defendant which at least should be shared with the Plaintiff. The real issue however is what the periodic sum that is required to provide for the injured parties [sic] needs. The most cost-efficient way to achieve that result should be the goal of compensation not the payment of a sum with uncertain parameters affecting its calculations.
>
> Structured annuities can also eliminate another very contentious area in obstetrical damage assessments, namely life expectancy. Medical experts may differ over a considerable range as to whether a particular level of brain damage will leave an injured infant with 10, 20, 40 or 60 years of life expectancy. One does not need a degree in mathematics to recognize that the actual costs to be

> paid out in respect of an infant with a life expectancy of 10 additional years is significantly less than the sum needed to provide for an additional 60 years.
>
> The life insurance industry has provided a product which virtually eliminates the need to consider this difference. It is called a disability or impaired structured annuity. Based on medical information and assessment, the life insurance company takes on the risk by providing a life annuity at a cost based on an educated guess of a life expectancy of the individual being considered.
>
> The payments are then made for the life of the infant regardless of the actual event of death being longer or shorter than the company's estimate at the time of its contract. In many if not most cases the life insurance company's estimate will provide a lower cost than would be the case if either of the Plaintiffs or defense experts estimates were used.
>
> ...
>
> The provisions of s. 116 of the Courts of Justice Act provides for actions arising after October of 1989 a significant incentive to a Plaintiff to a consent to an annuity for future care. It provides in effect that the Court can approve a periodic payment (annuity) if satisfied the Plaintiff meets the care needs of the Plaintiff without an automatic compensation for "gross-up" (Campbell, supra at 23-5).

310 With respect to this issue, my ruling of April 15, 1998 stands. In that ruling I questioned whether I was bound by Mr. Justice Finlayson, speaking for the Court of Appeal, in Wilson v. Martinello (1995), 23 O.R. (3d) 417, 37 C.P.C. (3d) 325. Counsel for the defendants argued that I was not bound by Finlayson J.A.'s comments regarding the proper two-step process to be followed as his remarks were obiter dicta. The plaintiffs' counsel argued the opposite.

311 After doing some research in this area, I have come to the conclusion that the remarks of Mr. Justice Finlayson are not obiter. They are judicial dicta. In light of s. 116 of The Judicature Act, I am bound by the Court of Appeal's findings. In the words of Finlayson J.A.:

> To my mind it is clear that s. 116 is not engaged until the end of a trial when the court has decided all issues of liability and has assessed damages in the conventional manner. It is only then that the issue of whether to structure some or all of the damages arises if there is no consent under s. 116(1)(a). At that stage, the plaintiff is in a position to determine if he is going to "request" a gross up.

> Once the findings of fact have been made as to those heads of compensation which would attract gross up, hopefully the parties can agree to the results that flow from the calculation of gross up as prescribed by r. 53.09(2) of the Rules, supra. If they cannot, evidence would have to be led on the issue having in mind the formula set out in r. 53.09(2). Once the calculation has been made, the defendant would have to either agree to a lump sum award with gross up as found by the court or put forward a scheme of periodic payments (a structure) for the consideration of the court under s. 116(1)(b) of the Act (p. 335).

Accordingly, once a request for gross up has been made, the court must determine whether the structure proposed by the defendant will be in the plaintiff's best interest (p. 337). In the case at bar, no request for gross up has been made. Thus, I am not obliged to determine whether a structured settlement will be in the plaintiffs' best interest in this instance.

312 For what it is worth, I have a great deal of sympathy for the position put forward by counsel for the defendants. I would recommend that it is time for the legislative assembly to reconsider the whole issue of structured settlements and their use in a tort-compensatory system.

313 In conclusion, Counsel will have to re-attend before me, by appointment, in order to settle the form of this judgment. Plaintiffs' counsel should prepare a draft judgment and have it available for consideration when this case comes back before me. Issues of pre-judgment interest and costs remain to be dealt with. A short summary of the heads of damages that this judgment will award the plaintiffs is as follows:

HEAD OF DAMAGE	AMOUNT PER YEAR	TOTAL
Future Attendant Care 1996-1997 $40,000 1998-2011 $60,000 2012-2036 $142,139 (half year) $73,017 cleaning services: $3,895 2026 - 2036 1/2		- present value to be inserted -
General Damages	$261,000 (present $261,000 upper limit - "Trilogy")	

Lost Income - "Lost Years" Deduction (fixed at 50%)	- present value to be inserted; this figure will be supplied to the court by the agreement of Counsel or will be fixed by me after submissions -

LISSAMAN J.

cp/d/ln/bbd/DRS/qlhcs