IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2010/4637

FINDING INTO DEATH WITH INQUEST

Form 37 Rule 60(1)
Section 67 of the ***Coroners Act 2008***

Inquest into the Death of CHLOE MARY MURPHY

Delivered On:	11 March 2016
Delivered At:	65 Kavanagh Street Southbank, Victoria, 3006
Hearing Dates:	29 February – 3 March 2016
Findings of:	CORONER JACQUI HAWKINS
Police Coronial Support Unit	Acting Inspector Jenette Brumby

I, JACQUI HAWKINS, Coroner having investigated the death of Chloe Mary Murphy

AND having held an inquest in relation to this death between 29 February 2016 – 3 March 2016
at Melbourne
find that the identity of the deceased was Chloe Mary Murphy
born on 22 January 2010
and the death occurred on 5 December 2010
at the Royal Children's Hospital, 50 Flemington Road, Parkville, Victoria, 3052
from:

1 (a) HEAD INJURY

in the following circumstances:

1. Chloe Murphy was born at St Vincent's Private Hospital on 22 January 2010 and was the only child of loving parents Anthony and Phurithee Murphy. Chloe was described by her parents as a happy and healthy baby girl who rarely cried.

2. Chloe died on 5 December 2010, at the Royal Children's Hospital after suffering extensive, traumatic, non-accidental injuries.

BACKGROUND CIRCUMSTANCES

3. In October 2010, Mrs Murphy decided to return to work and started looking at occasional child-minding. Mrs Murphy posted an advertisement on a community website for Thai people living in Australia and Mrs Ketapat Jenkins responded to the advertisement.

4. On Tuesday 26 October 2010, Mr and Mrs Murphy met with Mrs Jenkins, her husband and their two children at the Jenkins' house in Kensington. The Murphys were impressed by the cleanliness of the house and the many children's toys and decided to allow Mrs Jenkins to babysit Chloe on a trial basis.

5. On Thursday 28 October 2010, Mrs Jenkins looked after Chloe for the first time and provided Mrs Murphy with regular updates throughout the evening. At approximately 11pm, Mr and Mrs Murphy picked Chloe up from the Jenkins' house. During the night, Mrs Jenkins had accidently cut Chloe's thumb when she was cutting her nails and she apologised to them.

6. That evening, Mrs Murphy discovered she was pregnant. Over the following weeks the relationship between Mrs Jenkins and Mrs Murphy became closer with daily phone calls,

although Mrs Murphy described some tension in their relationship at times. On 22 November 2010, Mrs Murphy had an ultrasound and discovered she had miscarried. She later attended the Royal Women's Hospital due to complications with her miscarriage.

7. On 3 December 2010, during the day, Mr Murphy suggested they should go out for dinner and a movie. Mrs Murphy contacted Mrs Jenkins to see if she could babysit and she agreed. Mr Murphy arrived home from work at approximately 5.30pm. They fed and bathed Chloe and prepared for their night out. They arrived at Mrs Jenkins house at approximately 7.30pm. There was no one else at home apart from Mrs Jenkins' children, who were asleep upstairs. Mrs Jenkins and Mrs Murphy spoke in Thai, whilst Mr Murphy played with Chloe. According to the Murphys and Mrs Jenkins, Chloe appeared happy and mobile before they left at approximately 8pm. Mrs Murphy stated that whilst talking to Mrs Jenkins she noticed Chloe crawl around and pull herself up using furniture. Chloe was alert and showed no signs of being in distress.

8. During the next three hours, Mrs Jenkins reported that Chloe cried a lot and at times started to shake and clench her fists. Mrs Jenkins reported that she fed Chloe, changed her clothes and that Chloe eventually fell asleep in the cot, before waking up and crying again. According to Mrs Jenkins, at some later stage, Chloe had difficulty breathing. She turned Chloe over and listened to her back. At that time, Mrs Jenkins thought she would call the Murphys however they arrived before she had a chance. Telephone records confirm that Mr and Mrs Murphy did not receive any calls or messages from Mrs Jenkins whilst they were out.

9. At 11.09pm Mr and Mrs Murphy arrived at Mrs Jenkins' house. Mrs Jenkins answered the door and was holding Chloe in her arms and asked why she was not informed that Chloe had asthma. They both replied that she did not have asthma and they noticed that Chloe's breathing was laboured. They attempted to wake her, but this was unsuccessful. When Mr Murphy held Chloe, he immediately noticed that she was limp and had no control of her body and her head flopped onto his chest. They realised she was unconscious and immediately drove her to the Royal Children's Hospital.

10. The Murphys arrived at the Royal Children's Hospital at 11.18pm. At this time, Chloe was non-responsive and not actively breathing. She was immediately taken to the resuscitation area and attended to by various medical staff.

11. A computed tomography (CT) scan was performed at approximately 2.33am on 4 December 2010, which showed a subdural haemorrhage, subarachnoid haemorrhage and cerebral oedema with mass effect and compression.

12. After performing these medical investigations, clinicians were immediately suspicious of a non-accidental injury and contacted police and the Department of Human Services (DHS)[1] child protection.

13. Chloe was transferred to the Paediatric Intensive Care Unit (ICU) and was prepared for surgery. At the commencement of the surgery, Dr Patrick Lo, Neurosurgeon discovered a two centimetre skull fracture on the left side of the anterior fontanelle. Dr Lo and Dr Benoit Jenny performed a craniotomy and evacuated a large, acute subdural haematoma with active bleeding from underneath the fracture site. During the surgery, Chloe suffered another cardiac arrest and was again resuscitated. After surgery, she was returned to the ICU and closely monitored.

14. A further CT scan was conducted at 7.45am which disclosed a frontal region subarachnoid haemorrhage persisting with continuing brain swelling and early obstructive hydrocephalus. At approximately 9.25am, Dr Elder, Ophthalmologist reviewed Chloe and found extensive, severe and multilayered retinal haemorrhages in both eyes.

15. Chloe's condition continued to deteriorate and Mr and Mrs Murphy were informed that Chloe's injuries were non-survivable and any further treatment was futile.

16. Chloe's life support was withdrawn and she died peacefully with her parents and grandparents on 5 December 2010 at 6.22am.

POST MORTEM EXAMINATION AND REPORT

17. On 6 December 2010, Dr Melissa Baker, Forensic Pathologist at the Victorian Institute of Forensic Medicine performed an autopsy on the body of Chloe and provided an opinion that the medical cause of death was 1a) HEAD INJURY. Dr Baker stated "*the exact mechanism of the head injury cannot be determined with certainty but may be due to shaking or impact or a combination of both.*"[2]

18. Dr Baker observed there was evidence of a recent craniotomy however, was unable to identify a skull fracture. Dr Baker could not confirm the skull fracture at autopsy. She

[1] Now known as the Department of Health and Human Services.
[2] Exhibit 1 – Autopsy Report dated 31 October 2011, hot tub brief, p234

advised that due to surgical intervention, it was not possible to determine the presence of scalp bruising, although she noted that it was not described at the time of surgery. She commented that because she did not see a skull fracture there was no definite evidence of cranial impact. She noted however, that the absence of scalp bruising or a skull fracture does not exclude cranial impact.[3]

19. Neuropathological examination of the brain demonstrated features of marked brain swelling and consequent global cerebral ischaemic injury following evacuation of an acute left subdural haematoma and episodes of cardiac insufficiency. Much, if not all of the axonal injury observed, was of an ischaemic origin and Dr Baker considered it was not possible to identify any pattern of traumatic axonal injury given the extensive overlay of ischaemia.[4]

20. Due to the suspicion of non-accidental injury and identification of retinal haemorrhages, at the request of Dr Baker, Dr Linda Iles, Forensic Pathologist, performed an additional neuropathological examination which revealed the presence of acute retinal haemorrhages.

21. Dr Baker stated that the triad of bilateral subdural haemorrhages, encephalopathy and retinal haemorrhages is described as occurring in 'shaken baby syndrome' in the absence of any other cause being identified, eg haematological or metabolic disorder. She further explained that the literature on shaken baby syndrome is extensive and controversial. Many believe that shaking alone may not be sufficient to produce the triad of injuries described above, and that some form of blunt trauma is required. Dr Baker considered the issue of whether there was evidence of blunt force trauma was complicated due to surgical intervention.

22. Dr Baker stated that a further significant finding was that Chloe had three fractures in her left arm. On post mortem examination, there was no evidence of any other fractures, in particular no older or healing fractures, to suggest that Chloe was subject to previous episodes of trauma.[5]

23. Other causes of her injuries were investigated and there was no evidence of any natural disease which may have caused or contributed to her death.

[3] Exhibit 1 – Autopsy Report dated 31 October 2011, hot tub brief, p234-5
[4] Exhibit 1 – Autopsy Report dated 31 October 2011, hot tub brief, p235
[5] Exhibit 1 – Autopsy Report dated 31 October 2011, hot tub brief, p237

CRIMINAL INVESTIGATION AND PROSECUTION

24. Detective Leading Senior Constable Justin Tippett conducted a thorough criminal investigation into the circumstances of Chloe's death, including conducting two records of interview with Mrs Jenkins.

25. Mrs Jenkins consistently denied shaking, dropping, hitting, or doing anything to hurt Chloe.

26. Two days after Chloe's death, Mrs Jenkins gave an interview to the Herald Sun and denied any wrongdoing and deflected the attention away from herself and onto Mr and Mrs Murphy.

27. As Mrs Jenkins was a suspect in a homicide investigation, she was also interviewed by the DHS in relation to whether she should be looking after her own children. During this interview, she denied causing harm to Chloe and again suggested that Mr and Mrs Murphy often fought and may not have looked after their daughter well.

28. Victoria Police sought approval to have listening devices installed in Mrs Jenkins' car and home. Mrs Jenkins did not make any admissions, but did disclose to her close friend Suparat Charuchinda, that she had left another child unsupervised whilst he was in her care and he had fallen out of a walker.[6]

29. As a consequence of the medical evidence and the circumstances of Chloe's death, Mrs Jenkins was charged with manslaughter and committed to stand trial in the Supreme Court of Victoria.

30. Mrs Jenkins was subsequently indicted in the Supreme Court of Victoria for one count of child homicide. A trial was held between 17 February and 26 March 2014. Mrs Jenkins was subsequently acquitted by a jury of 12.

THE PURPOSE OF A CORONIAL INVESTIGATION

31. The Coroners Court of Victoria (Coroners Court) is an inquisitorial jurisdiction.[7] The purpose of a coronial investigation is to independently investigate a reportable death to ascertain, if possible, the identity of the deceased person, the cause of death and the circumstances in which death occurred.[8] The cause of death refers to the medical cause of death, incorporating where possible the mode or mechanism of death. For coronial purposes,

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[6] Coronial brief, p883-884

[7] Section 89(4) *Coroners Act 2008* (Vic).

[8] Section 67(1) *Coroners Act 2008* (Vic).

the circumstances in which the death occurred refers to the context or background and surrounding circumstances to the death, but is confined to those circumstances sufficiently proximate and causally relevant to the death and not to all circumstances which might form part of a narrative culminating in death.[9]

32. Section 67 of the *Coroners Act 2008* (Vic) (Coroners Act) requires that a coroner must find, if possible, the identity of the deceased, the cause of death and the circumstances of the death. The Victorian Court of Appeal has determined that the term "*if possible*" makes it obligatory that the coroner must "*pursue all reasonable lines of inquiry*".[10] Further, the Coroners Court must act as an "*independent*" and "*active investigator*" and "*do anything possible to determine the cause and circumstances of the death*".[11]

33. The broader purpose of coronial investigations is to contribute to a reduction in the number of preventable deaths, the promotion of public health and safety and the administration of justice.

34. It is not the role of the coroner to lay or apportion blame, but to establish the facts.[12] It is not the coroner's role to determine criminal or civil liability arising from the death under investigation or to determine disciplinary matters.

35. A coroner may comment on any matter connected with the death, may report to the Attorney-General and may make recommendations to any Minister, public statutory authority or entity, on any matter connected with the death, including recommendations relating to public health and safety and the administration of justice.[13]

36. This finding draws on the totality of the material produced as part of the coronial investigation into Chloe's death, including the coronial brief, statements, reports and testimony of witnesses who gave evidence at the Inquest and any exhibits tendered through them. In writing this finding I do not purport to summarise all of the evidence but refer to it only in such detail as appears warranted by its forensic significance.

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[9] *Harmsworth v The State Coroner* [1989] VR 989, *Clancy v West* (unreported 17/08/1994, Supreme Court of Victoria, Harper J).
[10] *Priest v West & Anor [*2012] VSCA 327 at p2
[11] *Priest v West & Anor [*2012] VSCA 327 at p6
[12] *Keown v Kahn* (1999) 1 VR 69.
[13] Section 72(1) and (2) *Coroners Act 2008* (Vic).

CORONIAL INQUEST

37. On 4 June 2014, Mr and Mrs Murphy requested that an Inquest be held in relation to Chloe's death.

38. Due to the previous criminal prosecution, the circumstances of Chloe's death did not require a mandatory inquest. However, the former State Coroner, His Honour Judge Ian Gray determined that an Inquest would be conducted pursuant to section 52(1) of the Coroners Act. I took carriage of this investigation in September 2015.

39. Two directions hearings were held, the first on 7 October 2015 and the second on 10 February 2016, to assist me to define the direction and scope of my investigation.

40. An Inquest into the death of Chloe Murphy was held in Melbourne between 29 February and 3 March 2016.

Witnesses

41. The following witnesses gave *viva voce* evidence at the Inquest.

- Dr Linda Iles, Forensic Pathologist, Victorian Institute of Forensic Medicine*[14]
- Dr Timothy Cain, Radiologist, Royal Children's Hospital*
- Dr Padma Rao, Radiologist, Royal Children's Hospital*
- Dr Patrick Lo, Neurosurgeon, Royal Children's Hospital*
- Dr James Elder, Ophthalmologist, Royal Children's Hospital*
- Dr Mark O'Sullivan, Orthopaedic Surgeon, Royal Children's Hospital*
- Dr Maryanne Lobo, Consultant Paediatrician, Victorian Forensic Paediatric Medical Service*
- Dr Byron Collins, Forensic Pathologist*
- Professor Marcus Pandy, Chair of Mechanical and Biomedical Engineering, University of Melbourne*
- Mr Anthony Murphy
- Mrs Suparat Charuchinda
- Mrs Sarah Aupetta (nee George), Senior Protection Practitioner, Department of Human Services
- Detective Leading Senior Constable, Justin Tippett, Coroner's Investigator, Victoria Police
- Professor Lori Frasier, Professor of Paediatrics, University of Utah School of Medicine[15]

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[14] * Witness participated in the 'hot tub'.

[15] Professor Frasier did not participate in the hot tub due to her physical location, being based in New York, however she did have the benefit of reading the hot tub brief, and the transcript of the hot tub from Monday 29 February 2016.

42. Mrs Jenkins was called to give evidence on 1 March 2016. Ms Mandy Fox of counsel, appeared on Mrs Jenkins' behalf and made an application for her to be excused from giving evidence on the grounds that she may incriminate herself. I subsequently determined that there were reasonable grounds for her request and excused Mrs Jenkins from giving evidence.[16]

Issues investigated at Inquest

43. The issues identified regarding the circumstances of Chloe's death requiring further exploration included:

- Evidence as to the events of 3 December 2010, prior to 8pm.
- Chloe's injuries.
- Were the injuries the result of shaken baby syndrome or non-accidental injury?
- Possible mechanism of injuries and force required to cause the injuries.
- Possible timing of injuries.

Evidence to the events of 3 December 2010 prior to 8pm

44. At Inquest, Mr Murphy gave evidence that Chloe had been happy and well the week before her death. When they arrived at Mrs Jenkins' house at approximately 7.30pm, Chloe appeared healthy and was in good spirits.

45. Mr and Mrs Murphy stayed at Mrs Jenkins' house for approximately half an hour and Mr Murphy played with Chloe while Mrs Murphy spoke to Mrs Jenkins. Mr Murphy stated that Chloe was happy, playing with him, pulling herself up onto furniture and walking with him while he held her hands. Prior to them leaving Chloe in Mrs Jenkins' care, Mr Murphy described Chloe as "*just being her normal delightful self*".[17]

46. Mr Murphy stated that when they returned to the Jenkins' house, just after 11pm, Mrs Murphy had tried to call Mrs Jenkins so as not to wake the children, however the call went unanswered, so they both went to the front door. Mrs Jenkins answered the door and was holding her phone. Mr Murphy reported Mrs Jenkins was holding Chloe, cradling her like a newborn and she appeared to be asleep.[18] Mrs Jenkins appeared calm and according to Mr Murphy there was "*no real reason for any alarm or concern at that point*".[19]

[16] Ruling on Application made on behalf of Mrs Ketapat Jenkins pursuant to section 57 of the Coroners Act, dated 1 March 2016
[17] Transcript of evidence, p89
[18] Transcript of evidence, p91
[19] Transcript of evidence, p91

47. The first moment Mr Murphy thought something was wrong was when Mrs Jenkins asked why they had not told her that Chloe had asthma. He stated that it was at this point that he became concerned and heard Chloe's laboured breathing.[20] He took Chloe from Mrs Jenkins' arms and noticed she was "*basically floppy...she had absolutely no ... neck control or any control of her body whatsoever.*"[21] Mr Murphy knew that they had to get Chloe to hospital immediately.

48. Mrs Jenkins in her record of interview on 4 December 2010, stated that Chloe was alert and was holding Mrs Jenkins' hair when Mr and Mrs Murphy arrived and she had to convince them that there was something wrong with Chloe and that they should take her to hospital.[22] At Inquest, Mr Murphy completely disagreed with Mrs Jenkins' version of events.

49. After arriving at the Royal Children's Hospital, Mrs Murphy called Mrs Jenkins to try and ascertain how Chloe came to be in the condition she was in. At 1.35am, on 4 December 2010 Mrs Jenkins sent a text message to Mrs Murphy. The message read:

> *you can think anything shit with me as much as you want. But what I know is I should not say yes today cause I already feel shit gonna happen. I know how you feel so do I. Who want this happen. I'm crazy lie as you said. You make me sad I know you. How suck I am I didn't know she stop breathing. and I'm crazy that I did all stuff you said to me that I did to her. Thank for proof me how suck I am.*[23]

50. Mrs Jenkins has given a number of accounts of the circumstances of the evening of 3 December 2010. Despite denying harming Chloe in any way, her versions do have some inconsistencies, however as she was excused from giving evidence she was not cross-examined and questioned about these inconsistencies.

51. Having heard Mr Murphy's evidence and observed his demeanour in Court, I find that he was a credible witness, in the sense of being a truthful person. To the extent that Mr Murphy's account of events diverged from that given by Mrs Jenkins from time to time prior to the Inquest, I prefer the evidence of Mr Murphy.

Chloe's injuries

52. To assist me with my investigation, I requested nine expert medical witnesses to give concurrent evidence, also known in the Coroners Court as a "hot tub." The experts were

[20] Transcript of evidence, p92
[21] Transcript of evidence, p92
[22] Coronial brief, p740
[23] Coronial brief, p650

requested to review the medical evidence that formed part of the coronial brief[24] and were provided with a series of questions. They met privately in a conclave and discussed the questions together. The Court then resumed for the experts to give their evidence. A nominated spokesperson answered each question and the experts were asked if they all agreed and whether anyone dissented.

53. The medical evidence is that the injuries sustained by Chloe were as follows:

- A two centimetre skull fracture on the left-sided anterior fontanelle.
- Bilateral widespread acute subdural haematoma.
- Subarachnoid haemorrhage.
- Cerebral oedema (brain swelling).
- Bilateral retinal haemorrhages.
- Subtle abnormalities of grey/white matter suggestive of diffuse axonal injury (an injury which is caused by shearing between the nerve cells and nerve fibres).
- Hypoxic ischaemic injury (injury to the brain caused by poor oxygenation and poor circulation).
- Three fractures in the left arm including a fractured ulna, radius and olecranon.

54. Despite these extensive internal injuries, on post mortem examination there were no visible external injuries.

Skull fracture

55. Dr Lo performed a craniotomy to the front left of the skull and upon opening the scalp noted that there was a two centimetre fracture extending from the lateral aspect of the anterior fontanelle along the line of the coronal suture, but separate from the coronal suture. Further, he found "*copious and acute subdural haematoma with active bleeding from the sagittal sinus and a venous lake adjacent to the sagittal sinus...under the fracture.*"[25] Dr Lo also noted that the brain was markedly swollen.

56. In evidence, the hot tub participants all agreed that a skull fracture implies impact to the head and there was consensus that the skull fracture was most likely sustained during the same trauma and that this event caused some or all of the other brain injuries.[26] Dr Collins expanded on the potential mechanism and stated that "*this fracture has been caused by blunt*

[24] Also known as the hot tub brief
[25] Hot tub brief, p185
[26] Transcript of evidence, p13

force trauma and that could be occasioned in a variety of mannerisms or manners, from one end of the spectrum a fall onto a hard surface ... or a direct blow to the head."[27]

57. The skull fracture was not seen by Dr Baker at autopsy. However, in evidence, Dr Lo confirmed he did see the skull fracture during surgery.[28] Dr Lo suggested the reason it may not have been seen was because in order to perform the operation to drain the acute haemorrhage, the saw had to cut through the site of the fracture. For this reason, Dr Lo agrees that the fracture would not have been visualised at autopsy.[29] Dr Lo said it would have been beneficial to take a photograph of the injury at the time of surgery, however due to privacy reasons at the hospital and surgery protocols, he was not able to do so. Based on this evidence, I accept that Chloe did suffer a two centimetre skull fracture.

58. In relation to the timing of the injury, Dr Lo stated he could not determine the exact time of the injury. However, given the nature of the haemorrhage and the findings at the time of surgery of an acute subdural haematoma, in his clinical opinion, the skull fracture would have occurred within 12 hours preceding the operation.[30]

Injuries to the brain

59. At Inquest, Dr Lo outlined the injuries to Chloe's brain as follows:

> *subdural haematoma, a blood clot under the membrane covering the brain, at multiple sites. She also had haemorrhage in multiple layers that are lining the brain both in the subdural space, the subarachnoid space and within the ventricle inside the brain. She suffered a swollen brain with radiological evidence of extensive hypoxic ischaemic injury. There was a bridging vein that had haemorrhaged, that had torn along with a venous lake adjacent to the vein and there was radiological evidence with features strongly suggestive of a diffuse axonal injury.*[31]

60. Dr Lo's opinion was that these head injuries were clinically and radiologically very severe.[32]

61. Dr Iles described diffuse axonal injury as injury to axons in the brain that occur in a diffuse fashion, so not just focally in a small area but in a widespread area of the white matter of the brain. She said from a neuropathological point of view, there were several causes and the two most common causes are vascular or ischaemic axonal injury and traumatic axonal injury.[33] Dr Iles confirmed that diffuse traumatic axonal injury is a result of shearing forces,

[27] Transcript of evidence, p16
[28] Transcript of evidence, p13
[29] Hot tub brief, p187
[30] Hot tub brief, p188
[31] Transcript of evidence, p17-18
[32] Transcript of evidence, p30
[33] Transcript of evidence, p18

i.e. as a result of acceleration, deceleration, rotation and shearing long white matter tracts in the parts of the brain that have a large number of these axons.[34]

62. There was some dissent amongst the hot tub participants as to whether there was traumatic diffuse axonal injury in the brain. Dr Lo and Dr Rao confirmed that there was radiological evidence of traumatic diffuse axonal injury.[35] Dr Rao stated that she considered the diffuse axonal injury

> *to be a result of traumatic shearing forces that are generated when the head is rapidly accelerated and decelerated and with a rotational component often. So it's a shearing injury and the damage is inflicted as the tissue slides over each other and it particularly occurs at one of the most sensitive areas ....*[36]

63. Dr Iles was unable to confirm the presence of the traumatic diffuse axonal injury as she had only reviewed Chloe's brain after death and after extensive brain surgery. Dr Iles commented that a lot of secondary ischaemic events occurred prior to her neurological examination.[37]

64. Based on the evidence of the experts Dr Lo and Dr Rao, I accept there was radiological evidence of traumatic diffuse axonal injury on the CT scan performed on 4 December 2010.

Retinal haemorrhages

65. Due to Chloe's extensive brain injuries, she was reviewed by an ophthalmologist after surgery on 4 December 2010. Dr Elder reported "*retinal haemorrhages in all layers and pre-retinal haemorrhages were noted in both eyes. The haemorrhages extended to the retinal periphery and were too numerous to count.*"[38] Dr Elder said that there was very little normal retina able to be visualised. In his opinion, the haemorrhage in the retinal vessels were extensive and diffuse; they were "*extremely severe retinal haemorrhages.*"[39]

66. Dr Elder opined that these retinal findings were consistent with a non-accidental mechanism of injury, particularly in association with the extensive haemorrhage and identified skull fracture.[40] In Dr Elder's considerable experience as an ophthalmologist of 26 years, he said "*the severity and distribution of the retinal haemorrhages form a very unusual pattern.*"[41]

[34] Transcript of evidence, p19
[35] Transcript of evidence, p21
[36] Transcript of evidence, p19
[37] Transcript of evidence, p19
[38] Hot tub brief, p192
[39] Transcript of evidence, p31
[40] Hot tub brief, p192
[41] Transcript of evidence, p32

He stated the force required to cause these injuries would be extreme and likened to something as traumatic as a motor vehicle accident.[42]

Arm fractures

67. Post mortem CT scans revealed the presence of three fractures in Chloe's left arm. Orthopaedic surgeon, Dr O'Sullivan gave evidence that the first of the fractures was a mid-shaft fracture across both the radius and ulna and the third was a fracture of the olecranon, which is at the top end of the ulna.

68. Dr O'Sullivan stated that the fracture at the top end of the ulna is extremely uncommon in babies and it is postulated in the literature that it is due to a hyperextension rotation injury and almost nothing else can cause this type of injury.[43]

69. Dr O'Sullivan stated that the fractures of the mid shaft of the radius and ulna were a different fracture pattern, or of a different force pattern to the fracture at the top end of the ulna and required a bending force at that area. Further, that a different mechanism was required to produce these two distinct fracture sites. Dr O'Sullivan noted that in his 25 years of experience at the Royal Children's Hospital, he had never seen this type of fracture pattern before.[44]

70. According to Dr O'Sullivan, the type of injury required to cause the fractures would have been a severe twist or wrench of the arm, which could have been side to side or with some rotation involved.[45] He confirmed that young children presenting with these types of injuries would have "*pseudoparalysis with lack of movement, not wanting to hold anything with that hand and not using the arm to crawl.*"[46] Further "*the child would have been very upset, crying and the arm would have been limp or appearing paralysed.*"[47]

71. Dr O'Sullivan said that symptomatically, a child of Chloe's age with no head injury, would not be using the arm. Further, the child "*can be quite upset, they don't want to feed but definitely they don't want to move that arm. You don't tend to see much swelling [and] you may not see any bruising.*"[48] He confirmed that there was some discussion about whether Chloe could stand with assistance and hold onto something and he said he did not think that

[42] Transcript of evidence, p34
[43] Transcript of evidence, p41
[44] Transcript of evidence, p42
[45] Hot tub brief, p196
[46] Hot tub brief, p196
[47] Hot tub brief, p197
[48] Transcript of evidence, p43

would be possible if her arm was fractured. Dr O'Sullivan gave evidence that the type of fractures Chloe sustained would be "*very, very unlikely*" to be as a result of a fall.[49]

72. Professor Frasier gave evidence that based on the evidence that Chloe used both arms equally and without difficulty or pain at the time the Murphys left her at Mrs Jenkins' house, she had not suffered the fractures at that time.[50]

73. In terms of timing of Chloe's fractures, Dr O'Sullivan stated that there was no periosteal reaction around these fractures, indicating that they were reasonably new and would have occurred within the week before the images were taken.[51] Dr Rao stated that the injury was acute and most likely occurred within the five days prior to death.[52]

Were the injuries the result of shaken baby syndrome or non-accidental injury?

74. A number of the medical witnesses referred to the fact that some of Chloe's injuries were consistent with shaken baby syndrome. In recent times, the term shaken baby syndrome has become controversial in medical literature and has been broadened and replaced with abusive head trauma or non-accidental injury.

75. Professor Lori Frasier gave evidence that shaken baby syndrome looked at the combination of injuries to the brain, as well as retinal haemorrhages. Professor Frasier stated that the

> *combination of features was an indication there was a child who may have been subjected to severe head trauma. The retinal haemorrhages were strongly associated with those cases that we felt were due to violent back and forth motion of the head, particularly acceleration, deceleration and rotational motions.*"[53]

76. The medical experts called to give evidence in this case all agreed that abusive head trauma or non-accidental injury are now the accepted terms that are used to describe these types of injuries. Dr Lobo confirmed that non-accidental injury is now the accepted medical term.[54]

77. Dr Rao explained that

> *the presence of unexplained skeletal injury and unexplained intracranial injury manifested by diffuse cerebral oedema and hypoxic ischaemic brain injury associated with multi-compartment intracranial haemorrhage in a child of this age is consistent with there having been severe injury to the child, and the appearances*

[49] Transcript of evidence, p42
[50] Hot tub brief, p364Q
[51] Hot tub brief, p196
[52] Hot tub brief, p179
[53] Transcript of evidence, p138
[54] Transcript of evidence, p48

are concerning for the injuries sustained during a shaking injury. These types of injury are seen to occur in the context of non-accidental injury.[55]

78. Professor Frasier was questioned at Inquest about whether she thought that Chloe had been shaken and she responded, "*when we see severe retinal haemorrhaging we generally feel that the child has suffered some type of rotational acceleration, deceleration injury due to shaking*"[56] in addition to the evidence of a skull fracture.

79. The expert medical evidence confirms that Chloe's injuries were sustained as a result of non-accidental injury.

Possible mechanism of injuries and force required to cause the injuries

80. It is not known how Chloe sustained the injuries she did. Mrs Jenkins has maintained that she did not harm Chloe. Therefore, the medical experts were asked as part of the hot tub to postulate the possible mechanisms of the injuries.

81. Professor Frasier gave evidence that due to the multiple injuries sustained by Chloe it appeared there were different mechanisms. She stated that the head injuries probably required both shaking back and forth and impact and the arm injury was a separate mechanistic event.[57]

82. The hot tub participants agreed that the combination of injuries could not have been from shaking alone and the presence of the skull fracture indicated that some impact had occurred.[58]

83. Dr Lobo reasoned that "*it was a combination of impact on her head caused by a fall or from being flung with force against the floor or a wall or furniture as well as rotational force to her head caused by vigorous shaking of her unsupported head.*"[59]

84. Consensus of the medical experts was that global rotational acceleration and deceleration force to Chloe's head was required. Shaking a child could create these rotational forces.[60] Dr Iles indicated from a neuropathological perspective that "*the diffuse axonal injury identified radiologically would not be in keeping with shaking alone.*"[61]

85. Dr Lobo provided a number of possible scenarios of the mechanism of injuries including:

[55] Hot tub brief, p170
[56] Transcript of evidence, p138
[57] Transcript of evidence p139
[58] Transcript of evidence, p48
[59] Transcript of evidence, p22
[60] Transcript of evidence, p23
[61] Transcript of evidence, p48

- Chloe was grabbed by the forearm and twisted and possibly grabbed around the chest, shaken and thrown against a wall or on the floor; or
- she was left unsupervised in a walker and fell down the stairs, however she thought this scenario was much less likely; or
- she fell down the stairs in her carer's arms and the carer landed on top of her; or
- a significant fall from height, such as being thrown from the first floor; or
- a motor vehicle accident.[62]

86. Dr Lobo stated *"a complex fall could explain some if not all of her injuries but it was very unlikely."*[63] Dr Lobo commented that a child who falls down stairs has a series of simple falls rather than one massive fall. Further, if there had been a complex fall you would expect to see other injuries like multiple bruising or lacerations.[64]

87. Professor Frasier did not agree that Chloe's injuries could have occurred as a result of a fall. She commented that in a clinical setting she has seen children who have fallen down stairs and they have had relatively minor injuries, but she has never heard of a fall of a child with Chloe's type of injuries.[65]

88. Dr Elder said that extreme force would be required to have caused the retinal haemorrhages such as a motor vehicle accident or severe crushing injuries because the pattern of injuries associated with Chloe were unusual.[66] Dr Elder said a simple fall could not cause retinal haemorrhages however he did state that there has been one reported case of a child who fell approximately two metres down stairs and had retinal haemorrhages, however he said that particular case was unwitnessed and could not be corroborated.[67] Dr Elder noted in his opinion that it is very unusual for a complex fall to cause retinal haemorrhages.

89. At Inquest, the hot tub participants agreed that Chloe's injuries were the result of significant trauma. They also agreed that the degree of force *"was very severe and much more than could be generated by normal handling or playing with Chloe."*[68]

[62] Transcript of evidence, p22 & p50
[63] Transcript of evidence, p49
[64] Transcript of evidence, p49-50
[65] Transcript of evidence, p140
[66] Transcript of evidence, p34
[67] Transcript of evidence, p35
[68] Transcript of evidence, p21

Conclusion as to the possible mechanism of injury and force required to cause the injuries

90. Mrs Jenkins has consistently denied causing any harm to Chloe. Based on the expert medical evidence, it is possible that Chloe suffered a fall, however given the absence of external bruising and lacerations and the presence of the severe retinal haemorrhages, I find this scenario alone, was most unlikely.

91. The medical experts agreed that there had to be more than one mechanistic event including "*a twisting force to her arm, a rotation and force to her head and then an impact of her head on a firm surface.*"[69] There was also agreement between the medical experts that this combination of injuries were likely to have occurred in sequence.[70]

92. The medical evidence demonstrates that the combination of Chloe's injuries were extensive, traumatic, severe, violent and non-survivable. Many of the clinicians involved in this case had not seen evidence of such a combination of these injuries before. However, despite the medical evidence, it is ultimately not known what caused Chloe's constellation of injuries.

Possible timing of injuries

93. According to Dr Lo, the timeframe for the development of the subdural haematoma depends on a number of factors.[71] Dr Lo noted that at the time of surgery there was active bleeding and no clear clot formation, so there was still active pumping of blood from the sinus and the veins. He suggested that the brain injury would have occurred around six hours prior to surgery.[72] Further, Dr Lo commented that at the time of surgery there was noted to be a venous dural lake tear adjacent to the head injury site. This would have related to a rapid onset and massive amount of bleeding from that area. The rapidity of onset would have resulted in the clinical features presenting quite quickly, more likely minutes to hours.[73] The consensus of the hot tub participants was that the injuries most likely occurred around six hours prior to the surgery. Dr Lo was prepared to say that "*an event occurred based on these timings, on or around 9pm to 10pm on the night of 3 December 2010.*"[74] He reported Chloe could have had a brief lucid interval however, in his opinion this was very unlikely.

94. Dr Baker was unable to provide a timeframe for the injuries but commented that

[69] Transcript of evidence, p53
[70] Transcript of evidence, p53
[71] Transcript of evidence, p24
[72] Transcript of evidence, p46
[73] Transcript of evidence, p28
[74] Transcript of evidence, p46

the literature on infants with abusive or severe accidental head trauma suggests that the onset of symptoms occurs at the time of or shortly after the traumatic event. Whilst lucid intervals do occur after some head injuries and are well described in children with isolated extradural haematomas, the literature indicates that a child presenting with a subdural haematoma is less likely to have a lucid interval than a child presenting with an extradural haematoma.[75]

95. Dr Lobo said that if Chloe was awake and alert at the time of being dropped at Mrs Jenkins', which is corroborated by her and the Murphys – "*this information strongly suggests that she sustained her trauma during the interval between being dropped off by her parents and the time when they arrived to collect her.*"[76] Further, Dr Lobo reasoned that "*the onset of symptoms in severe head trauma occurs at the time of or shortly after the traumatic event. Chloe suffered a severe and profound brain trauma. This strongly suggests that her brain was injured just before the time she was first noted to be floppy and unresponsive.*"[77]

96. In Professor Frasier's opinion, Chloe would have been immediately or very nearly immediately symptomatic following the injury, with neurologic symptoms such as altered consciousness, possibly seizures, difficulty breathing, poor colour and or other obvious symptoms of an infant in significant distress.[78] Professor Frasier stated that Chloe was normal when her parents left her at Mrs Jenkins' home. She does not believe that Chloe had a lucid interval after this combination of injuries. Further, she espoused Chloe "*would have been immediately distressed, in some way not able to act like a normal child; potentially not quite unconscious, but perhaps wavering in and out of consciousness until unconsciousness or a seizure finally made her unconscious.*"[79]

97. Dr Iles agreed that "*very substantial force has been required to produce this spectrum of injuries [and] that decreases the time to presentation of symptoms markedly.*"[80] However, Dr Iles did not feel comfortable with giving a physical time.[81]

Conclusions as to possible timing of injuries

98. The evidence demonstrates that Chloe was well, aware, happy and healthy at the time of being left in Mrs Jenkins' care at 8pm on 3 December 2010. The medical evidence supports a conclusion that once Chloe had sustained her constellation of injuries, particularly the head

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[75] Exhibit 1 – Autopsy Report dated 31 October 2011, Hot Tub brief, p235
[76] Hot tub brief, p210
[77] Hot tub brief, p210
[78] Hot tub brief, p364Q
[79] Transcript of evidence, p144
[80] Transcript of evidence, p29
[81] Transcript of evidence, p47

injuries, she would have rapidly deteriorated. It was unlikely that she would have had a lucid interval.

FINDINGS

99. In making my findings, the appropriate standard of proof to apply is articulated in *Briginshaw v Briginshaw*[82] which requires me to be satisfied on the balance of probabilities.

100. I find that Chloe Mary Murphy died on 5 December 2010 from 1a) HEAD INJURY. I further find that Chloe's injuries included a fractured skull, bilateral widespread acute subdural haematoma, subarachnoid haemorrhage, cerebral oedema, bilateral retinal haemorrhages, evidence of traumatic diffuse axonal injury, hypoxic ischaemic injury and three fractures in her left arm.

101. I am satisfied that the combination of Chloe's injuries were from severe, traumatic non-accidental injury. I further find that more than one mechanistic event was required to cause the injuries sustained by Chloe, which most likely included severe shaking in the form of a rotational acceleration and deceleration action, some form of rotational twisting and hyperextension to the left arm and impact to the head. However, I am unable to determine the exact mechanism by which Chloe sustained the injuries.

102. On the evidence available to me, I find that Chloe was alert, well, happy and healthy at 8pm on 3 December 2010. I further find that Mrs Jenkins was the sole carer of Chloe on the night of 3 December 2010 and that no other adult was present at Mrs Jenkins' home when she was babysitting Chloe. Therefore, I am satisfied to the requisite degree that Chloe sustained the constellation of injuries seen on her body and described by the experts, after she was dropped off at Mrs Jenkins' house and prior to being picked up by her parents at 11pm.

103. I find on the balance of probabilities that Mrs Jenkins caused the significant and traumatic injuries Chloe sustained on the night of 3 December 2010.

104. I wish to express my gratitude to the medical experts whose professionalism and expertise enabled me to understand the complex medical evidence in this case.

105. I commend Detective Leading Senior Constable Justin Tippett for his commitment and dedication to this investigation over many years.

[82] (1938) 60 CLR 336

106. Pursuant to section 49(1) of the Coroners Act, I intend to refer this matter to the Director of Public Prosecutions because I believe that an indictable offence may have been committed in connection with Chloe's death.

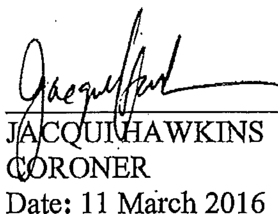
107. I would like to express my sincere condolences to the Murphy family. I acknowledge the grief and devastation you have endured and will continue to endure as a result of Chloe's death.

Pursuant to section 73(1) of the **Coroners Act 2008**, I order that the finding be published on the internet.

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

- Mr and Mrs Murphy
- Mrs Ketapat Jenkins
- Royal Children's Hospital
- Dr Linda Iles, Forensic Pathologist, Victorian Institute of Forensic Medicine
- Dr Timothy Cain, Radiologist, Royal Children's Hospital
- Dr Padma Rao, Radiologist, Royal Children's Hospital
- Mr Patrick Lo, Neurosurgeon, Royal Children's Hospital
- Dr James Elder, Ophthalmologist, Royal Children's Hospital
- Mr Mark O'Sullivan, Orthopaedic Surgeon, Royal Children's Hospital
- Dr Maryanne Lobo, Consultant Paediatrician, Victorian Forensic Paediatric Medical Service
- Dr Byron Collins, Forensic Pathologist
- Professor Marcus Pandy, Chair of Mechanical and Biomedical Engineering, University of Melbourne
- Professor Lori Frasier, Professor of Paediatrics, University of Utah School of Medicine
- Consultative Council on Obstetric and Paediatric Mortality and Morbidity
- Child Safety Commissioner
- Department of Health and Human Services
- Detective Leading Senior Constable, Justin Tippett, Coroner's Investigator, Victoria Police
- Director of Public Prosecutions

Signature:



JACQUI HAWKINS
CORONER
Date: 11 March 2016