IN THE CORONERS COURT

OF VICTORIA

AT MELBOURNE

Court Reference: COR 2017 2381

FINDING INTO DEATH WITHOUT INQUEST

Form 38 Rule 63(2)

Section 67 of the Coroners Act 2008

Findings of:	**AUDREY JAMIESON, CORONER**
Deceased:	**BABY FF**[1]
Date of birth:	**19 May 2017**
Date of death:	**21 May 2017**
Cause of death:	**Hypoxic Ischaemic Encephalopathy and Intracranial Haemorrhage complicating obstructed labour.**
Place of death:	**The Royal Women's Hospital 20 Flemington Road, Parkville, Victoria 3052**

[1] The names of the deceased infant and their family members have been redacted to protect their identity. Pseudonyms are comprised of randomly generated two letter sequences.

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Pursuant to section 67(1) of the **Coroners Act 2008**, I make findings with respect to **the following circumstances**:

1. Baby FF was the first baby born to Ms RJ and Mr GX. Baby FF died when he was two days old. Baby FF was born at the Cabrini Hospital; medical care was provided by private obstetrician Dr Weng Chan.

2. On 19 May 2017 at 3.30am, Ms RJ presented to the Cabrini Hospital in spontaneous labour. She presented at 39 weeks' gestation or approximately one week before her expected due date. Ms RJ's labour was fraught and became obstructed. Ultimately, Ms RJ underwent an urgent, category-one caesarean section[2] at about 6.45pm.

3. At 7.00pm, Baby FF was born in poor condition. He received resuscitative interventions and was subsequently intubated. One hour after Baby FF's birth, the Paediatric Infant Perinatal Emergency Retrieval (**PIPER**) team arrived.[3]

4. During the following three hours, the PIPER team stabilised Baby FF and transported him to the Royal Women's Hospital (**RWH**) Neonatal Intensive Special Care (**NISC**). On 20 May 2017 at 1.00am, Baby FF was admitted to the NISC with a primary diagnosis of Hypoxic Ischaemic Encephalopathy (**HIE**).[4]

5. Baby FF's condition never improved and active treatment was withdrawn subsequent to discussion with his family. On 21 May 2019, Baby FF was extubated at 9.15pm and he died at 9.30pm.

INVESTIGATIONS

Forensic pathology investigation

6. Dr Matthew Lynch, Forensic Pathologist at the Victorian Institute of Forensic Medicine (**VIFM**), performed an external examination upon the body of Baby FF. Baby FF's

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[2] A "Category 1" caesarean section is where there is urgent threat to life or the health of a woman or foetus.

[3] The Paediatric Infant Perinatal Emergency Retrieval (PIPER) team is a state-wide service which provides accessible and timely expert advice to health care providers for high-risk neonatal and paediatric care and transport to tertiary centres.

[4] Hypoxic Ischaemic Encephalopathy (HIE) is a syndrome characterised by abnormal neurological function which is usually manifested as decreased conscious state, seizures, difficult initiating and maintaining respiration, and depression of muscle tone and reflexes. The cause or "aetiology" of HIE is wide ranging but it is usually due to an acute (severe and sudden) hypoxic (deficient oxygen) or ischaemic (deficient blood-supply) event.

family expressed a preference for no internal examination based on their Jewish faith. Dr Lynch reviewed a post mortem computed tomography (CT) scan and referred to the medical records of RWH and the RWH electronic medical deposition form as well as the Victoria Police Report of Death, Form 83.

7. Dr Lynch noted that Baby FF was born at term after an uneventful pregnancy. He commented that Baby FF's APGAR scores[5] were 1, 2 and 2 at one minute, five minutes and ten minutes respectively. Dr Lynch noted that Baby FF showed no neurological improvement prior to his death and that the RWH medical deposition proffered HIE as a potential cause of death.

8. Dr Lynch reported circular bruising in Baby FF's right occipitoparietal region and curvilinear abrasions in his left parietal region consistent with the application of vacuum and forceps respectively. A sutured occipital laceration was also noted. The post mortem CT scan was reported by paediatric radiologist Dr Tim Cain of the Royal Children's Hospital. CT scanning detected intracranial haemorrhage and a subgaleal haematoma but no evidence of skull fracture. Pneumomediastinum[6] was also noted.

9. Dr Lynch stated that examination of the placenta revealed acute chorioamnionitis (maternal inflammatory response stage 2, grade 1),[7] ectasia of chorionic veins[8] and small fibrin thrombi[9] raising the possibility of cord occlusion, maternal decidual arteriopathy[10] and fresh marginal haemorrhage.[11]

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[5] An infant with an APGAR score between 0-3 requires immediate resuscitation. APGAR stands for "Appearance, Pulse, Grimace, Activity, and Respiration". Each of these elements are assessed and provided a score between 0 and 2. 2 is the best score. The combination of each score is added for the total APGAR, which is an overall impression of the infant's health after birth. 10 is the best score.

[6] Pneumomediastinum is a condition classified as free air in the mediastinum, which is a division of the thoracic cavity, including *inter alia* the heart, thymus gland, portions of the oesophagus and trachea.

[7] Chorioamnionitis is a bacterial infection that occurs before or during labour. The name refers to the membranes surrounding the foetus: the "chorion" (outer membrane) and the "amnion" (fluid-filled sac). The condition occurs when bacteria infect the chorion, amnion, and amniotic fluid around the foetus.

[8] Chorionic veins occur where there is dilation or distention of the blood vessels that carry blood through the outermost foetal membrane around the embryo.

[9] Fibrin thrombi are blood clots formed in vessels by repeated deposits of a fibrous, non-globular protein by the circulating blood; fibrin thrombi do not usually completely occlude the vessel.

[10] Maternal decidua refers to the mothers endometrium where the placenta attaches. Arteriopathy means disease of arteries. Arteriopathy is observed in placentas from preeclamptic pregnancies as well as several collagen vascular / autoimmune disorders and in those with evidence of growth restriction.

[11] "Marginal" refers to the location of the haemorrhage on the placenta.

10. Dr Lynch ascribed the medical cause of Baby FF's death to hypoxic ischaemic encephalopathy and intracranial haemorrhage complicating obstructed labour.

Coroners Prevention Unit Investigation

11. Following a triage meeting, I requested that the Coroners Prevention Unit (**CPU**)[12] review the circumstances of Baby FF's death. Specially, I requested that the CPU consider Ms RJ's pregnancy and labour care by Dr Weng Chan. As an internal department of the Coroners Court of Victoria (**CCOV**), the CPU had full access to the Coronial File and also sought statements from relevant practitioners. The CPU considered *inter alia* the following documents:

    a. Victoria Police Report of Death for the Coroner;

    b. Victorian Institute of Forensic Medicine Medical Examiner's Report;

    c. E - Medical deposition form

    d. Maternal Medical Records Cabrini Hospital

    e. Neonatal Medical Records Cabrini Hospital

    f. Neonatal Medical Records The Royal Women's Hospital

    g. Medical Records Dr Weng Chan

    h. Statement by Private Obstetrician Dr Weng Chan

    i. Statement by Paediatrician Dr Gideon Lurie

    j. Statement by Dr Danielle Wilkins, Cabrini Director of Maternity Services

Ms RJ's Pregnancy

12. Ms RJ had a relatively uncomplicated pregnancy. She was 34 years of age and had a normal range Body Mass Index (**BMI**).[13] Ms RJ's routine pregnancy blood testing all

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[12] The Coroners Prevention Unit (CPU) was established in 2008 to strengthen the prevention role of the coroner. The unit assists the coroner with research in matters related to public health and safety and in relation to the formulation of prevention recommendations, as well as assisting in monitoring and evaluating the effectiveness of the recommendations. The CPU comprises a team with training in medicine, nursing, law, public health and the social sciences.

[13] Body Mass Index (BMI) is an index of weight-for-height that is commonly used to classify underweight, overweight and obese adults. BMI is defined as the weight in kilograms divided by the square of the height in

yielded normal results, including full blood examination, iron studies and thyroid function tests. Ms RJ's blood group was B positive and she had negative serology testing.[14] Ms RJ's first trimester combined screening test indicated a low-risk pregnancy. She tested negative for gestational diabetes[15] and subsequently, the presence of Group B Streptococcus (**GBS**).[16]

13. Ms RJ underwent a total of five antenatal ultrasound scan (**USS**) during her pregnancy. The first USS was at 10 weeks gestation. The USS did not indicate any morphological abnormality. Serial USS during the third trimester placed the foetus in the 60-65% growth range. On 18 May 2017 at 38 weeks and six days, a USS performed in Dr Chan's rooms estimated the foetal weight to be 3300 grams (+/-500 grams).

14. The CPU commented that the only abnormality Ms RJ experienced during her pregnancy with Baby FF was low vitamin D for which she was supplied a supplement. Baby FF's anticipated due date was 24 May 2017.

Summary of Labour & Birth

15. The CPU noted that the Cabrini Health labour and birth progress notes and partogram[17] were brief. Dr Chan provided additional information in a typed summary.

16. Ms RJ presented in spontaneous labour at 3.30am on 19 May 2017, one week before Baby FF's expected birth date. Ms RJ was tachycardic (her heart rate exceeded 100 beats per minute or **BPM**) throughout her labour. During the first stage of labour, Ms RJ's heart rate reached 120 BPM. During the second stage of labour her heart rate ranged up to 170 BPM and the baseline foetal heartrate rose and became tachycardic prior to

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metres (kg/m2). According to the World Health Organisation, the normal range for BMI in adults is 18.5 to 24.99 kg/m2.

[14] Blood tests to detect; the presence of varicella, syphilis, Human Immunodeficiency Virus (HIV) infections; hepatitis B and C serology, maternal blood group; iron levels; and immunity to rubella.

[15] Gestational diabetes is diabetes that occurs for the first-time during pregnancy and goes away after a baby is born. Gestational diabetes occurs when the mother's body is unable to cope sufficiently with the increased level of hormones from the placenta, which block the action of the mother's insulin.

[16] GBS is an important cause of serious infections such as sepsis and meningitis in neonates. In the event that GBS is detected, mothers in labour are given intravenous antibiotics. This has been demonstrated to reduce the risk of GBS-related disease in the neonate.

[17] A partogram or partograph is a composite graphical record of key data during labour entered against time on a single sheet of paper. Relevant measurements might include statistics such as cervical dilation, foetal heart rate, duration of labour and vital signs.

delivery. During labour, Ms RJ's temperature remained normal[18] and the liquor remained clear/pink in colour, with no meconium.[19] Dr Chan noted that Ms RJ was anxious in the course of her pregnancy and in labour.

17. At 9.00am, Dr Chan contacted the birth suite and was informed that Ms RJ was 5cm dilated and the foetal head was -1cm from the ischial spines.[20] Dr Chan considered artificially rupturing (**ARM**) Ms RJ's membranes[21] but did not do so immediately due to lack of available birthing rooms.[22]

18. At 11.00am, Ms RJ's membranes were artificially ruptured with a subsequent plan in place to review her uterine contractions' duration and strength. At that time: Ms RJ's cervix was 6-7cm dilated and effaced;[23] Ms RJ's heart rate was 100 BMP and she was afebrile;[24] the foetal head remained -1cm from the ischial spines.

19. At 1.00pm, Ms RJ had an epidural for pain relief. At 1.45pm, a midwife examined Ms RJ and identified that her cervix was 7cm dilated and that the presenting part of the foetus had descended to the level of the ischial spines. The results of the vaginal examination were reported to Dr Chan. Ms RJ was noted to be more comfortable with the epidural but still '*nervous*'. At 2.45pm, Dr Chan conducted a further vaginal examination and identified that Ms RJ's cervix remained 7cm dilated. Dr Chan found that the foetal head was in a deflexed posterior position[25] at the level of the ischial spines.

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[18] A raised temperature can increase maternal heart rate.

[19] Meconium stained liquor is an intrapartum risk factor for foetal hypoxia.

[20] On vaginal examination, the station of the head is determined in reference to the ischial spine, an obvious protuberance on the pelvic bone called the ischium.

[21] Amniotic membranes are protective to the foetus, with anti-inflammatory, anti-bacterial, and anti-viral properties. Membrane rupture is sometimes referred to as "waters breaking". Prolonged rupture of membranes is considered when the duration is more than 18 hours prior to delivery. Prolonged rupture of membranes is a risk factor for early-onset neonatal sepsis; offensive or purulent liquor may indicate infection.

[22] At 9.00am, Dr Chan discussed augmenting labour by the artificial rupture of the membranes. But due to the current numbers of women in labour, there was not a spare birthing room.

[23] The cervix was opening (dilating) and the cervix was thinning or stretching (effaced).

[24] Afebrile is a medical term meaning "without fever".

[25] A deflexed posterior position indicates that the foetal head was extended backward and that the head was faced toward the stomach instead of the maternal back.

20. At 3.00pm, Ms RJ was provided an oxytocic syntocinon infusion[26] to augment her labour. It was titrated to a maximum rate of 36ml/hour.[27] Cardiotocographic (**CTG**)[28] monitoring was continuous during Ms RJ's labour. The foetal heart rate (**FHR**)[29] and maternal heart rate were differentiated by use of a saturation probe that continuously recorded the maternal heart rate.[30] The CTG showed a normal FHR until 3.00pm to 3.30pm, when there were periods of reduced variability. The CPU informed me that normal baseline variability is indicative of adequate foetal oxygenation. Importantly, there were no FHR decelerations during this period; the FHR did not fall below the normal baseline. The possible causes were considered to be a phase of foetal sleep or the effects of epidural narcotics.[31]

21. Between 4.00 to 4.30pm, the CTG showed reduced variability associated with variable decelerations.[32] Some FHR decelerations were slow to return to the baseline FHR by the end of the uterine contraction.[33] The second stage of labour was diagnosed at 5.00pm, with full dilation of the cervix and maternal pushing. At 5.10pm, Dr Chan performed a vaginal examination and found that the foetal position had moved from left occiput posterior/transverse to left occiput anterior[34] and +1 in relation to the ischial spines.[35]

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[26] A medication was administered to mimic the effect of oxytocin, stimulating the muscles of the uterus to produce rhythmic contractions.

[27] In response to slower than expected progress in labour as the contractions had decreased in duration. 10 units of syntocinon diluted in a litre of normal saline was commenced at 3.00pm at a rate of 12ml/hr increasing every half an hour to 36ml/hr at 4.00pm.

[28] CTG, is electronic foetal monitoring of the heartbeat. CTGs are a widely used technique for assessing foetal wellbeing.

[29] According to the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (**RANZOG**) Intrapartum Foetal Surveillance Clinical Guidelines 4th ed. (2019), the baseline FHR is the mean level of the FHR when it is stable, excluding accelerations and decelerations and contractions. It is typically determined over a time period of 5 or 10 minutes and expressed in BPM.

[30] A maternal saturation probe provides continuous maternal heart rate monitoring and enables a clear distinction to be made between the maternal and foetal heart rate.

[31] A baseline Foetal Heart Rate (FHR) between 110-160 beat per minute (BPM), with variability of FHR between 5-25 BPM and no deceleration in the FHR.

[32] Above n 27: "variable decelerations" are repetitive or intermittent decreasing of FHR with rapid onset and recovery. Time relationships with contraction cycle may be variable but most commonly occur simultaneously with contractions.

[33] Indicating a late deceleration.

[34] The foetus was faced toward Ms RJ's back with his head slightly off centre in the pelvic area; the "left occiput anterior" position is often cited as the preferred birthing position to minimise diameter of the foetus as it is born.

[35] Station +1 indicates that the foetal head was two centimetres below the ischial spine. The station of the foetal head is a critical factor to consider when assessing the relative safety of vaginal birth.

The baseline FHR was 145 BPM, with the maternal heart rate ranging from 120 BPM up to 170 BPM.

22. In the period from 5.00 to 5.30pm, the CTG was difficult to interpret. However, after this time there was a definite rising baseline FHR from 145 BPM to 170 BPM in addition to reduced variability. At around 5.40pm, Ms RJ was placed in the lithotomy position.[36] At this time the FHR baseline was 160 BPM to 170 BPM, with the decelerations unable to be interpreted.[37]

23. After about one hour of active pushing, Ms RJ was exhausted and her ability to push effectively was limited. At 6.10pm, Dr Chan decided to deliver the baby by an assisted Ventouse vacuum extraction[38] delivery in the birthing room. He attached the vacuum to the foetal head and pulled three times, but delivery was unsuccessful. Between 6.19pm and 6.25pm, Dr Chan pulled the foetal head using Neville Barnes forceps on four occasions.[39] After the first use of forceps, there was some decent of the foetal head. However, there was no progress with the second and third pulls.

24. After 6.10pm, the CTG remained in situ but had a poor-quality trace.[40] The CTG did not continuously record the FHR or uterine contractions, rendering CTG interpretation impossible. At 6.27pm, FHR auscultation recorded 160 BPM;[41] this was the last contemporaneous recording of the FHR.[42] Retrospective documentation noted '*6.13pm FHR heard after each contraction*'. The last record of the FHR was at 6.30pm.

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[36] The patient lies on their back while their legs are bent at the knee at about 70 - 90 degrees; the legs are support by placing the calves in stirrups. The lithotomy position is common position used in childbirth or surgery in the pelvic region.

[37] As the CTG was not recording uterine contractions, decelerations and recovery relative to the contractions were unable to be determined.

[38] A Ventouse is a vacuum device used to assist the delivery of a baby when the second stage of labour has not progressed adequately.

[39] The midwives noted four pulls, but later Dr Chan wrote three pulls.

[40] A foetal scalp electrode was not used. A FSE, is applied to more accurately and reliably record the FHR.

[41] Auscultation is the action of listening to sounds from the heart, lungs or other organs as part of a medical diagnosis.

[42] Auscultation of the FHR should be undertaken and documented after each contraction or at least every five minutes in the active stage of labour according to the RANZOG Intrapartum Foetal Surveillance Clinical Guideline 3rd ed. (2014).

25. At 6.34pm, an urgent category one caesarean section[43] was called and Paediatrician Dr Gideon Lurie and Anaesthetist Dr Hendel were notified. The syntocinon infusion was ceased.

26. At 6.45pm, Ms RJ arrived in theatre and had an epidural top up by the anaesthetist Dr Hendel. Retrospectively, Dr Chan noted '*VE-head pushed up prior when epidural being topped up.*' In his statement, Dr Chan described a vaginal examination in theatre to dis-impact the head gently and 'nil cord felt' whilst the anaesthetist was administering narcotic analgesia via the epidural.

27. At 6.50pm, the caesarean section commenced. At 6.53pm the FHR was unable to be auscultated by a midwife in theatre. The first incision was made at 6.56pm. Clear liquor was noted in theatre and the baby was in an occiput anterior position.

Summary of Post-Natal Period and Death

28. Baby FF was born with a birthweight of 4000 grams.[44] He was born in poor condition; Baby FF was apnoeic,[45] pale, floppy and bradycardic with a heart rate of less than 60 BPM. Intermittent Positive Pressure Ventilation (**IPPV**) and chest compressions were applied. At two minutes of age, Baby FF's heart rate was greater than 100BPM and chest compressions were ceased.

29. Baby FF remained pale and apnoeic with no spontaneous respiration, there were two attempts at intubation with a size 3.5 endotracheal tube (**ETT**). Intubation was difficult due to copious secretions in the upper airway impeding a clear view of the vocal cords. After two unsuccessful attempts, Dr Lurie requested the assistance of Dr Hendel who intubated Baby FF at seven minutes of age using a size 3.0 ETT tube. Dr Lurie inserted an umbilical vein catheter. Brief cardiac compressions were given after each intubation

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[43] Defined as urgent threat to life of a woman or foetus according to The Royal Australian and New Zealand College of Obstetricians and Gynaecologists 'Categorisation of urgency for caesarean section' July 2015.

[44] The weight was established on admission to the RWH NISC, which was after fluid administration, therefore the birth weight was likely to be around the estimated 3800 grams. At 4000grams the weight places him just above the 3rd centile for weight according to the World Health Organization Child Growth Standards chart. Whilst on the smaller end of the growth spectrum, this would be considered within a normal range.

[45] Not breathing.

attempt as the heart rate transiently dropped below 100BPM. Ventilation was continued using a Neopuff device,[46] with good oxygen saturations obtained.

30. Following the assessment of Baby FF's APGAR scores and prior to the arrival of the PIPER team and prior to the PIPER team's arrival, Baby FF remained floppy, with dilated pupils and no respiratory effort. However, he had a normal heart rate and oxygen saturations. Paired umbilical cord gas test and an initial blood gas test showed severe metabolic acidosis.[47] A blood glucose level was normal. At 7.12pm, blood was collected for a full blood examination, C Reactive Protein (CRP)[48] and blood cultures.

31. At 8.10pm, the PIPER team arrived. At 8.30pm, passive cooling was commenced.[49] During the following three hours, the PIPER team stabilised Baby FF. An arterial line was inserted, and inotropic infusion commenced to improve cardiac function, along with further fluids and a blood transfusion.

32. Baby FF was transported by the PIPER team to the RWH Neonatal Intensive Special Care (NISC). The team arrived at 1.00am, when Baby FF was six hours of age. At 2.30am, therapeutic active cooling[50] was commenced, when Baby FF was seven and a half hours of age. At the time of his admission to the NISC, the primary diagnosis was severe Hypoxic Ischaemic Encephalopathy (HIE).

33. During his admission to the NISC, Baby FF remained critically unwell with significant neurological impairment and complications associated with ischaemic brain injury.[51] He

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[46] An attachment that achieves controlled target Peak Inspiratory Pressure (PIP) and delivering consistent Positive End Expiratory Pressure (PEEP) to help Functional Residual Capacity (FRC).

[47] A condition that occurs when the body produces too much acid or when the kidneys are not removing enough acid from the body.

[48] The C-reactive protein (CRP) is a protein in the blood that participates in the immune response to pathogens and tissue inflammation. It is a sensitive but non-specific marker of infection or inflammation occurring at some site in the body. It is not specific for any diagnosis, but its elevation can be a 'flag'.

[49] Passive cooling is done at peripheral hospitals that don't have the facilities for therapeutic cooling. The baby is not wrapped or placed in an incubator and allowed to passively cool. Cooling has a neuroprotective effect and prevents death of brain cells and neurons.

[50] Therapeutic hypothermia aims to lower the temperature of the vulnerable deep brain structures to 33-34°C. Both whole-body hypothermia and selective head cooling has a neuroprotective effect and prevents death of brain cells and neurons.

[51] Ischaemic brain injury is caused by a lack of blood-supply to the brain.

had significant birth injuries, including: an occipital laceration, which was sutured in the NISC; head and scalp bruising and swelling; subgaleal haemorrhage.[52]

34. In light of Baby FF's severe brain damage and extremely poor prognosis, withdrawal of intensive care was recommended. Following multiple meetings between the RWH neonatologist Dr Manley and Baby FF's parents, care was withdrawn on 21 May 2017.

35. The CPU informed me that Dr Chan had numerous telephone discussions with Ms RJ and Mr GX to explain the events leading to their son's death and pathology results. On 23 June 2017, Mr GX and his father met with the Cabrini Medical Director of Obstetrics and Director of Women's and Children's Services.

Medical Statement Review

36. At my direction, the CPU obtained and reviewed, *inter alia*, statements from obstetrician Dr Chan, paediatrician Dr Lurie and the Cabrini Hospital Director of Obstetrics Dr Danielle Wilkins. The statement questions focussed on when the medical practitioners considered labour and foetal wellbeing abnormal and whether there were delays in medical management. Additionally, further information was sought on the attempts at instrumental delivery in an effort to establish possible causes of Baby FF's birth injuries.

37. Dr Wilkins informed me that Baby FF's death was reviewed by the Cabrini mortality committee. The committee noted that a portable CTG machine was not utilised during transfer from the birthing suite to theatre. Cabrini Hospital has re-educated midwives of the requirement. However, the Cabrini mortality committee did not consider the lack of CTG monitoring during transfer to have contributed to Baby FF's death. The committee also concluded that an obstetrician should consider transferral to the operating theatre for a trial of forceps if Ventouse vacuum extraction was unsuccessful, or, if a complex instrumental delivery is anticipated.

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[52] The Royal Australian and New Zealand College of Obstetricians and Gynaecologists state that a subgaleal (or subaponeurotic) haemorrhage (SGH) is a potentially lethal condition in newborns. It is the result of bleeding into the space between the epicranial aponeurosis and the periosteum, caused by rupture of the emissary veins (which are connections between the Dural Sinuses and scalp veins). The morbidity and mortality associated with subgaleal haemorrhage is due to the potential space beneath the aponeurosis being large and therefore blood loss into this space can be significant and life threatening. (See: https://ranzcog.edu.au).

38. Dr Wilkins stated that Baby FF's death was also reported to the Safer Care Victoria Sentinel Event program.[53] A summary review by the Consultative Council on Obstetric and Paediatric Mortality and Morbidity (**CCOPMM**) was completed.[54]

39. In his statement, Dr Chan expressed his distress over Baby FF's unexpected death. The CPU summarised the pertinent points raised by Dr Chan:

    a. Ms RJ was described as anxious during her pregnancy;

    b. Maternal tachycardia during labour was caused by maternal effort in labour and anxiety;

    c. The CTG was considered to be normal;

    d. The decision for delivery was at around 6.00pm. The baby was delivered by emergency caesarean section at 7.00pm. The emergency caesarean section followed three attempts at assisted Ventouse vacuum extraction and three attempts using Neville Barnes forceps in the birth room;

    e. The unsuccessful Ventouse vacuum extraction was caused by loss of suction pressure when traction was applied;

    f. The unsuccessful forceps delivery was caused by maternal exhaustion leading to an inability to effectively push;

    g. There was no indication for the need of a caesarean section before a category one caesarean section was called;

    h. There was no prior indication to cease the Syntocinon infusion before Ms RJ was transported to theatre;

    i. As there was normal uterine resting tone in between contractions, tocolysis[55] was not considered necessary;

    j. Dr Chan assessed Ms RJ in theatre, where no umbilical cord was felt and he then 'gently' dislodged the foetal head;

    k. There were no delays in performing the caesarean section;

    l. Umbilical venous and arterial cord lactates taken after delivery at 7.09pm were arterial 4.4 and venous 6;

    m. Kleihauer was negative and placental examination normal; and

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[53] The Safer Care Victoria supports Victoria's three minister-supported bodies that monitor and report on highly specialised areas of health care: Consultative Council on Obstetric and Paediatric Mortality and Morbidity, Victorian Perioperative Consultative Council, and Voluntary Assisted Dying Review Board.

[54] CCOPMM considers, investigates and reports on obstetric and paediatric mortality and morbidity, as well as related matters referred by the Minister for Health or the Department of Health and Human Services.

[55] Drugs administered to relax the uterus.

n. No meconium liquor was noted by the midwives during labour or Dr Chan in theatre

o. The paediatrician Dr Lurie was present in theatre.

Discussion of Contributing Factors

Indication for earlier birth

40. The CPU informed me that Ms RJ was monitored appropriately during labour with continuous CTG monitoring and regular labour progress assessments. No meconium was noted during labour, however if meconium was present, the monitoring and management of labour would be unaltered.

41. The CPU noted unaddressed issues in the statements provided. Neither Dr Chan nor the Cabrini mortality committee considered the rising baseline FHR combined with reducing variability, to be indicative of inadequate foetal oxygenation.[56] The statements did not provide any comment on the poor CTG trace quality from 6.10pm, when there were attempts to perform an instrumental delivery.[57] The need for a foetal scalp clip to more accurately and reliably record the FHR was not mentioned, nor the need to perform a foetal scalp lactate.[58] Finally, there was no explanation as to why the portable CTG machine was not used to continuously record the FHR in the 30 minutes prior to birth.

Birth injuries

42. Dr Chan's statement did not specifically note any connection between the birth injuries of a subgaleal haemorrhage and intracranial brain bleed. Nor did it mention the difficulties encountered during his attempted instrumental delivery and disimpaction of the foetal head from the pelvis in theatre.

Expert Obstetric Opinion

44. In light of the outcome of the CPU investigation, I obtained an expert obstetric opinion. The expert opinion[59] was sought from Obstetrician Associate Professor Edward Weaver.

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[56] See "Summary of Labour & Birth" paragraph 20-27.

[57] See "Summary of Labour & Birth" paragraph 24.

[58] The performance of foetal blood sampling provides evidence of foetal well-being. Lactate is the measurement of circulating lactic acid, with a level greater than 4.8mmol/Litre indicating the foetus should be delivered immediately by either instrumental delivery or urgent caesarean section.

[59] The questions provided to Associate Professor Weaver are provided in Attachment A.

Associate Professor Weaver had access to the coronial brief of evidence, including the primary medical records and statements by treating clinicians. The expert was asked to consider the medical management during labour and delivery of Baby FF. Specifically, I asked Associate Professor Weaver to consider the potential contributing factors highlighted by the Court's internal review:

a. Would an earlier delivery have been appropriate in the circumstances?

b. What was the degree contribution of the instrumental delivery to Baby FF's birth injuries?

Summary of Expert Obstetric Opinion

45. Ultimately, Associate Professor Weaver concluded the antenatal care was of a good standard, with risks identified and appropriately managed; although the initial labour was slow in progression, it was appropriately augmented by a syntocinon infusion.

46. Dr Chan made the correct decision to attempt an operative vaginal delivery given the clinical circumstances. Once difficulties were encountered, a category one urgency for caesarean section was appropriate and in accordance to the contemporaneous Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) guideline.[60] Once this decision was made, Baby FF was born less than half an hour later.

47. Following the decision to perform an operative delivery, Associate Professor Weaver noted some areas where care could be improved. Nevertheless, Associate Professor Weaver cautioned, these practice changes may not necessarily have led to a better perinatal outcome.

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[60] Based on the contemporaneous RANZCOG Categorisation of urgency for caesarean section. RANZCOG does not recommend any specific time interval attached to the various categories.

- Category 1 is urgent threat to life or the health of a woman or foetus.
- Category 2 is maternal of foetal compromise but not immediately life threatening.
- Category 3 is needing earlier than planned delivery but without currently evident maternal or foetal compromise.
- Category 4 is at a time acceptable to both the woman and the caesarean section team, understanding that this can be affected by a number of factors.

FHR monitoring during transfer

48. Associate Professor Weaver highlighted that there was no continuous FHR monitoring on transfer from the birthing room to commencement of the caesarean section in theatre. The FHR was tachycardic following the attempted instrumental delivery. CTG monitoring needed to continue on transfer to theatre to detect decelerations in relation to contractions. He stated that, to accurately monitoring foetal wellbeing during labour, any interruptions to heart rate monitoring must be minimised.[61]

49. The foetal heart rate was abnormal following the attempted forcep delivery, but Associate Professor Weaver was unable to comment further as continuous CTG monitoring was not in progress during the transfer to theatre. Associate Professor Weaver was critical that there was not continuous CTG monitoring between the decisions to perform a category one Caesarean Section and transfer to theatre and birth.

Use of delivery instruments

50. Associate Professor Weaver noted that the attempted sequential instrumental delivery[62] was performed in the birthing suite rather than in theatre. Associate Professor Weaver believed a trial of forceps should have been performed in theatre, given the private hospital setting and extra time required for setting up theatre for an emergency caesarean section after hours. However, he was reticent to be critical of Dr Chan, as Associate Professor Weaver believed he would better understand the Cabrini Hospital environment and resources available after hours.

It should be noted that there is an increased risk of unfavourable perinatal outcome in babies who are born vaginally following the use of multiple instruments, but there are also risks in delivering a baby by CS at full dilatation.

51. Associate Professor Weaver also noted that there was no administration of a uterine relaxant to allow increased perfusion of the placenta following attempted forceps.[63]

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[61] Royal Australian and New Zealand College of Obstetricians and Gynaecologists Women's Health Committee. The applicable '*Foetal Surveillance Clinical Guideline*' (2016).

[62] The use of Neville Barns forceps following the failed Ventouse vacuum extraction.

[63] The perfusion of the intervillous spaces of the placenta with maternal blood allows the transfer of nutrients and oxygen from the mother to the foetus and the transfer of waste products and carbon dioxide back from the foetus to the maternal blood.

Birth injuries

52. Dr Lynch's external post-mortem examination of Baby FF found a subgaleal haemorrhage and an intracranial haemorrhage, but no skull fractures. These birth injuries most likely occurred at the time of delivery. Associate Professor Weaver identified that the subgaleal haemorrhage was likely related to the attempted Ventouse vacuum extraction and/or use of forceps. He further opined that the intracranial haemorrhage occurred proximal to the use of forceps when the foetal head was elevated. Associate Professor Weaver did not comment on the technique employed by Dr Chan to dislodge the foetal head from the pelvis.

General comments

53. Associate Professor Weaver commented on the emotional toll on all staff involved in such clinical incidents. He also noted the increasing numbers of difficult births at full dilation that have been reported in the obstetric literature. Associate Professor Weaver thought this may be due to the increased number of caesarean sections and more use of regional anaesthesia, rather than general anaesthesia where the uterus is invariably more relaxed.

Delivery of Foetus at Caesarean Section – Recommended Practice and Clinical Guidelines

Contemporaneous Guidelines

54. The RANZCOG *Delivery of the Foetus at Caesarean Section* guideline was revised in 2017, approximately five months prior to Baby FF's death. The Guideline notes that the potential for foetal injury at caesarean section includes, inter alia, skull fracture and / or intracranial haemorrhage following disimpaction when the head is deep in the pelvis. Relevantly, the Guideline notes that there is some evidence that inflatable devices may reduce the risk of uterine injury.

Recommended Practice

55. The CPU informed me that other relevant recommended practices in line with the contemporaneous RANZCOG guideline, include:

    a. Continuous CTG monitoring of the foetal heart rate during the transfer to theatre;

b. When it is a caesarean section at full dilation, the theatre team must confirm that a careful vaginal assessment has been completed, including a discussion on the previous unsuccessful attempts at instrumental delivery;

c. Once the situation is suspected or diagnosed, the multi-disciplinary team in theatre need to be aware of their roles, responsibilities and techniques to be employed. This would include a discussion on the manoeuvres that maybe required;[64]

d. The need for multi-disciplinary scenario-based training[65] that includes techniques to be adopted for safe delivery of the baby where the head is deeply impacted in the pelvis; and

e. The anaesthetist is appropriately prepared in anticipation of the need for uterine relaxants and possible management of a post-partum haemorrhage.

Coronial Recommendations to RANZCOG

Finding into death without Inquest by Coroner Caitlin English; Lucia Grace Sefton (Bowlen)

56. On 18 September 2019, Coroner English completed Findings into the death of Lucia Grace Sefton Bowlen.[66] During the investigation into the death of Baby Lucia, Her Honour consulted with the RANZCOG Women's Health Committee. Coroner English proposed several recommendations specific to foetal head disimpaction which were supported by the advice of obstetric expert opinion provided by Specialist Obstetrician and Gynaecologist Dr David Simon of West Gippsland Hospital.

57. Coroner English summarised the information provided by RANZCOG in her Findings. As such, I will not repeat the statement, save to say that the College indicated: *there is no high-quality evidence of a reduction in fetal head trauma and limited evidence of*

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[64] A World Health Organisation (WHO) Surgical Safety Checklist to increase the safety of patients undergoing surgery by systematic checking to ensure conditions are optimal for patient safety. The surgical 'timeout' is performed by the surgeons, anaesthetist and theatre nurses in the operating theatre immediately before a planned procedure. At the time a person is brought into theatre, the surgical team pauses to confirm patient identity, surgical site and planned procedure.

[65] Practical Obstetric Multi-Professional Training (PROMPT) is an evidence based multi- professional training program for obstetric emergencies.

[66] Finding into death without Inquest by Coroner English; Lucia Grace Sefton (Bowlen) COR 2015 3928.

any clinically significant neonatal benefit (where using a "Fetal Pillow™" or similar inflation device).[67] RANZCOG indicated that the College supported ongoing multidisciplinary education in relation to disimpaction manoeuvres and techniques.

58. In a response to Coroner English's Findings and Recommendations dated 28 November 2019, RANZCOG stated, *inter alia,* that the College would communicate with the Practical Obstetric Multi Professional Training (PROMPT) Maternity Service (UK) and facilitators of that service. The College intended to relate that greater emphasis on a scenario where foetal head disimpaction is required may be incorporated into the training provided.

Finding into death without Inquest by Coroner Simon McGregor; Finn Moser

59. On 11 November 2019, Coroner McGregor completed Findings into the death of Finn Moser.[68] Coroner McGregor made several recommendations in relation to obstetric emergency processes and education, including foetal head disimpaction. His Honour's recommendations to RANZCOG were substantially similar to those made by Coroner English in the recently preceding months.

60. The RANZCOG accepted Coroner McGregor's recommendations in relation to refreshing education resources on: early identification and escalation of obstructed labour or potentially difficult foetal head extractions during caesareans; multi-disciplinary scenario-based training, such as PROMPT; the risk of head injuries in relation to obstructed labour and vaginal disimpaction; continuous fetal monitoring, particularly in theatre and up until the time of caesarean. The College noted that it was unable to mandate a specific obstetric emergency scenario be implemented by hospitals. However, RANZCOG indicated that it would inform education facilitators and members that they ought to place greater emphasis on safe delivery of a baby where the head is deeply impacted in the pelvis in scenario-based obstetric emergency training.

61. The College further indicated that it had considered Coroner McGregor's Findings in the context of a review of the *Delivery of the Foetus at Caesarean Section* Guideline (2017). This had been amended to include the following three recommendations:

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[67] Finding into death without Inquest by Coroner English; Lucia Grace Sefton (Bowlen) COR 2015 3928.

[68] Finding into death without Inquest by Coroner McGregor; Finn Moser COR 2017 0191.

a. Where an impacted foetal head is suspected, the most senior obstetric doctor present should perform a vaginal examination immediately before commencing a caesarean section to exclude the possibility of further descent of the presenting part such that vaginal delivery would be more easily accomplished;

b. Clinicians experienced in caesarean sections and trained in neonatal resuscitation should be in attendance or readily available where a technically difficult delivery is anticipated, and

c. Consideration should be given to incorporating difficult caesarean section scenarios into obstetric emergency training with both maternity and theatre teams including disimpaction of the fetal head at caesarean section.

62. RANZCOG noted that His Honour's recommendation that continuous foetal monitoring, particularly in theatre and up until the time of caesarean, had been incorporated as a "Good Practice Point" in the RANZCOG *Intrapartum Fetal Surveillance Clinical Guideline*. This Guideline was approved for publication in November 2019. This recommendation has also been included into the RANZCOG *Foetal Surveillance Education Program*.

COMMENTS

Pursuant to section 67(3) of the *Coroners Act 2008* (Vic), I make the following comments connected with the death:

1. The investigations into the death of Baby FF identified several areas of concern in relation to the provision of antenatal care. Principally, these concerns related to the foetal monitoring in the hours prior to the urgent category one caesarean section and the cause of Baby FF's birth injuries.

2. Although definitively not contributory, it is not possible to identify whether the failure to monitor the FHR according to the contemporaneous RANZCOG guidelines were an opportunity lost to intervene in the clinical course leading to Baby FF's death. I note the Royal Women's Hospital re-educated internal hospital staff on the imperative of consistent FHR monitoring in seeking positive perinatal outcomes.

3. Birth injuries were considered by the CPU to be attributable to either the attempts at operative vaginal delivery or during head disimpaction prior to caesarean section. Court appointed expert Associate Professor Weaver surmised that Baby FF's birth injuries were likely caused by the use of the Ventouse vacuum and Neville Barnes forceps. However, he ultimately concluded that the antenatal care was of a good standard, with risks identified and appropriately managed; the totality of the evidence provided in this matter indicates that the medical care and treatment provided to Ms RJ and Baby FF was reasonable and appropriate in the circumstances.

4. The investigation into Baby FF's death also considered other coronial investigations where birth injuries contributed to neonatal death. Each investigation considered difficulties surrounding disimpaction where the foetal head is deep within the pelvis immediately prior to caesarean section; my colleagues made recommendations to the relevant training and accrediting body, RANZCOG. I will provide a copy of my findings to RANZCOG and Safer Care Victoria for their records.

5. In the wake of coronial recommendation and internal reviews, RANZCOG amended the relevant guidelines and indicated that it will emphasise the importance of education and multi-disciplinary training these issues with education facilitators. In light of these changes, I do not intend to make further recommendations to the College.

6. I extend my sincere condolences to Ms RJ and Mr GX for the tragic and unexpected death of their infant son.

FINDINGS

1. I find that Baby FF, born 19 May 2017, died on 21 May 2017 at the Royal Women's Hospital, 20 Flemington Road, Parkville, Victoria 3052.

2. I find that Baby FF was born by caesarean section following an obstructed labour.

3. I find that Baby FF sustained birth injuries either:

    a. during attempts at operative vaginal delivery with the use of Ventouse vacuum and/or Neville Barnes forceps, OR

    b. during disimpaction of the foetal head prior to caesarean section.

4. I find that medical staff failed to adequately monitor the foetal heart rate during, and immediately prior to, transfer to the operating theatre.

5. However, I further find that the medical care and treatment provided to Baby FF was generally reasonable and appropriate in the circumstances.

6. I accept and adopt the cause of death ascribed by Dr Matthew Lynch and I find that the cause of Baby FF's death was hypoxic ischaemic encephalopathy and intracranial haemorrhage complicating obstructed labour.

I direct that a copy of this finding be provided to the following:

Ms RJ & Mr GX

Jenny Radnell, Clinical Risk Manager at Cabrini Health

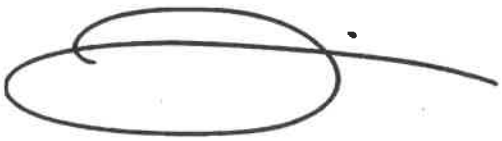
Vicki Hammond, General Counsel at The Royal Women's Hospital

Annabelle Mann, General Counsel at the Royal Children's Hospital on behalf of the Paediatric Infant Perinatal Emergency Retrieval (PIPER) team

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) Women's Health Committee

Safer Care Victoria on behalf of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM)

Signature:



AUDREY JAMIESON

CORONER

Date: **19 October 2020**