IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: 2006 /4010

FINDING INTO DEATH WITH INQUEST

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

Inquest into the Death of: MATTHEW JACK WHYTE

Delivered On:	3 March 2015
Delivered At:	65 Kavanagh Street Southbank 3006
Hearing Dates:	18, 19, 20 March 2013
Findings of:	PETER WHITE, CORONER
Representation:	Mrs M Whyte appeared on behalf of the Family Mr P Halley appeared on behalf of the Royal Children's Hospital
Police Coronial Support Unit	Leading Senior Constable Tracey Ramsey

I, PETER WHITE, Coroner having investigated the death of MATTHEW JACK WHYTE

AND having held an inquest in relation to this death on 18 March 2013, 19 March 2013 and 20 March 2013

at Melbourne

find that the identity of the deceased was MATTHEW JACK WHYTE

born on 9 April 2003

and the death occurred on 20 October 2006

at Royal Children's Hospital, Parkville, Victoria

from:

1 (a) BRAINSTEM ISCHAEMIA IN ASSOCIATION WITH ARNOLD CHIARI MALFORMATION

in the following circumstances:

David Wallace[1]

1. Matthew Jack White (herein referred to as Matthew) was three years and six months old when he died at the Royal Children's Hospital (RCH) on 20 October 2006.

2. When Matthew was four months old, his mother noticed he was vomiting unusually. On 9 September 2003, he was admitted to the RCH. An MRI scan of his brain demonstrated communicating hydrocephalus[2] due to an Arnold Chiari malformation[3] type 1. This appeared to be associated with a very tight posterior fossa. He was also noted to have a brachycephalic skull. On 10 September 2013, Mr Wallace inserted a ventriculoperitoneal shunt (VP shunt) in order to shunt the excess fluid away from the brain.

3. This surgery appeared to work well and on follow up appointments, he was noted to be progressing. He was however, noted to have global development delay. He was also under the care of respiratory physicians for croup, stridor and difficulty swallowing food.[4]

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[1] Mr David Wallace is a neurosurgeon based at the Royal Children's Hospital in Melbourne

[2] Mosby's Medical, Nursing and Allied Health Dictionary (Sixth Edition) defines hydrocephalus as "a pathological condition characterised by an abnormal accumulation of cerebrospinal fluid, usually under increased pressure, with in the cranial vault and subsequent dilation of the ventricles."

[3] Mosby's Medical, Nursing and Allied Health Dictionary (Sixth Edition) defines Arnold Chiari malformation as "a congenital herniation of the brainstem and lower cerebellum through the foramen magnum into the cervical vertebral canal."

[4] Statement of Mr Wallace, Exhibit 4.

A MRI scan was performed in May 2004, which showed the Chiari malformation and cervical syringomyelia.[5]

4. Matthew was receiving physio treatment and was noted to have delayed gross and fine motor milestones. His paediatrician wrote to Mr Wallace in September 2004 noting that Matthew had a chronic non-productive cough and difficulty feeding.

5. On 29 December 2004, Mr Wallace performed a decompression of Matthew's very tight posterior fossa and an upper cervical laminectomy. He was reviewed on 17 February 2005 and was noted to be doing well, was more alert and his stridor had lessened. Mr Wallace's intention was to follow the progress of his syrinx as syringomyelia can spontaneously regress after posterior fossa decompression.[6] He was reviewed again in June 2005 and his VP shunt was working well. He was not walking or crawling but was saying single words. A MRI scan showed that the cervical syrinx was more prominent. As a result, on 10 August 2005, Mr Wallace inserted a syringopleural shunt. Matthew underwent a revision of this shunt on 22 February 2006, as the cervical syrinx did not deflate in response to the first attempt.

6. Between March and September 2006, Mrs Whyte took Matthew to the RCH emergency department on seven occasions, as he was suffering from vomiting, dehydration and irritability.

7. On 28 March 2006 he was readmitted with vomiting and dehydration. An X-ray and CT scan did not reveal any abnormality with his shunt functioning and it was thought that he was suffering from an infective illness.[7]

8. He was readmitted on 5 May 2006 with irritability and vomiting. The CT scan indicated mild ventriculomegaly and he underwent a shunt revision.[8]

9. He presented again on 1 June 2006 with possible gastroenteritis. A CT scan and x-ray indicated everything was working normally.[9] He had further admissions on 7 August

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[5] A fluid filled cavity within the spinal chord.

[6] Statement of Mr Wallace, Exhibit 4 page 2

[7] Statement of Mr Wallace, Exhibit 4 page 2

[8] Ibid

[9] Ibid

2006, with suspected raised intracranial pressure, and on 29 September with a suspected head injury.[10]

10. In September 2006 at a weekly clinical discussion for the neurological team, 'an x-ray discussion session', considered Matthew's case. (There are no notes of this discussion but I note here that the later evidence of the units Clinical Director Dr Maixner, suggests that the preponderance of opinion was not in favour of a referral to the cranio facial unit).

11. Notwithstanding the advice given, (and indeed his own reservations), on 14 September 2006 Mr Wallace referred Matthew to the craniofacial team. [11] Mr Wallace stated that

> *'he did so to explore the feasibility of a unique craniofacial operation directed towards a longer term solution to Matthew's problems given that he had a very small posterior fossa and a generalised abnormally shaped skull.'*[12]

12. On 6 October 2006, Matthew was taken to the RCH by ambulance. The Ambulance Victoria VACIS electronic patient care report notes that Matthew was having breathing problems. According to the medical records, he was admitted at 17.05. He was diagnosed with an upper respiratory tract infection, a CT scan was performed and he was discharged at 21.54.

Dr Wirginia Maixner[13]

13. On 17 October 2006, Matthew was again admitted to the RCH with worsening headaches and vomiting. A CT scan of his brain showed a slight increase in ventricular size.[14] He was taken to theatre and Dr Maixner performed a revision of the ventriculoperitoneal shunt.[15] Dr Maixner reported that the ventricular catheter was clearly blocked.[16] There was a small amount of bleeding involved with the procedure but that cleared with irrigation.[17]

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[10] Ibid.

[11] See paragraph 43 and T 129: 25-31.

[12] Statement of Mr Wallace dated 13 December 2012, p 42-3 of the inquest brief.

[13] Dr Wirginia Maixner is the clinical director of the neurosurgical unit at the Royal Children's Hospital.

[14] Statement of Dr Maixner Exhibit 5, page 2.

[15] Mr Wallace was not available to treat Matthew. The evidence was that Mr Wallace consults in Ballarat on a Tuesday, the day Matthew was brought in to the RCH. T172:19-20.

[16] Statement of Dr Maixner Exhibit 5, page 2.

[17] Ibid.

14. On the morning of 18 October 2006, Matthew appeared well and had a Glasgow Coma Score (GCS) of 15. Later in the day, he had an episode of unresponsiveness, vomiting and bradycardia. A further CT scan was performed. Dr Maixner considered that the bleeding from the previous procedure may have caused the shunt to block and Matthew was sent back to theatre. A revision of the ventriculoperitoneal shunt valve was noted to be full of blood and the ventricular catheter was blocked. A new ventricular catheter was inserted with good flow demonstrated. A new valve was connected. His bradycardia improved after the procedure.[18]

15. On the morning of 19 October 2006, Matthew had not significantly improved. A CT scan showed the shunt was functioning correctly but throughout the day he was lethargic but responding to stimuli. He had a further episode of bradycardia and a repeat CT scan. Dr Maixner was concerned that the ongoing bradycardia, apnoea and unresponsiveness was caused by his tight craniocervical junction, which had been aggravated by his recent shunt dysfunctions.[19]

16. In the early hours of 20 October 2006, Dr Maixner performed a posterior fossa decompression. Dr Maixner removed a marked bony bar at the foramen magnum. She noted that the level of compression at the craniocervical junction was severe. She also separated fibrous bands over the dura but she did not perform a duraplasty at this time as she had some concern of opening the dura, 'in such a chronic compressive state'.[20] Upon completion of the procedure, Matthew's intracranial pressure fell.[21]

17. Matthew was transferred to ICU. His intracranial pressure remained normal to mildly elevated through the morning. At 1.30 pm Matthew suddenly became hypotensive, associated with a drop in his heart rate but not associated with a change in his intracranial pressure. CPR was commenced.[22]

18. The cause of the cardiac arrest was felt to relate to brainstem ischaemia and he was taken for an MRI. Matthew had a further cardiac arrest while in the MRI scanner. Cardiac surgery was consulted as to whether mechanical cardiac support was feasible pending

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[18] Ibid

[19] Ibid

[20] Ibid

[21] Ibid

[22] Ibid

duroplasty but it was not considered feasible and resuscitation was ceased. Matthew subsequently passed away.[23]

Medical investigation

Associate Professor Ranson

19. Associate Professor David Ranson of the Victorian Institute of Forensic Medicine performed a post mortem medical examination on 25 October 2006. Assoc Prof Ranson provided an autopsy report[24] and attended at the inquest hearing to give evidence as to his findings.

20. The autopsy revealed significant congenital abnormality with an Arnold Chiari malformation. The cerebellar tonsils were elongated and passed through the foramen magnum and in to the chord for a distance of 1.5cm.[25] No additional natural disease was identified. He commented that an ischaemic event of the brainstem associated with compression via cerebellar tonsillar herniation could account for Matthew's death. There were no signs that the shunts were infected and microbiological testing found no pathogens.

21. Assoc Prof Ranson concluded that the cause of Matthew's death was 1(a) brainstem ischaemia in association with Arnold Chiari malformation.

22. He agreed in oral evidence that it was likely that the problems with the two shunt revisions further increased pressure in the already tight posterior fossa, leading to ischaemia.[26]

Associate Professor Penelope McKelvie

23. Associate Professor Penelope McKelvie, neuropathologist at St Vincent's Hospital, undertook a neuropathological examination of the brain. Assoc Prof McKelvie provided a report of her findings,[27] and attended the inquest and gave evidence.

24. Assoc Prof McKelvie observed focal acute ischaemic changes in the medulla consistent with brainstem compression by the cerebellar tonsils.[28] The medulla controls the

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[23] Ibid

[24] Exhibit 7

[25] See autopsy report Exhibit 7, page 6 of inquest brief

[26] T196:23-31

[27] Exhibit 3

[28] Exhibit 3 page 1

respiratory system, heart rate and blood pressure.[29] She testified that, she saw changes of chromatolysis that indicate the ischaemic changes commenced at least 24 hours before Matthew's death.[30] Ischaemia in the brainstem is not usually recoverable.[31] Assoc Prof McKelvie agreed with Counsel for the RCH that the ischaemic change was quite acute and close to the 24 hr period.[32] She could not date the changes back any further than those 24 hours.[33]

25. She testified that, at the time of examination, there was no hydrocephalus, that is, no dilation of the ventricles at the time of autopsy.[34]

26. She agreed with Dr Maixner's opinion that the bleed after the revision of the shunt aggravated the tonsils and caused further tonsillar descent and subsequent brain ischaemia.[35]

Coronial Investigation

27. I conducted an investigation in to Matthew's death to explore the circumstances leading up to his final admission on 17 October 2006. During the course of the investigation, I received an expert report from Mr Andrew Danks, the Chairman of Neurosurgery at Monash Medical Centre.[36]

28. Mr Danks queried some of Mr Wallace's, and the RCH's management of Matthew.

29. I also received a statement from Matthew's mother, Mrs Whyte, raising concerns about Matthew's treatment at the RCH and issues of communication between units at RCH.

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[29] T42:30-31

[30] T52:16-19

[31] T53:1-2

[32] T60:26-29

[33] T60:18-21

[34] T41:14-15

[35] T61-62

[36] Dr Danks is Chairman of Neurosurgery at the Monash Medical Centre, from 2002, with a particular interest in paediatric neurosurgery. After completing an MD in tumour biology and working as adult neurosurgeon at RMH, he worked as a neurosurgeon at the Brigham and Women's Hospital in Boston US, in both adult and paediatric neurosurgery, returning to Melbourne and resuming practise at the Monash Medical Centre, in both areas of specialty, from 1996.

30. I note that at the commencement of the inquest, Counsel for the RCH read out an apology on behalf of the RCH.[37] The apology acknowledged that, when Matthew presented at the ED on 6 October 2006, he was exhibiting signs of abnormal breathing, and in hindsight, this should have alerted RCH to the potential need for Matthew to undergo a further posterior fossa decompression but it cannot be said whether this would have prevented the outcome.[38]

31. I have reviewed the evidence and Counsel's submissions as well as the submission made by Michelle Whyte. Having directed myself in respect of the burden and standard of proof, I make the following findings.

32. Matthew Whyte was born on 9 April 2003 with an Arnold Chiari malformation.

33. He was admitted to the Royal Children's Hospital on 9 September 2003 at the age of 4 months, after unusual vomiting at home. An MRI scan of his brain showed communicating hydrocephalus due to the Chiari malformation. A VP shunt was successfully inserted by Consultant paediatric neurosurgeon, Mr Wallace and this process began to remove the excess fluid away from the brain, and to reduce the pressure within the posterior fossa.

34. While this aspect of Matthew's condition appeared to be progressing satisfactorily, other aspects of his presentation, all directly connected to the malformation continued to deteriorate.[39] This impacted upon his respiratory system causing,

> 'ongoing symptoms of respiratory dysfunction, including intermittent stridor, chronic cough and ongoing feeding difficulties. Despite this no action was taken when he was reviewed in clinic on 18 November 2004'. [40]

35. On 29 December 2004, Mr Wallace performed a decompression of the posterior fossa and an upper cervical laminectomy following which, Matthew was noted to be doing well. The dura was not opened at the foramen magnum during this process.[41]

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[37] See Exhibit 1.

[38] Ibid

[39] See paragraphs 3-4 above.

[40] See statement of Dr Danks, exhibit 8 page 2.

[41] Ibid page 3

36. Following this procedure the Radiologist noted that, a posterior fossa decompression had been performed with an occipital mid line bony defect through which the medial posterior cerebral hemispheres are herniating posteriorly. And:

> 'there is still no appreciable CSF surrounding the cerebellar tonsils with the foramen magnum remaining tight. The tip of the dens still indents the anterior brain system.'[42]

37. In conclusion the Radiologist stated that,

> 'following the decompression there is no evidence of decreased pressure on the brain stem at the level of the foramen magnum, and since the last examination in October there has been an increase in the size of the known cervical syrinx with some new surrounding oedema.'[43]

38. Dr Danks commented,

> 'that there had been apparent radiological progression despite the operation.'[44]

39. In early August 2005 a further MRI (again) indicated that the cervical syrinx was more prominent, and this led to the insertion of a syringe pleural shunt by Mr Wallace on 10 August. A revision on 22 February 2006, suggested further problems with the cervical syrinx.[45]

40. Thereafter between March and October 2006, Mrs Whyte was caused to take Matthew to the Children's Hospital Emergency Department, on seven occasions. She described that during this period Matthew was waking up nearly every day, with severe headaches, irritability and vomiting. I further note here that Mrs Whyte had brought her son to emergency because of her concern that his general health was poor, and that he was in pain and in the belief that staff, who were familiar with his history, would be able to help.

41. As set out above however, these presentations were treated as possibly connected to shunt malfunction, and further CT scans were taken.

42. Later, on the 7 September 2006, Matthew and his mother again saw Mr Wallace and discussed the latest MRI. According to Mrs Whyte, Mr Wallace informed her that the

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[42] See radiology report of 31 December 2004 by Dr M Fink in the RCH Medical records

[43] Ibid.

[44] See Statement of Dr Danks, Exhibit 8 page 3

[45] See paragraph 5 above

situation was not critical, but that it was urgent, [46] and that he (Mr Wallace), would make arrangements for the craniofacial unit to further review the case. Mrs Whyte stated that,

> 'he informed me the cranios would probably be able to do an opening for him in the back of the head to allow for that room'[47].

43. This referral was undertaken by Mr Wallace in the circumstances set out in paragraph 11 above. Mr Wallace stated in evidence that he was not expecting that the cranio facial unit would be able to help Matthew.[48] Mr Wallace testified that it was not clear in his mind that something could have been done, and he did not mean to infer that it could.[49] Mr Wallace apologised to the family for any misconception.[50]

44. As suggested, this occurred following a clinical meeting of the neurosurgical team during September 2006. In regard to that meeting I am satisfied from the evidence of the Clinical Director that the preponderance of views expressed by senior clinicians suggested that Matthew required a further posterior fossa decompression,[51] rather than referral to the craniofacial unit, the latter the preference of Mr Wallace.

45. Thereafter Mrs Whyte was advised by a craniofacial unit staffer that the earliest he could be seen was on 22 December. She was unhappy about the delay and continued to take Matthew to the emergency department as circumstances required. Later she was told that Matthew could now be seen on November 24, which offer, she accepted while remaining distressed about her son's condition and what she saw as the failure of the Hospital to deal with the sense of urgency that she had perceived from Mr Wallace.

46. Again, as above, according to expert witness Dr Danks, the craniofacial surgeons would never have solved this problem. Rather in Dr Danks opinion,

> 'This problem required the foramen magnum to be decompressed effectively which is a neurosurgical procedure.' [52]

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[46] T31:27

[47] T31:18-21

[48] T121:27-30

[49] T129:22-24

[50] T130:1

[51] T173:5-11

[52] T215:11-14

47. Dr Dank's further opinion was that decompression with duraplasty was needed to open the foramen magnum, following Matthews admission on 6 October, with a high chance of a good outcome if that had occurred at that time.[53]

48. The matter of Matthew's on going illness and the hospitals various responses to his condition, ultimately came to a head on 17 October 2006 in the circumstances described in paragraph 10 to 18 above.

49. As set out, Matthew died on the afternoon of 20 October when he suffered a cardiac arrest while in an MRI scanner.

50. Having now reviewed the various opinions offered in this case and whether it was appropriate to move to a decompression with duraplasty operation, following Matthew's admission on 6 October 2006, I have considered the opinions offered by both Mr Wallace and Dr Danks, and the facts and circumstances under pinning those opinions. I have also considered the various opinions offered in regard to the dangers of the procedure, and of the likelihood of succeeding in saving Matthews life by employing such an approach, in the time critical circumstances, which then existed.

51. Having so directed myself, I find myself satisfied that by 6 October 2006 that such a procedure, should have been discussed with Mrs Whyte, and offered to her.

52. I am further satisfied that while the deteriorating nature of Matthew's presentation and the need for such a procedure was unusual, that in the particular circumstances of the ongoing progression of the malformation (and the failure of earlier efforts to provide a successful solution), that it was reasonable to present this course, as an appropriate, as well as a reasonably achievable option.

53. I further consider that given Mr Wallace's own reservations about duroplasty and about what might be done for Matthew by the Craniofacial Unit, by the time of his meeting with Mrs Whyte on September 7, that he should have referred Matthew's case to his head of unit at that time, and sought a full review of the case by another surgeon.

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[53] I note here that this solution was also contemplated by Unit Director, Dr Wirginia Maixner, who operated on the 20 October 2006, but ultimately she decided not to as once she had removed the bone and fibrous band, she observed free pulsation of the CSF underneath the dura that suggested the tightness had been relieved. (T169:11-15). Dr Maixner again contemplated duraplasty on 20 October 2006 after Matthew went in to cardiac arrest but found that duraplasty could not be undertaken in the circumstances, as described above.

It is also apparent that the earlier ischemic damage sustained by Matthew meant that the undertaking of a decompression with duraplasty procedure on 20 October, was unlikely to have succeeded in saving his life.

COMMENTS

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

54. I note with approval that in similar circumstances, (that is a clinical review meeting resulting in a divergence of views as to how best to proceed), that treatment options at the Children's Hospital are now elevated for review by a second consultant under the direction of the units Clinical Director.

55. I am further persuaded that while perhaps contrary to the then existing surgical unit culture, that such a change was then, and now remains, appropriate.[54]

56. In complex and potentially life critical cases like Matthew's, such an approach promises to allow for an appropriate input from a collection of relevantly skilled and immediately available medical experts, followed by a review and possibly ongoing management, by a second clinician, appointed by the Clinical Director.

57. Such a course should be seen as likely to ensure that the best interests of the patient, (as well as those of the responsible surgeon), are properly protected.

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

The family of Matthew Whyte

The Chief Executive of the Royal Children's Hospital

Clinical Director of the Neurosurgery unit, Royal Children's Hospital, Dr Wirginia Maixner.

Mr David Wallace, Paediatric Neurosurgeon.

Signature:

PETER WHITE
CORONER
Date: **3 March 2015.**

[54] See submission of Mr Haley of Counsel, for Royal Children's Hospital, concerning this matter. See also opinion of Dr Danks at transcript page 278.