SYDNEY CORONERS COURT

Inquest:	**Inquest into the death of Isaraelu PELE**
File number:	2285/07
Hearing dates:	22-26 February, 1 March 2010
Date of findings:	31 May 2010
Place of findings:	Sydney Coroners Court, Glebe
Coroner:	Deputy State Coroner H.C.B. Dillon
Findings:	I find that Isaraelu Pele died at Bankstown Hospital, New South Wales on 18 December 2007 as a result of bacterial meningitis that had not been diagnosed by a number of clinicians who had examined him.

Recommendations:

To the Minister for Health:

1. I recommend that the Royal Alexandra Hospital for Children (the Children's Hospital at Westmead) and the Sydney South West Area Health Service review their guidelines to provide for the assessment by senior staff of children presenting with any signs of toxicity before such children are discharged;

2. I recommend that the Children's Hospital and Area Health Service review their guidelines to provide for annual training of clinical staff in Emergency

Departments in relation to the detection of meningitis, including the possibility of children presenting without signs of meningism and with normal vital signs, and in relation to the appropriate tests to be conducted;

3. I recommend that the children's Hospital and Area Health Service review the efficacy of CRP and other tests, whether alone or in combination, in improving the diagnosis of serious bacterial infection;

4. I recommend that the Children's Hospital and Area Health Service review the literature concerning meningitis they distribute to parents (or carers) on discharge of children with any sign of toxicity. The document given to parents ought include clear, succinct instructions on what to look out for and the importance of returning immediately to a doctor if signs or symptoms are seen.

5. I recommend that the Children's Hospital and Area Health Service the consider amending their triage questionnaires to include an inquiry as to the number of recent attendances made by children at hospitals or on General Practitioners in relation to the same illness.

6. I recommend that the Children's Hospital and Area Health Service consider amending their triage questionnaires to include an inquiry seeking to measure the degree of parental concern.

7. I recommend that the Children's Hospital consider whether a measure of "parental concern" can and should be built into its computerised diagnostic tool for serious bacterial infection.

8. I recommend that NSW Health consider rolling out the Children's Hospital's computerised diagnostic tool to all NSW hospital Emergency Departments.

9. I recommend that NSW Health consider ways in which the Children's Hospital's computerised diagnostic tool (or a suitable version of it) may be made available to primary carers.

10. I recommend that, if it has not already done so, the Children's Hospital consider developing a training module in which clinicians not only discuss but *practice* the diagnosis and treatment of rare but serious bacterial infections in simulated settings.

11. I recommend that, if it has not already done so, the Children's Hospital consider formally integrating the study of cognitive bias and error into its teaching and

training syllabus concerning differential diagnosis.

Representation:

Ms. K. Stern (Counsel Assisting) instructed by Ms E. Bayley (Crown Solicitor's Office)

Mr D. Hirsch instructed by Mr D. Eid representing the family of Isaraelu Pele.

Mr M. Windsor SC instructed by Ms P. Moncrieff representing the South West Sydney Area Health Service and the Royal Alexandria Hospital for Children.

Mr M. Fordham instructed by Mr J. Van der Poll and Ms C. Slyney representing Dr B. Chugh.

Mr E. Pike instructed by Mr J. Kamaras representing Dr J. Poovaiah.

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REASONS FOR FINDINGS

Introduction

1. The Greek playwright Euripides wrote, "What greater pain can mortals bear than this: to see their children killed before their eyes?"[i] Fai and Lila Pele have had that terrible experience watching bacterial meningitis slowly kill their much-loved 8-year old son Isaraelu, known as "Elu", over a few days leading up to his death in Bankstown Hospital on the night of 18 December 2007.

2. Heightening the tragedy and sadness of this case is the fact that Mr and Pele were careful, vigilant parents who sought medical attention for Elu from the time he became sick on 14 December until he was at death's door on 18 December. Despite the attentions of a number of doctors, his fatal illness remained undiagnosed until an autopsy was conducted following his death.

3. Meningitis is an inflammation of the leptomeninges or the inner membranes that enclose the brain and the spinal cord. Meningitis may develop very quickly and bring on severe signs and symptoms within 24 hours. Bacterial meningitis is well-known to be a disease that has a high morbidity and mortality rate if not detected and treated sufficiently early. Suspected meningitis is a medical emergency. Untreated, bacterial meningitis is almost always a fatal disease.[ii] On the other hand, most bacterial meningitis presentations are not acute but symptoms develop over a number of days. One estimate is that about 75 per cent of patients suffering from meningitis fall into this category.[iii] The slower onset of signs and symptoms, however, does not reduce the urgency of the need for diagnosis and treatment.

4. Following Elu's death, his parents requested a coronial investigation. They raised a number of questions about his care and treatment. In particular, they felt that Elu's condition had not been appropriately addressed by staff at Bankstown and Westmead Children's Hospitals when he was presented there in the days before his death.

5. One of the purposes an inquest may serve is to address and, if possible, allay the suspicions and fears of family members of the person who has died, as well as the concerns of the wider community. Unexpected or sudden deaths raise troubling questions and issues. Civilised societies know that what harms one of its members may harm many

others. Coroners, for centuries, have sought to answer some of those troubling questions by exploring the facts that can be discovered.

6. A proper inquest is neither a witch-hunt nor a whitewash but a search for truth. It is intended to be an independent, objective examination of the available evidence relating to the circumstances of a person's unexpected or unnatural death.

7. A coroner's primary task is, if possible, to make formal findings concerning the identity of the person who has died, when and where the death took place and the cause and manner of death. Death is a process which culminates in a final shutdown of our hearts and brains and respiratory systems. In seeking to understand the "cause of death" a coroner attempts to identify the physiological and medical problems the person suffered which directly contributed to that ultimate event.

8. The phrase "manner of death", as far as a coroner is concerned, relates to the circumstances in which the process of death took place. The coroner asks, "How did this death come about?" The manner of Elu's death, and the lessons that can be learned from it, has been the focus of this inquest.

The issue for this inquest

9. The principal questions for the inquest are what happened and why the gravity of Elu's illness was not recognised until too late despite the fact that he was seen on a number of occasions by two experienced General Practitioners and in the Emergency Departments of two hospitals. There is no dispute about Elu's identity, where or when he died, or the physiological cause of his death.

10. A coroner has a discretion to make recommendations relating to the death if he or she considers them to be appropriate. I propose to make certain recommendations. They are outlined and discussed below.

11. Before I go on to discuss those questions, however, it is important to say something about Elu himself.

Elu Pele

12. Mr and Mrs Pele are Samoans who came to Australia, like many hopeful immigrants, to give their children a chance of a better standard of living than they could give them at home. The Pele family are strong and affectionate towards one another.

13. Elu was born on 6 December 1999 and was one of six children. He was described by his mother and his brother Pao, who supported her during the hearing, as a very active boy who "loved life". He was a talented sportsman, playing basketball and rugby, and representing his school in athletics.

14. His mother described him as "the handsome and pretty boy of the family". Indeed, his photographs show him to have been a very good-looking boy. He was charming and an integral part of his Samoan community and his church congregation.

15. The pain of losing Elu in such tragic circumstances has been very difficult for the family. Mrs Pele wrote that the family visited his grave every week and that "his image in the remaining moments of his short life will never be forgotten."

What happened? A chronology of events

16. Prior to his death Isaraelu had attended the local medical centre and saw a GP on three occasions – on 14 December 2007, when he saw Dr James Poovaiah; on 15 December, when he saw Dr Baljit Chugh, who had been Isaraelu's GP since February 2002; and on 17 December, when he again saw Dr Chugh. He was also taken by his parents to hospital on three occasions – on 16 December to Bankstown Hospital; on 17 December to the Children's Hospital at Westmead; and on 18 December to the Bankstown Hospital when he was noted on arrival to have had a cardiac arrest. Even after his death at Bankstown Hospital on the evening of 18 December, the cause of his death was not identified. The report of death to the Coroner indicates that the cause of death was unknown.

17. These events must be considered in greater detail. As Counsel Assisting submitted in her opening address, however, the fact-finding exercise is difficult in this case. The events in question took place over three years ago. In the most honest of witnesses, memories fade and fragment. They can be reconstructed long after the event but sometimes with details

missing or inserted in the story at the wrong places or times. Honest witnesses can, with the best of intentions, make mistakes.

18. It should be noted at this stage, however, that the parents of a child are naturally likely to pay him closer attention for longer than a busy clinician who has many patients to examine and care for. The loss of a child is a distinctly memorable event and it is likely that the lead up to it will also be remembered in large measure by vigilant, caring parents such as Mr and Mrs Pele.

19. The clinicians involved in this case were all busy people seeing and caring for numerous patients. Their statements, in most cases, were prepared some months after Elu's death. In Dr Poovaiah's case, his statement was made about 18 months later. Where there is an inconsistency between the contemporaneous clinical notes and the statements of the clinicians it seems likely, as Counsel Assisting submitted in her closing address, that the clinical notes are the most accurate record both of Elu's signs and symptoms and of examinations and assessments conducted. This is especially so where comprehensive notes were taken. Unfortunately, however, that was not always the case.

The first presentation 14 December: Dr Poovaiah

20. Dr Poovaiah was working at the Primary Health Care Medical Centre in Bankstown as a GP when Elu was brought by his father to the clinic on 14 December due to vomiting. Pao Pele was also present.

21. Dr Poovaiah was seeing Elu for the first time. Pao and Lila Pele recall telling Dr Poovaiah that Elu had been vomiting, that he was not eating or drinking and that he was complaining of headaches. Dr Poovaiah flashed a light in Elu's eyes. He examined Elu's throat and abdomen and detected no abnormality.

22. While he felt Elu's brow, he did not take a temperature as he had broken his thermometer. Despite the symptoms he had been told about, which might have indicated a bacterial infection, Dr Poovaiah did not think to borrow a thermometer from another doctor or from the general supply available in the clinic. His note-taking was, to put it mildly, less than comprehensive. Although, ultimately, these deficiencies probably did not affect the outcome for Elu, this was inferior practice for a doctor as experienced as Dr Poovaiah.

23. Elu's father, Mr Lila Pele, stated that, using his son Pao as an interpreter, he had told Dr Poovaiah that Elu had been vomiting after eating McDonalds food, was not eating and

drinking very little, was dizzy, had headaches and a fever. Dr Poovaiah's sparse notes of the visit record: "Complained of vomiting since having McDonalds Hamburgers last night. On examination throat abdomen. No abnormality detected."

24. Although he agreed in cross-examination by counsel for the Pele family that gastroenteritis would ordinarily be expected to be accompanied by diarrhoea and abdominal pain, his diagnosis was probable food poisoning. He appears to have reached that conclusion quickly and gave little suggesting an attempted differential diagnosis.

25. Differential diagnosis is the process of weighing the probability of one disease accounting for a patient's signs and symptoms rather than another. The clinician uses the evidence gathered from the medical history of signs and symptoms together with a physical examination to develop a list of possible causes of the disorder from which the most likely may be chosen as a diagnosis or as the starting point for further investigations.

26. Dr Poovaiah prescribed an anti-emetic drug to treat the symptoms. It seems likely that Elu's history of having eaten fast food was a significant factor in Dr Poovaiah's diagnosis. He ordered no pathological tests to confirm or refute his theory, nor does he appear to have explored the history to determine whether other members of the family had also eaten fast food and suffered similar reactions. Mrs Pele's evidence is that McDonalds food was ordered for the whole family. Apart from Elu, no one else became sick. This might have caused Dr Poovaiah (and other clinicians who were attracted to the theory of gastroenteritis) to question the hypothesis.

The second presentation 15 December: Dr Chugh

27. Mrs Pele was still concerned about Elu the following morning, 15 December. She returned with him to the clinic. This time they saw Dr Chugh, their regular GP. Dr Chugh candidly admitted that he does not include all details of a history in his records and that he was reliant upon his progress notes as to Elu's presentation and the history from Mrs Pele. He also frankly conceded that he had no reason to doubt that Mrs Pele was correct as to her account of the history.

28. Mrs Pele said that she told Dr Chugh that Elu had not been eating, appeared to have a temperature, was tired and was complaining about having headaches. Dr Chugh examined Elu's throat, took his temperature, and tested for neck stiffness. From the neck stiffness

test it is clear that he attempted a differential diagnosis to assess the possibility that Elu had meningitis.

29. His only notes recorded: "No vomiting feels better script no dehydration panamax". He prescribed Panamax (paracetamol) to be taken in 240 mg/5 ml doses. He said that if Elu had had a temperature he would have recorded it. He said that he did not suspect meningitis at that attendance. Following this presentation, according to Mrs Pele, Elu was given regular Panamax in 5 ml doses.

30. Despite the dosages of anti-emetics and paracetamol, Elu continued to display signs and symptoms of illness. On the evening of 15 December, he attended a Christmas Carols at his church but was too sick to participate. Mrs Pele described him as vomiting two or three times that day, rubbing the base of his head around his neck and looking very tired. He seems from her description also to have been blinking slowly.

The third presentation 16 December : Bankstown Hospital

31. The following morning, a Sunday, the Pele family went to a church function. Elu travelled with his family to the function but refused to eat and only sipped a little water. He stayed in the family van sleeping much of the time.

32. Later that day, however, he vomited blood. His father took him to Bankstown Hospital at about 6pm that evening. The failure by clinicians at the hospital adequately to investigate the possibility that Elu suffered from meningitis was one of the lost opportunities to save his life.

33. On presentation at 18:03, Registered Nurse Dolmark, the triage nurse, noted that Elu had been vomiting for three days, had had no food intake, no diarrhoea, only minimal food intake, blood in his vomit, fevers for three days, had been vomiting three to four times a day, and that he was pale and lethargic. His fever was 36^{o} on arrival but rose to 38^{o} at 2035 and was still at that level at 2115.

34. Elu was examined at some time around 2000 – 2030 by Dr Uzma Rasheed, an intern. Mrs Pele arrived during this time. Dr Rasheed took a detailed history from Mrs Pele which included the details set out above, but also that the fever was associated with the headache, and that there had been decreased urine output. She recorded Elu's temperature as being 38.2^{o}. On examination, Elu was noted to be lethargic, quiet, and pale. He had no abdominal tenderness. Dr Rasheed noted that Elu's left ear was inflamed but no discharge

was seen. Although it is not recorded in the notes, it is likely that Dr Rasheed was told that the vomiting had commenced after Elu had eaten McDonalds fast food because this is noted in the discharge letter given to Mrs Pele later that evening.

35. At some time after this initial examination Dr Rasheed discussed Elu with Dr Rosemary Govender, then a career medical officer, who was her supervisor that evening. A management plan was arrived at involving a trial of fluids, Panadol and urinalysis to rule out a urinary tract infection. This plan of management catered to Dr Rasheed's provisional diagnosis of gastroenteritis.

36. Uranalysis was performed and showed trace ketones (indicating that Elu had not been eating) but no other abnormality. Elu was given Panadol 400 mg at 2035 and probably was also given Nurofen but at what time the notes do not record.

37. The clinical notes record that at about 2225 Elu's temperature had come down to 36.4^{o}. His vital signs seemed to be encouraging and someone, apparently not Dr Rasheed, noted that Dr Govender would review him.

38. At an unrecorded time after 2225, Dr Rasheed saw Elu again. She recorded that he continued to complain of a headache in the frontal and occipital region, but that he had not vomited since 1730. She continued to advise his parents to "push for fluids" to rehydrate him.

39. Some time later, (the time not being recorded in the progress notes) prior to discharge, Dr Rasheed again saw Elu. She recorded that his headache had improved and again noted that he had not vomited since about 1700. She noted (on what basis is unclear), "mother did not give adequate analgesia over the last few days" and urged Mrs Pele both to push Elu to take fluids and to give him regular Panadol. She also advised her to bring him back if the headache did not improve. The last entry in the notes records, somewhat cryptically, "mother wants to go home". (There is no suggestion, however, that Mrs Pele took Elu home against medical advice.)

40. Although a history of headaches, fevers for three days and vomiting were noted in it, Dr Rasheed's discharge letter offered a diagnosis of only of "viral infection" and did not explore or speculate about any differential diagnoses needing follow up. The letter advised the GP that Mrs Pele had inadequately medicated Elu with analgesia. She also

advised that Elu had felt better after being receiving Nurofen and fluids. She suggested that the GP review Elu the following day and encourage "oral intake" of fluids.

41. The question whether the doctors had considered and examined Elu for signs of meningism was a matter of some contention. Dr Govender appears to have made no entries in the notes at all. Dr Rasheed made no notes about examining Elu for signs of meningism. Both doctors made statements some months after the events and both gave oral evidence at the inquest.

42. In her statement of 21 February 2008, Dr Rasheed said that on examination she had found the various signs and symptoms recorded in the clinical notes referred to above but added that she had observed that Elu had had "no neck stiffness" and "no rash". Regrettably, because she made no note of these negative findings, it is unclear whether this assertion was a later reconstruction or whether she had, in fact, tested Elu for signs of meningism at that time. In her oral evidence, Dr Rasheed insisted that she had conducted these tests and also added that she had tested Elu for photophobia. Again, if she did so, it was not recorded.

43. In her evidence, Mrs Pele made no mention of Elu being tested for neck stiffness at the initial examination. She stated, however, that some time after 11pm, that the doctor who had conducted the initial examination had then conducted a test of that nature. This must have been Dr Rasheed. That test apparently took place shortly before Elu was discharged. Once again, there is no record of a test being conducted or of the negative findings.

44. Dr Rasheed, perhaps unsurprisingly, had no clear recollection at the inquest of the events of 16 December. It had been a busy night in the Emergency Department and, at the time Elu presented, she did not consider him to be gravely ill. There was no particular reason to recall what she had done until Elu died. The notes were not comprehensive and could have provided only limited assistance in refreshing her memory. Even two months afterwards, when she wrote her statement, the process of reconstructing memories had probably been well under way for some time.

45. It is evident, nevertheless, that Dr Rasheed had at least turned her mind to the question of meningitis at some time that evening. Apart from one or possibly more tests for meningism (neck stiffness, photophobia, rash), however, she conducted or ordered no other tests specifically designed to exclude meningitis. In particular, despite the fevers,

headaches and other non-specific signs and symptoms that Elu was exhibiting or reporting, no blood tests or blood cultures were ordered.

46. In cross-examination she conceded, with the benefit of hindsight, that Elu had been showing at least some of the signs of toxicity: vomiting, fever, headache, pallor, anorexia (a refusal to eat) and dehydration.

47. The NSW Health Clinical Practice Guidelines on "Acute management of infants and children with fever" set out four basic tests of toxicity in an easily remembered mnemonic: A B C D standing for Arousal, alertness, activity; Breathing difficulties; Colour and circulation; and Decreased fluids in and out. The guidelines state:

> Abnormality of any of these signs places the child at high risk of serious illness. The presence of more than one sign increases the risk. A 'toxic' child appears drowsy, lethargic or irritable, pale, mottled and tachycardic. Children with these signs must be seen urgently, investigated and treated as a priority.[iv]

48. Dr Rasheed was also cross-examined about the proposition, drawn from a medical text on emergency medicine, that it was inappropriate to diagnose gastroenteritis if no diarrhoea is present. The authors, Professor Gary Browne[v] and Dr Bruce Fasher[vi] remark:

> Gastroenteritis is a common childhood complaint, the commonest complication of which is dehydration… Most cases will be viral… Signs include vomiting, diarrhoea, fever and abdominal pain… *Beware of attributing vomiting without diarrhoea to gastroenteritis.* (Emphasis added.) [vii]

49. Dr Rasheed disagreed with this and said that in practice a doctor does not always see the classical signs of gastroenteritis when a patient presents with it. She said that diarrhoea may take some time to develop.

50. This was troubling evidence. The experience of the learned authors is far more extensive than that of Dr Rasheed. Dr John Raftos gave evidence that the delay would be at most hours not days as Dr Rasheed thought. I prefer their opinions to hers on that point. Her claim unwittingly suggests that Dr Rasheed may have misdiagnosed, and still be misdiagnosing, illnesses as gastroenteritis due to inadequate differential diagnosis.

51. Dr Rasheed was a relatively inexperienced doctor. Appropriately, she discussed the case with Dr Govender. Regrettably, however, neither doctor made comprehensive clinical notes of that discussion. The notes suggest that Dr Govender reviewed Elu at that stage after which a plan was formulated. The two doctors, however, said in their statements that Dr Govender did not review him until some time later. No notes were made by either doctor of that review.

52. In any event, according to Dr Rasheed, after her initial examination, and during the first discussion with Dr Govender, she indicated to Dr Govender that her provisional diagnosis was viral gastroenteritis, with Elu's headache being secondary to dehydration. They formulated a plan including urinalysis, a trial of fluids and analgesia.

53. According to Dr Rasheed's statement, the analgesia was to take the form of both Panadol (paracetamol) and Nurofen (ibuprofen). The clinical notes of the plan mention only Panadol but the medication notes show that Nurofen was given to Elu but not at the time he was first given Panadol. This is another indication of the problem of reconstruction in her evidence.

54. Concerning the later review, Dr Rasheed stated that she and Dr Govender had found Mrs Pele and Elu asleep in a chair when they arrived to review him and had woken him. Dr Govender stated that this review had taken place at about 2200. She said that she had taken a history from Mrs Pele. According to Dr Govender, Mrs Pele told her that she was concerned about Elu's poor oral intake over the past three days, that he had intermittent fever and vomiting and an episode of "loose stools". Dr Govender also said that Mrs Pele had told her that "with the decreased oral intake [Elu] had developed a mild headache but had not taken any analgesics. They also spoke about his last episode of vomiting.

55. Dr Govender said that she had then examined Elu and found that he was easily rousable, said that he had no headache or pain, he was able to respond to her questions and able to recognise his mother. She said that her clinical examination found no rash and no photophobia, his Kernig's and Brudzinki's signs[viii] were negative, his neurological signs were normal, his Glasgow Coma Scale was 15/15 (normal), and he had no neck stiffness or pain. She also said that he had had a mildly inflamed pharynx, normal tonsils, normal eardrums and no cervical lymphadenopathy. She found his chest to be clear, he was well-perfused and had a heart rate of 80. She also found him to be afebrile. Significantly, she found that his abdomen was soft non-tender, was not distended and that there was no organomegaly (enlargement of abdominal organs). In her statement, Dr Govender said that during the examination Elu had reported that his headache had recurred. She said that she had recommended that he stay in the Emergency Department for further observations and had requested a urine sample for screening.

56. She stated that she had reassessed Elu at about 2230 and found him to alert, non-drowsy, afebrile, comfortable and well-perfused. She said that he reported that he no longer had a headache and that she concluded that he had responded to fluids. The urine sample had

come back negative by that time. She said that her impression was, therefore, that he was suffering a viral infection that had improved with rehydration.

57. Dr Govender said that she had told Mrs Pele that if Elu's headache persisted the hospital would need to reassess him and "consider undertaking a lumbar puncture". She also stated that "I told her that a lumbar puncture was not warranted at this time but we needed to keep Isaraelu in the Emergency Department to monitor him and reassess him at a later time." She said that she had recommended further analgesia and fluids. She said that she had asked Dr Rasheed to document the clinical findings and these discussions, to review Elu later and to explain what was involved in a lumbar puncture.

58. For a number of reasons, I cannot accept this as an accurate or reliable account of what occurred. First, Dr Govender, in her oral evidence, made a poor impression as a witness. While this may, in great measure, be attributable to a witness's understandable nervousness and to her natural remorse for the loss of a young patient, her repeated inability to answer questions immediately or directly implied both that she had very little clear recollection of the events in question and that much of her evidence was consciously or sub-consciously being reconstructed as she gave it. While demeanour evidence is not a decisive measure of a witness's reliability, taken together with evidence that is plainly wrong, it may have a powerful effect. In examination by Counsel Assisting and cross-examination by counsel for the Pele family, Dr Govender was a hesitant, defensive and very uncertain historian of the events of 16 December.

59. Second, the impression of unreliability her oral evidence presented was strengthened by the almost complete absence of clinical notes concerning her reviews of Elu.

60. Third, some of the history and observations she purported to recall are inconsistent with what is recorded in the notes. The triage notes recorded "nil diarrhoea". Apart from Dr Govender's claim that Mrs Pele had mentioned "loose stools", all the other evidence in this inquest, including the history taken by Dr Rasheed, suggests that Elu did not have any episode of diarrhoea. Dr Rasheed's recorded observations included the fact that Elu's left ear was inflamed, yet Dr Govender claims that his ears had been normal to her observation.

61. Fourth, some of the observations concerning Elu's degree of alertness and rousability are very inconsistent with the evidence of the family of their own observations over a sustained period and with the objective fact that Elu was, by 16 December, a sick child

almost certainly suffering meningitis at that stage and with the observations made by the triage nurse that Elu was lethargic on presentation. Mrs Pele's recollection is that Elu was very slow to respond when attempts were made to wake him at Bankstown Hospital, that his eyes were repeatedly blinking and rolling, and that he had difficulty sitting up.

62. While there is, of course, some degree of subjectivity in the judgments expressed by the doctor and the parents, his mother knew Elu much better than the doctors. The weight of evidence indicates that Elu was far more lethargic than Dr Govender suggests retrospectively. If she really now recollects an impression that Elu was alert and non-drowsy, it is likely to have been because his symptoms improved as a result of analgesia and fluids.

63. Counsel for the Pele family enumerated several other reasons why I should reject her evidence. Having made the points I have above, it is unnecessary in proceedings of this nature to take them up further except to reiterate that I do not regard Dr Govender as a reliable witness where there is a conflict between the records or recollections of Mrs Pele and Dr Govender's account.

64. Despite the difficulties in gaining an accurate picture of what happened at the hospital, it is clear enough that decisions were taken, probably jointly by Drs Rasheed and Govender, to prescribe both Panadol and Nurofen, although Dr Rasheed says that she did not intend both to be administered together. Dr Rasheed said she would only prescribe both if there was a high fever which was not responding to the Panadol. Dr Govender said that Nurofen would have been prescribed to make Elu more comfortable if he had already been given a dose of Panadol. The inference from this, although not accepted by Dr Govender, is that Panadol had not been effective to make Elu comfortable. This is suggestive of continuing headache that is, in any event, recorded by Dr Rasheed.

65. Both Drs Rasheed and Govender appear to have relied upon Elu's improvement following a trial of fluids and Panadol, and the negative finding on the neck stiffness examination, as effectively rendering a diagnosis of meningitis unlikely. Both, however, agreed that it could not be ruled out.

66. Meningitis must have been in the forefront of their minds, however, because the evidence of both doctors and Mrs Pele is that consideration was given to a lumbar puncture if Elu's headache did not improve. This makes it all the more puzzling that a blood test and culture was not ordered that evening. I will discuss this further below.

67. The discharge letter given to Mrs Pele to give to her general practitioner recorded a diagnosis of "viral infection". The onset of vomiting after Elu had eaten McDonalds food was specifically mentioned although the diagnosis of viral infection in the discharge letter suggests that Dr Rasheed was not thinking of food poisoning as the cause of Elu's symptoms. There was no mention of lumbar puncture or of meningitis. The diagnosis of "viral" infection also suggests that Dr Rasheed thought that a diagnosis of a bacterial illness was unlikely but she clearly had not excluded it.

The fourth presentation: Dr Chugh 17 December

68. The next day, Monday 17 December 2007, Mrs Pele's evidence is that Elu was unable to walk. He vomited blood. He continued to complain of a sore head at the front and the back. Mr and Mrs Pele took Elu first to see Dr Chugh.

69. Dr Chugh noted that Elu was afebrile and had attended hospital the previous evening. Dr Chugh recalls Elu's eyes opening and closing slowly. This corroborates Mrs Pele's account of Elu's presentation and was a sign of lethargy, an important indicator of toxicity. On being told that Elu had vomited blood Dr Chugh advised Elu's parent to attend the Children's Hospital at Westmead urgently. He focussed particularly on Elu having vomited blood and said that his priority in those circumstances had been to get Elu to hospital.

70. He did not turn his mind to other possibly worrying issues. The discharge letter he wrote said simply "*Thank you for seeing Mast Isaraelu Pele, who has been vomiting and has blood this morning when vomited. He is pale and [has] mild to moderate dehydration*". The envelope, but not the letter itself, was marked "urgent".

The fifth presentation: Westmead Children's Hospital 17 December

71. Following Dr Chugh's advice to them, the Peles took Elu to the Westmead Children's Hospital immediately. They arrived there at about 1050. Elu was seen to be lethargic and was placed in a wheelchair in the Emergency Department. It may be reasonably inferred from this that he was observed to have had difficulty walking at that stage.

72. Elu was triaged by Registered Nurse Rosemary Bang, a very experienced paediatric nurse. Nurse Bang gave frank and thoughtful evidence and was for this reason an impressive witness. She explained that she had conducted the triage by responding to a series of prompts on a computer screen in assessing the patient in front of her. One

particularly candid aspect of her evidence was her statement that she would exclude a diagnosis of meningitis in a child without neck stiffness.

73. I digress to note that this was also evidence of Dr Theresa Ho who saw Elu later that day. It is a candid acceptance of the reliance placed on, and priority given by medical staff to, signs of meningism despite clear emphasis in the guidelines upon the fact that the absence of meningism does not exclude a diagnosis of meningitis[ix]. RN Bang also candidly accepted that, in assigning a triage category to the child, she would not have regard to whether or not a child's symptoms were being masked by Panadol. She also accepted that she had not asked why Elu was in a wheelchair, although she accepted that that could be significant information in an assessment of his presenting condition. She did not ask if he had attended another hospital during the course of his illness.

74. RN Bang recorded that Elu had been vomiting for approximately one day and that he had vomited blood. She accepted that this description may erroneously have referred just to the duration of vomiting blood. She noted that Mr and Mrs Pele told her that his fever over the preceding 24 hours had been 38 – 38.9°. She describes him a pale and lethargic, but rousing easily. She entered *"gastroenteritis viral"* as the presenting problem.

75. Triage nurses, while usually experienced professionals, are not charged with the ultimate responsibility of diagnosis. Their views, no matter how cogent, are, necessarily, at best tentative and preliminary opinions. Nevertheless, it would be unrealistic to dismiss those opinions as lacking influence in relation to the ultimate diagnosis. At the very least, the opinion of an experienced and respected triage nurse would provide the examining doctor with a starting point for a differential diagnosis of the presenting problem.

76. A tentative diagnosis by a triage nurse may unwittingly give rise to the cognitive or logical error of "anchoring", that is, the over-valuing of first impressions or one hypothesis to the exclusion of other realistic possibilities.[x] Whether or not that is what happened in this case is difficult to determine because cognitive errors are, of course, not made consciously. In any event, the working diagnosis developed in the hospital after Elu was seen by doctors, and with which he was discharged, did not alter from the tentative opinion offered by RN Bang at triage. This is an issue I will consider more fully below.

77. While at the hospital, Elu was seen by Dr Mohammad Rahman, a Senior Resident Medical Officer and Dr Ho, a Senior Paediatric Registrar. Dr Ho discussed his case also

with Dr Doyle, an advanced trainee in paediatric emergency medicine working as the fellow in charge of the Emergency Department that afternoon.

78. On initial assessment by Dr Rahman at around 1314 Elu was noted to look sick and lethargic. His temperature was 37.2^{o}. He was noted to have been vomiting since eating McDonalds food on the previous Thursday (it was by then Monday) and to have been unable to tolerate any fluids or solids since then. He was not thirsty. He had no diarrhoea, He was dizzy. There was no one at home with diarrhoea or vomiting. Dr Rahman entered as his provisional diagnosis *Vomiting and/or nausea – non-specific*.

79. However, when he discussed the case with Dr Katherine McDevitt, the on-call general medical registrar at the hospital that day, after having obtained a high blood sugar reading, he told her that Elu had gastroenteritis. He did not discuss Elu's symptoms generally with her and did not indicate any suspicion that Elu had meningitis. Dr McDevitt indicated that it was very unusual to be consulted in this way as she was not on-call in the Emergency Department. She was generally only contacted in order to arrange admissions, although it does not appear that Dr Rahman ever considered admitting Elu.

80. Dr Rahman may or may not have tested for signs of meningism. His evidence was that he did but, if so, he did not record it. He gave evidence that he was not told about a headache. It is more likely that he did not ask the parents specifically if Elu had a headache because it is inconceivable that they would not have told him about it if he had asked. He may or may not have been aware that Elu had been to the Bankstown Hospital the previous night. Mrs Pele says that she told Dr Rahman this. Dr Rahman did not record any notes concerning previous attendances at hospitals or GPs.

81. Mrs Pele also described Elu lying with a pillow over his head whilst the history was being taken, and when asked to get up saying *"I'm too tired, my head mum, I can't walk"*. This was not noted. Dr Rahman may have been focussing on his typing during this exchange. Mrs Pele said that she had had to help Elu to the toilet. This also went unrecorded.

82. Dr Rahman said in oral evidence that when he examined Elu there were no signs of toxicity and that he did not assess Elu as being pale. It is not clear whether or not Dr Rahman saw Dr Chugh's referral letter which specifically described Elu as pale. Dr Rahman agreed that this assessment is clearly dependent upon some knowledge of the child. Perhaps for Dr Rahman, assessment of pallor was difficult because he did not know Elu and because he may have been inexperienced in assessing children of Samoan

ethnicity for pallor. The cause of Dr Rahman's failure to recognise that Elu was pale is not clear but the weight of evidence, especially the observations of other clinicians, suggests that Elu almost certainly was. Dr Rahman also conceded that he had not then been aware that if there was no abdominal pain and no diarrhoea the diagnosis was unlikely to be gastroenteritis.

83. Dr Rahman arranged for a blood test, but not for a CRP. He said he would have needed consultant approval to take a CRP (although Dr Doyle was not clear that this was in fact the case). This evidence appears to be contradicted by the letter of Dr Mary McCaskill who stated that junior doctors tended to over-rely on CRP tests to the detriment of their observations of patients. Her comments implied that junior doctors did not require authorisation by a consultant before ordering such tests. In any event, Dr Rahman described the CRP test as a non-specific indicator which can be raised in both viral and bacterial infection that considered would not have been helpful in the circumstances. He arranged for Elu to remain in the emergency department for observation.

84. Elu was then transferred to the care of Dr Ho at around 1500. Dr Ho ordered fluids. Her notes record that Elu was *"complaining of headache and nausea still"* although she said that the continuing complaint was probably the nausea and not the headache. She noted that he was easily arousable. The note of her assessment is timed at 1615. Shortly afterwards, at 1625, she prescribed Panadol which is noted to have been given at that time. Soon after that, at around 1645, Elu spiked a fever of 39.4°. He was noted to remain lethargic-looking and to be resting in bed. He asked to eat jelly but Dr Ho did not see him eat any. Dr Ho said that she had tested for signs of meningism. Her discharge note recorded that there were no signs of meningism.

85. At some time during the afternoon Dr Ho discussed Elu with Dr Doyle, the paediatric Fellow-in-charge in the Emergency Department. They discussed a range of possible diagnoses including meningitis. Dr Ho had observed during the afternoon that Elu's presentation improved. His blood test results were essentially normal. His vital signs were normal. Upon that basis, she decided that he should be discharged with a diagnosis of gastroenteritis. Dr Doyle indicated in her statement that she was happy with the decision to discharge.

86. Dr Ho said that she had observed Elu walk to the toilet although it did not appear from her evidence that she regarded this observation as being of any particular relevance to the possible diagnosis of meningitis. Elu's mother described Elu as having great difficulty

walking to the toilet and having to be supported by her. It is likely that Mrs Pele's account is more accurate because she knew Elu so well and Dr Ho at that stage was not thinking in terms of neurological disorders. Mrs Pele said Elu was saying he could not walk and placing his right hand on his forehead and back of his neck.

87. Dr Ho also gave evidence that she thought it was possible to exclude a diagnosis of meningitis if the vital signs and the white cell count were normal. No doubt she has revised that opinion in the light of Elu's death.

88. She said that she had given Mr and Mrs Pele a discharge letter and instructions to go to their GP the following day. Mrs Pele said they did not receive a discharge letter or instructions to return to their GP. She said they were simply told by a nurse that they were free to go home and did not need anything. A discharge note was evidently written by Dr Ho but it does not appear to have been given to Mrs Pele. She denied receiving it and certainly it was never acted upon by her. Given her demonstrated attentiveness to Elu's welfare, it would have been uncharacteristic for her to have ignored it.

The sixth presentation: Bankstown Hospital 18 December

89. Mrs Pele gave evidence that during 18 December she had sensed that Elu was getting worse but did not know what to do and needed help. Elu went to sleep in the evening and then his mother noted that he was cold. He was unresponsive. She called an ambulance but before the ambulance arrived Mr Pele took Elu to the Bankstown Hospital. He arrived there at 22.27 having had a cardiac arrest. His Glasgow coma scale was 3. He had no pulse. His pupils were unresponsive.

90. Dr Josef Ujma tested for neck stiffness by moving his head up and down, but this may well not be a reliable test for meningism according to Dr Raftos. Elu died at 2315.

What went wrong?

Submissions

91. Counsel Assisting, Ms Stern, in her closing submissions, suggested that:

> … the clinicians responsible for Elu's care between 14 and 17 December 2007 were led astray by the combination of a history of vomiting after eating McDonalds, an overemphasis upon the vomiting and an underemphasis upon the combination of

> presenting signs and symptoms, by the normal vital signs, and by the lack of any signs of meningism. Despite obvious references in the clinical notes to signs of toxicity, and common symptoms of meningitis, including lethargy, persistent headache, persistent fever, pale colour, repeated vomiting, absence of diarrhoea, dizziness and Elu looking sick, the clinicians treated Elu for dehydration secondary to either a viral illness or gastroenteritis, without apparently giving serious consideration to the possibility that Elu had meningitis. This is a clear omission given how clearly Elu's signs and symptoms reflect indicators which, on the guidelines set out above required further assessment, investigation and treatment.

92. She also submitted that:

> …the clinicians fell into the trap of attributing significance to Elu's apparent improvement with paracetamol, a trap which is clearly identified in the guidelines referred to above. Also, that the clinicians failed to attributed sufficient significance to Mrs Pele's obvious concern, reflected in her repeated attempts to obtain medical assistance for Elu. Elu clearly presented to both the Bankstown Hospital and the Children's Hospital at Westmead with signs of toxicity. He had continuing complaints of headache and fever. He was clearly increasingly finding it difficult to walk. His family saw that he was not himself and was seriously ill.

93. Counsel for the Pele family, Mr Hirsch, put the issue bluntly. In answer to the argument that the clinicians ought not be criticised he submitted that "the central issue is not 'failure to diagnose meningitis' but rather 'failure to exclude meningitis' in circumstances where all of the well-known signs and symptoms that enliven such exclusion were present".

94. He was particular critical in relation to the clinicians at the two hospitals. He argued that "it was not the supposed 'subtlety' of Elu's signs and symptoms that resulted in the failure to exclude meningitis; it was the positive belief that a diagnosis had already been made that led the [Children's] hospital to stop looking for anything else." Although this criticism was directed, in his written submissions, at the Children's Hospital, he applied it also in his oral argument to the Bankstown Hospital clinicians who saw Elu on 16 December.

95. Counsel for the Area Health Service and the Children's Hospital, Mr Windsor SC, emphasised the difficulties of diagnosing meningitis in a patient without meningism and submitted that it would be inappropriate in coronial proceedings to make findings that any of the clinicians had departed in a major way from professional standards accepted in Australia in 2007. Dr Raftos expressed opinions of that type in his report of December 2008. Coroners do not have jurisdiction to make findings concerning the guilt or innocence of "persons of interest", nor do they have jurisdiction to determine whether or not a person is liable in damages for negligence or some other form of civil wrong which may have resulted in the death of a person.

96. While I accept, therefore, that coroners generally ought not apply tests in their findings that relate to civil liability for a breach of a legal duty of care, it is certainly open to a coroner, in certain circumstances, to make findings that individuals or institutions or both made errors of judgment and to make findings about the consequences of those errors.

97. Mr Windsor also submitted that "while in retrospect the diagnosis of bacterial meningitis may seem clear, [the court] should not criticise the individual nursing staff for not making the diagnosis" because it was, in the circumstances of Elu's presentations, a difficult one.

98. Counsel for Dr Poovaiah contended, in summary, that there were no cogent grounds on which he could be criticised for his treatment of Elu and, in particular, there was no basis for concluding a causal connection between Dr Poovaiah's treatment of Elu and his death. Counsel for Dr Chugh made similar submissions.

99. Although, unlike negligence or criminal cases, inquests are not directed towards attributing personal responsibility or liability for fatal events, an inquest conducted without consideration of such questions in appropriate cases would be both incomplete and unsatisfactory. For the reasons that follow, some criticism of the clinicians is necessary. Before moving to those considerations, however, I should say that I do not think it would be fair or appropriate to criticise the nurses. Their job was not to diagnose patients but to triage them on limited information. They did not have the opportunity to conduct investigations.

Discussion

100. Bacterial meningitis can be, as Elu's case shows, a difficult disease to diagnose if the definitive test for it, a lumbar puncture, is not performed.

101. I have had the advantage during the inquest to acquaint myself with relevant extracts, exhibited during the inquest, from textbooks, clinical practice guidelines, articles in scientific journals and a fact sheet from the Children's Hospital at Westmead that were presented in evidence. As a result of reading those materials the following general propositions relevant to Elu's case can be advanced:

- early diagnosis of meningitis can be difficult even for experienced clinicians. *A high index of suspicion should be maintained.* Meningitis must be considered in any child with unexplained fever[xi];

- common symptoms of meningitis are high fever, headache, vomiting and loss of appetite, lethargy and drowsiness and irritability[xii];

- other symptoms of meningitis may include neck stiffness photophobia, rash, change in breathing and difficulty walking[xiii] but not all patients with meningitis will have fever, neck stiffness and altered mental status[xiv];

- CSF [cerebrospinal fluid] examination by lumbar puncture provides the definitive diagnosis of meningitis. Blood cultures may provide supportive evidence. Other investigations [including CRP] are helpful but not definitive in the diagnosis of meningitis[xv];

- generally parents know their children best and recognise when they are unwell. Clinicians should always listen to parents concerns[xvi];

- the signs of toxicity are listed as "ABCD": decreased alertness, arousal or activity, breathing difficulties, pale colour or circulation problems, or decreased fluid intake and decreased urine output. Abnormality of any of these signs places the child at high risk of serious illness[xvii];

- the response to antipyretics (drugs that reduce body temperature) should not be used as a diagnostic tool to try to differentiate bacterial from viral infection[xviii]. Apparent improvement with Paracetamol is not helpful in excluding the diagnosis[xix];

- all children discharged home from the Emergency Department with fever should be followed up the following day either in the Emergency Department or at their family doctor, to detect progression of infection, response to treatment and results of investigations. Although a child may be non-toxic when seen no test can exclude the child becoming toxic. Parents should be encouraged to look for toxicity every four to six hours and to seek clinical review if the child becomes toxic or unless. The discharging doctor should write a note to the family doctor with clinical diagnosis and a list of investigations performed[xx]; and

- serious bacterial infection can occur when a child has low-grade fever or is afebrile.[xxi]

102. Because many of the signs and symptoms of the disease are non-specific, the early diagnosis of bacterial meningitis can, unfortunately, be delayed because of the similarity of the symptoms of relatively benign viral infections. These difficulties may be

compounded by differences between individual patients. There may be significant differences between individuals depending on their ages with a diagnosis tending to be more difficult the younger the patient is. While it is a relatively uncommon disease compared with common viral infections[xxii], it is not so esoteric or rare as to be a merely academic phenomenon. All the clinicians involved in assessing Elu claimed to have been alert to the possibility that he may have been suffering from it.

103. Despite the difficulties in establishing a definitive diagnosis of bacterial meningitis, however, it was not beyond the capacity of the various clinicians who undertook the care of Elu to have made it in time to save his life. In a recent book on improving safety in medicine and other complex areas, Professor Atul Gawande observes that there are two fundamental categories of error: ignorance and ineptitude. "Ineptitude" is a harsh but accurate descriptor, applied by philosophers to the failure to apply knowledge correctly. Errors of "ignorance", on the other hand, occur because we have only a partial understanding of the world and how it works.[xxiii]

104. In Elu's case, it seems to me that the failure to diagnose his illness overlaps both categories. Apart from a lumbar puncture which, as the name implies, is a relatively invasive test, there is no definitive bio-chemical test for bacterial meningitis. For this reason, unless doctors perform a lumbar puncture, they will necessarily be attempting a differential diagnosis with only a partial understanding of all the operative factors and therefore may make errors of ignorance.

105. On the other hand, medical science has developed enough experience in the diagnosis and treatment of bacterial meningitis to know that it is a lethal disease and that where it may be reasonably suspected as the cause of the patient's signs and symptoms it ought be excluded from diagnosis before any other diagnosis is definitively adopted. Professor Gordion Fulde dramatically warns clinicians that "Emergency Department Law 1" is that "all patients are trying to die before your eyes". He exhorts them in the following (somewhat melodramatic but poignant) terms:

> You must always think in terms of worst case scenarios… This is even more vital where early specific treatment will cure or prevent death. It may seem dramatic, but if you treat or exclude these serious illnesses early, further management of the patient is very often straightforward. Remember medicine is best geared to treat the serious illnesses and society expects us to get these right. [xxiv]

106. In a nutshell, what went wrong in Elu's case, despite all the diagnostic difficulties his case may have presented to the clinicians, was that insufficient weight was given to a worst-

case scenario by everyone except Dr Chugh until it was too late. His very dangerous illness was not excluded. If a serious attempt to do so had made been up to 17 December, it seems likely that Elu's management would have been relatively straightforward. Dr Raftos gave independent expert evidence at the inquest to this effect.

107. Before considering his evidence, which was mainly concerned with the Emergency Departments, in detail the treatment of Elu by the GPs should be considered.

108. Dr Eric Fisher, an independent witness with particular expertise in General Practice, was critical of Dr Poovaiah. He said in his report dated 9 May 2009:

> In my opinion, Elu had three or possibly four red flag pointers for his headache which required further investigation to elucidate a cause. They were the sudden onset, fever, vomiting and possibly disturbed consciousness. He was not examined specifically to determine if he had signs of meningitis, although he presented with symptoms that suggested that meningitis as a diagnosis should be eliminated, in my opinion.

109. The evidence presents some difficulty, however, for determining whether or not Elu presented to Dr Poovaiah with a headache. On one version, namely Mrs Pele's account to Constable Nolan in the early hours of 19 December, shortly after Elu's death at Bankstown Hospital, it appears that Elu began to complain of headache only after seeing Dr Poovaiah. It may be that, after the event, Mr Pele became confused as to what he had told Dr Poovaiah on 14 December. If that was the case, Dr Fisher's criticism falls away. Dr Raftos, a specialist in emergency medicine who gave independent evidence, was, in any case, less inclined to be critical of Dr Poovaiah. He considered that Dr Poovaiah's treatment had been reasonable in the circumstances.

110. While I do not think that Dr Poovaiah's work on 14 December was of a high standard, Elu's death cannot be attributed to his failure to diagnose meningitis at this time. Others later had much better opportunities to observe him and the capacity arrange diagnostic tests quickly.

111. Dr Fisher was critical of Dr Chugh's letter. He said in his report of 9 May 2009, "In my opinion, Isaraelu Pele was desperately ill and had deteriorated since he had been seen on 15 December 2007. This was not reflected in the letter to Westmead Hospital. It clearly does not reflect the deterioration in his condition since 14 December 2007."

112. Dr Raftos, on the other hand, considered the letter was "not the best and not the worst" he had seen in an Emergency Department. In his view, when a GP sends a patient to a

hospital urgently with a letter, this is, in itself, an expression of serious concern that ought prompt the hospital staff to approach the patient as potentially seriously ill.

113. While I accept Dr Fisher's point that the letter provided only an incomplete history, I agree with Dr Raftos's view that the writing of the letter, of itself, was a clear indicator to the hospital of Dr Chugh's anxiety and concern for Elu. It would have been desirable, certainly, that Dr Chugh send a more detailed history to the hospital with Elu but his object was to get Elu to hospital urgently. His expectations were both that Mrs Pele could and would provide a fuller history to the hospital and that the hospital would recognise the need to treat Elu as a critical case.

114. Dr Fisher was also disapproving of Dr Chugh for failing to order pathological investigations such as blood counts, biochemistry, CRP and Erythrocyte Sedimentation Rate (ESR) tests. With the benefit of hindsight, it can be seen that it would have been desirable of him to do so. On the other hand, it was reasonable for Dr Chugh to expect the hospitals to carry out such tests in their own pathology laboratories. Dr Raftos considered that on both 15 and 17 December Dr Chugh had acted reasonably and appropriately. While the counsel of perfection suggests more detail ought to have been included in Dr Chugh's letter, Dr Raftos's view strikes me as apt in the circumstances.

115. Dr Chugh retains the trust of the Pele family. In my view, this is appropriate. Although he was uncertain of Elu's diagnosis, he was the one doctor who saw Elu before his final presentation at the Bankstown Hospital on 18 December to recognise that he was gravely ill. In all likelihood, he did so because he knew Elu's history and he took very seriously his parents' anxiety and concern for their son.

116. Criticisms were also made of the note-keeping practices of Drs Poovaiah and Chugh. I will deal with that issue more generally below.

117. In relation to the Emergency Departments, Dr Raftos was clear that Elu should have been further investigated whilst at both Bankstown Hospital and the Children's Hospital with a full white cell count, CRP, blood cultures and lumbar puncture given the signs and symptoms with which he presented. He considered that a CRP test should have been carried out in order to provide information about whether or not Elu had a bacterial infection. He thought that it would probably have been raised near the level of 100 mg/L at the Children's Hospital, and raised significantly in the level between 50 and 100 mg/L at Bankstown Hospital.

118. His opinion reflected the guidelines in that he said that 50-80 per cent of children aged over the age of two years with meningitis will present without signs of meningism, although those signs may develop as the illness develops.

119. Dr Raftos's view was that Elu was presenting with signs of toxicity, in which case the absence of abnormality upon observations of vital signs should not be relied upon to exclude the possibility of a serious bacterial infection. He was clear that urine intake and output and lethargy are signs of toxicity which stand by themselves even in a child with a normal heart and respiratory rate.

120. He placed particular emphasis upon the presence of two of the features of toxicity, lethargy and reduced oral intake/output as indicators that Elu was very ill. Dr Raftos's view, based upon the clinical records, was that those signs, together with the other signs and symptoms such as headache, fever and persisting vomiting, should have flagged Elu to the clinicians as a child who required careful investigation and in relation to whom it was necessary for the worst-case scenario to be excluded before a more benign diagnosis was reached.

121. In Dr Raftos's opinion, Elu had probably had meningitis since he first complained of headache on 14 December 2007, and that the clinicians erred in failing to institute appropriate tests to detect this. Elu had a number of signs of toxicity and displayed a number of the symptoms of meningitis. Despite this, in his view the doctors persisted in diagnoses of gastroenteritis or viral infections which should not have been reached unless more serious diagnoses had been excluded. The signs and symptoms were in any event inconsistent with gastroenteritis given that Elu had no diarrhoea and, at least by late on 16 December, his vomiting had persisted for more than three days. Dr Raftos's oral evidence was that although diarrhoea can occur a number of hours after the onset of gastroenteritis, a delay of a number of days is unlikely because the duration of gastroenteritis is typically less than three days.

122. The extent of Elu's illness was not identified and the apparent improvement with paracetamol should not have been relied upon in making decisions to discharge Elu. Paracetamol, as indicated in the guidelines, can mask the symptoms of meningitis such as fever and headache.

123. Dr Raftos also emphasised the importance of providing accurate information and instructions when a child like Elu is to be discharged. He said that it is important that the

discharge letter includes the clinical assessment. He said that if clinicians had thought in Elu's case that there was a possibility that he had meningitis and that possibility had not been excluded, this should have been stated in the discharge letter. Equally, if the clinicians had believed that a lumbar puncture may be necessary if Elu's condition deteriorated, he was of the view that this should have been stated in the discharge letter.

124. Dr Raftos's opinion was that if a CRP test and blood culture had been carried out at either the Bankstown Hospital or the Children's Hospital at Westmead they would have shown elevated readings suggestive of bacterial infection, although he conceded that a CRP reading of between 50 and 100 mg/L is consistent with either a viral or bacterial infection. He said that if such a reading had been obtained, the clinician should then look to see if there was other evidence of a bacterial infection.

125. He also said that with a reading at this level he would have been thinking it was more likely to be a bacterial than a viral illness. In Dr Raftos's opinion, it would have been illogical to maintain a diagnosis of gastroenteritis if the CRP test had been elevated enough to show a bacterial infection. [The fact that Elu had not had diarrhoea may have clinched the argument.] His view was that a lumbar puncture should have been carried out at both the Bankstown Hospital and at the Children's Hospital in response to Elu's presentation. Had this been carried out, and had Elu been treated with appropriate antibiotics up to the time when he was discharged on 17 December 2007, Dr Raftos thought that he would probably have survived.

126. Despite the fact that a diagnosis of bacterial meningitis was difficult to make in the absence of meningism and a lumbar puncture test, what seems quite clear is that Elu presented to both Bankstown and the Children's Hospital as a toxic child, that is, as a very sick young boy. Although, again, he did not display the full suite of signs and symptoms of toxicity, the tendency in both hospitals appears to have been not to exclude the worst-case scenario but to embrace as a working diagnosis the relatively benign hypothesis of viral gastroenteritis despite the fact that one of the key symptoms of that condition – diarrhoea – was missing. Differential diagnosis ought to have excluded that as working diagnosis at relatively early stage, especially since his history of attendances over a number of days and his parents' growing anxiety must have suggested to anyone who paid close attention to it (as Dr Chugh did) that his condition was deteriorating.

127. The question whether CRP tests should have been ordered was a matter of controversy during the inquest. Dr Raftos conceded that a CRP test was not a definitive diagnostic

test but contended strongly that it ought nevertheless have been carried out together with the Full Blood Count test at both Bankstown and the Children's Hospitals as one of the initial blood tests. He argued that a CRP test would, on the balance of probabilities, have shown that an elevated reading diagnostic of serious bacterial infection. This, in his opinion, would have resulted in Elu's admission to hospital, treatment with antibiotics and probable survival.

128. In cross-examination it was put to Dr Raftos that the CRP test is not good at distinguishing viral from bacterial infections. Although he conceded this, his riposte was that bacterial illnesses are dangerous and the pressing need is for a clinician "to build a profile of evidence". He said that the management of a toxic child should always include urinalysis, white cell and neutrophil counts, CRP and blood culture. While he conceded that none of the diagnostic tests apart from lumbar puncture was 100 per cent sensitive to bacterial infection, he estimated that each test was about 80 per cent accurate in this regard and argued that, therefore, a profile of three tests has a significantly greater chance of detecting a serious bacterial infection than if only one test, such as a white cell and neutrophil count, is carried out.

129. On the face of it, this appears to make very good sense. An argument to the contrary, however, was advanced by Dr Mary McCaskill, Medical Head of the Emergency Department of the Westmead Children's Hospital. In a letter to the court dated 25 February 2010, which became an exhibit in the proceedings, Dr McCaskill stated that studies showed the CRP test will positively indicate a serious bacterial infection in about 60 per cent of cases and, if the level is low, can be used to exclude serious bacterial infection in about 90 per cent of cases. She said "If it is high you can only be 60% sure that the child has a serious bacterial illness as compared with a viral illness or injury which is only marginally higher than guessing."

130. Dr McCaskill explained that in 2005 the hospital had developed guidelines for the use of CRP tests and that they had been reviewed again in 2009 when another test (Procalcitonin) was added to it as another marker of acute inflammation or infection. (I note that this test has about the same margins of error as the CRP test.) She said that in children under three years of age diagnosis of serious bacterial illness is often difficult because of an absence of specific localising signs. On the other hand, children over that age "usually have specific localising signs" of serious bacterial infection. Because of the relatively low positive predictive value of these tests, the guideline recommends that they

not be used in febrile children except in certain cases including "documented daily fever for more than 7 days".

131. From Dr McCaskill's account, it appears that CRP tests are, in her view, too frequently ordered by junior medical staff. The problem this creates is "more confusion by focussing the clinician's attention on the test and not the state of the child… Careful assessment of febrile children and ongoing observation is currently the best method to detect children with serious bacterial infections."

132. I accept Dr McCaskill's general point that "careful assessment" and "ongoing observation" of febrile children may be the best way of detecting serious bacterial infections and her finer point that over-concentration on fallible tests may distract clinicians from their assessment and observation of the patient him- or herself. Nevertheless, it seems to me that an approach that discourages the use of CRP by junior doctors may be flawed. I infer that junior doctors order CRP tests when a senior clinician would not because they lack sufficient experience to make confident differential diagnoses based on their assessment and observations.

133. Further, Dr McCaskill's comments appear to be directed to the assessment of febrile children. It is not clear to me whether she would apply the same rubric in relation to toxic children. One of the problems in Elu's case appears to have been that, despite a neat and easily comprehensible clinical checklist setting out signs of toxicity, he was not assessed as being toxic by the relatively junior hospital clinicians who observed him despite having at least two of the signs.

134. In Elu's case, although he was did not have a non-blanching rash, cancer, osteomyelitis or one of the other specific conditions referred to in the Westmead CRP protocol, there were signs and symptoms other than fever that indicated he may have been suffering from more than a simple infection. He had had a fever for a few days, he was lethargic and his fluid inputs and outputs were down. He did not have diarrhoea.

135. I do not understand Dr Raftos to be asserting that whenever a febrile child presents to a hospital, a CRP test ought be done as a matter of course. His position was more refined that than that: "Appropriate management of a *toxic child with fever without obvious cause* is to perform appropriate investigations to differentiate between viral and bacterial causes of the infection."[xxv] (Emphasis added.) Although considerable time was spent during the inquest arguing the question whether a CRP test ought to have been ordered at

the hospitals, once it is accepted that Elu was a toxic child on his presentation to the hospitals, there may ultimately be little in theory that divides the senior clinicians on this point.

136. Other mistakes or failures were also the subject of evidence given during the hearing. The recording of observations by doctors was not of a high standard. The critical importance of clinical notes cannot be overstated. They serve to provide a baseline for observations and should make clear what the course of a patient's progress has been. They refresh the clinician's memory of any problems, signs, symptoms, investigations and plans. They are the foundation of communication with other members of the health team who may see the patient afterwards. For this reason, *negative findings* are critical information that ought be routinely recorded in progress notes.

137. The patient's notes are also the official medico-legal record of the interaction between the patient and the health service. One group of experts has advised health care professionals:

> Comprehensive records, written when you saw the patient, are the keystone of your defence if you are sued. The better the records, the better is your chance of a successful defence. It does not matter what you did, if you did not write it down, you did not do it! Conversely, if you did write it down, you did do it! [xxvi]

138. Many complaints to the Coroners Court and to the Health Care Complaints Commission are brought because grieving families feel that their concerns were not listened to or were inadequately addressed. If, as the group of experts cited above agree, "avoidance of complaints is facilitated by good communication with patients", keeping a record of those communications is part of the discipline and development of good communication skills. This does not mean recording conversations verbatim, but capturing the essence of them.

139. I do not doubt that the Bankstown Hospital Emergency Department was busy on the night of 16 December. Nevertheless, Dr Govender's failure to make any notes whatsoever in the clinical record was poor clinical practice. She asserted in her statement and her oral evidence that she had expected Dr Rasheed to take notes. Dr Rasheed, although her notes were imperfect in relation to timing of entries, was on the other hand was a much more careful note-taker. Dr Rasheed gave evidence that she ordinarily would not record reviews conducted by her supervisors because she expected that they would make their own notes. She did not take a note of Dr Govender's observations and impressions. Given her reasonably careful note-taking practice, it seems unlikely that, if she had been asked or directed by Dr Govender to take notes on her account, she would have failed to do so. I doubt Dr Govender's evidence that she made such a request to Dr Rasheed.

140. At both Bankstown and the Children's Hospital, Elu's discharge was not well handled. When Elu was discharged from the Bankstown Hospital Mrs Pele's evidence is that Elu found it difficult to walk out. This was an important sign that did not register with Drs Rasheed or Govender. Mrs Pele said that when Elu was discharged she was not told of any signs or symptoms to watch out for on discharge except headache. It seems that it was made clear that a persistent headache required further assessment but it does not seem that Mrs Pele was given adequate explanation of the potential for deterioration in Elu's condition which could require further investigation or assessment or specific information about particular signs to be alert for. Dr Rasheed stated that merely that she had told Mrs Pele to give Elu fluids and analgesia and that if his headache returned, or if he did not improve, to return to the hospital. She gave Mrs Pele a discharge letter for her GP.

141. Given her vigilance and the history of repeated returns to doctors, it is almost inconceivable that if it had been made clear to Mrs Pele that there was a potential diagnosis of meningitis or serious bacterial infection she would not have returned Elu to the hospital promptly for investigations.

142. In retrospect, it seems to me that there may have been both lack of communication about the signs and symptoms to look out for, but also miscommunication. Dr Rasheed recorded in her discharge letter to the GP, "GP to follow up tomorrow". Presumably, this was said to Mrs Pele at the same time as she was told to bring Elu back if the headache persisted (as Dr Rasheed's note records) or "if there is a problem" (as Mrs Pele recollects being told). This strikes me as something of a mixed message. If there was a miscommunication, it may have been compounded by the facts that Dr Rasheed speaks in an Indian accent and Mrs Pele speaks English as a second language in a Samoan accent.

143. There also appears to have been a serious communications failure when Elu was discharged from the Children's Hospital. She said that she had given Mr and Mrs Pele a discharge letter and instructions to go to their GP the following day. Mrs Pele said they did not receive a discharge letter or instructions to return to their GP. She said they were simply told by a nurse that they were free to go home and did not need anything.

144. I doubt that a letter was given to Mrs Pele. Although a discharge note was written by Dr Ho in the computerised file for Elu, Mrs Pele almost certainly did not get it. Given the history, it seems highly likely that if Mr and Mrs Pele had been told to return to their GP the following day they would have done so and if they had been told to come back to

hospital if Elu got any worse, that they would have returned promptly. They would not have ignored a discharge note.

145. Perhaps there was a misunderstanding or miscommunication so that a nurse spoke to Mrs Pele instead of Dr Ho and gave misleading information. In any case, the consequence was that Mr and Mrs Pele concluded that the hospital staff had done all that they could and lost confidence in their ability to help Elu. Thus, during the following day when Elu's condition deteriorated, Mr and Mrs Pele remained with him at home but did not take him to the hospital. Mrs Pele gave him Panamax and massaged him.

146. Mr Windsor submitted that no criticism should be made of the nurses who dealt with Elu. Although some criticisms were made by counsel for the Pele family, they were relatively muted. They had no responsibility for the ultimate diagnoses reached by examining doctors and no capacity to run tests or investigations. In the circumstances, I think that it would unfair to attribute blame for Elu's death in any way to them.

147. The real problem that Elu's case presents is why he was not assessed as being seriously ill but was mistakenly assessed or diagnosed on a number of occasions by the clinicians all of whom, except for Dr Chugh on 17 December, fell back on a relatively benign diagnosis of viral gastroenteritis. In this case, despite the evidence to the contrary – lack of diarrhoea – and without gathering more evidence for or against their theory, most if not all the clinicians appear to have hypothesised that there was a causal connection between Elu's illness and McDonalds hamburgers. This made it easier for them to stop looking for other causes although they did not test their working hypothesis and despite the flaws in it: no evidence of diarrhoea and no other victims of food poisoning (despite the whole family eating the same type of food from the same source).

The phenomenon of diagnostic error

148. How commonly serious illnesses in patients are misdiagnosed is difficult to estimate. Some studies have shown that there are frequently significant differences between clinical diagnoses and findings after a post mortem examination.[xxvii] Prof Jerome Groopman, a specialist in emergency medicine, offers the figure that in the United States "some 10 to 15 per cent of all patients either suffer from a delay in making the correct diagnosis or die before the correct diagnosis is made."[xxviii] Apart from the fact that misdiagnosis, by definition, may never recognised, clinicians may be reluctant to report errors. Both these factors impede the task of measuring the size of the problem statistically.[xxix] A major

study, conducted at the Children's Hospital and recently published, commented that "Emergency department physicians tend to underestimate the likelihood of serious bacterial infection in young children with fever."[xxx] Although the study excluded children over 5 years of age as well as children suffering from meningitis, it nevertheless provides valuable insight into the diagnosis of serious bacterial illness in children. It found that only 70-80 per cent of febrile children presenting with serious bacterial illnesses were prescribed antibiotics on their first presentation at the hospital.[xxxi] It also found that while most children with serious bacterial illnesses were tested with cultures or other appropriate tests, 5-6 per cent were not.[xxxii]

149. Because misdiagnosis, as Elu's case so sadly illustrates, can have deadly consequences, it has been the subject of study, a field known as "cognitive psychology", for many years.[xxxiii] In summary, cognitive psychology is "the science that examines how people reason, formulate judgments, and make decisions."[xxxiv] Stripped of its psychological jargon, cognitive psychology appears to be largely commonsense. Any adult human being knows that we learn from experience and practice. We seek patterns in our activities and we learn from repeating experiences. We are able to make many of our day-to-day decisions because we can call on past experience (which includes errors) virtually without consciously thinking about them.

150. We make a large number of our decisions by taking mental shortcuts. For example, teachers develop "rules of thumb" which provide starting points for assessing the quality of essays presented to them. Sentencing judges and magistrates develop "tariffs" or unwritten guidelines for penalties they impose on offenders. This is why experienced people, whether they are doctors, ministers of religion, bus drivers or parents (one of the most complex of all human occupations), make fewer mistakes than inexperienced people.

151. These learned mental shortcuts are called "heuristics" by cognitive psychologists. Professor James Reason, an expert in cognitive psychology and a specialist in the field of human factors, the study of human error in complex situations, explains, "human beings are furious pattern matchers. When confronted with an unplanned-for situation we are strongly disposed to identify a familiar pattern and, where necessary, apply a problem-solving rule that is part of our stock of expertise."[xxxv]

152. Reliance on these mental shortcuts or "heuristics", useful as they are generally are, carries with it the risk of making mistakes. Professor Groopman contends that misdiagnosis

rarely results from technical error but that "the failure to diagnose reflects the unsuspected errors made while trying to understand the patient's condition."[xxxvi] A normally useful or good rule of thumb may be misapplied because of a failure to take into account contra-indications to the norm.[xxxvii]

153. Dr Donald Redelmeier has observed:

> These errors [can] include the "availability" heuristic (in which people judge likelihood by how easily examples spring to mind), the "anchoring" heuristic (in which people stick with initial impressions), "framing effects" (in which people make different decisions depending on how information is presented), "blind obedience" (in which people stop thinking when confronted with authority), and "premature closure" (in which several alternatives are not pursued).[xxxviii]

154. Professor Groopman identifies three principal types of cognitive error or bias that may lead to misdiagnosis. In addition to the "availability" and "anchoring" heuristics, he believes that "stereotypes can prejudice thinking so conclusions arise not from data but from such preconceptions". This is a cognitive error labelled "attribution".[xxxix]

155. In my view, the errors made by clinicians in Elu's case can be identified or analysed using Redelmeier's and Groopman's categories, in particular, the "availability", "anchoring", "framing effects", "premature closure" and "attribution" heuristics.

156. GPs and Emergency Department clinicians often see febrile children suffering from viral infections such as gastro-enteritis. That diagnosis is to the forefront of their minds because of the frequency with which they make it, and is therefore "available", while meningitis, a comparatively rare condition, is less so despite its gravity and clinical training that emphasises the need to be on the lookout for it because it is rare.

157. Almost all the clinicians – Dr Chugh being the exception on 17 December – appear to have "anchored" themselves once they came to a provisional diagnosis of viral gastro-enteritis despite the evidence to the contrary (lack of diarrhoea) and the availability of other possible diagnoses. "Premature closure" is a consequence of "anchoring".

158. Dr Poovaiah's clinical notes record that the patient was complaining of vomiting "since having McDonalds Hamburgers last night". The way he recorded this information, or "framed" it, suggests a causal relationship between the fast food and the vomiting. That may have reflected a theory he had developed himself or it may have been proposed to him by Elu's parents but once framed in this fashion the theory appears to have remained unchallenged. It does not appear in the Bankstown Hospital progress notes but it appears

(by inference) in the discharge letter signed by Dr Rasheed on 16 December. A similar connection was drawn by Dr Rahman at the Children's Hospital when he took a history. The histories taken by Dr Poovaiah and Dr Rahman were taken into account by Drs Chugh and Ho respectively. It would be surprising if Drs Chugh and Ho were not influenced by the presentation of that information in the form it came to them in the clinical notes.

159. The "framing effect" of the history of Elu eating McDonalds hamburgers probably resulted in the clinicians hypothesising that his illness was viral gastro-enteritis because they subconsciously "attributed" to McDonalds either a lack of hygiene or, more likely, a tendency to keep prepared food warm for lengthy periods, creating a health hazard, characteristics notorious in cheap and badly run fast food shops.

160. It is noteworthy that during the major clinical study conducted by the Children's Hospital, children were excluded from the cohort being studied if they had been referred from another hospital because, as the authors recognised, "it would not be possible for the clinician performing the clinical evaluation at The Children's Hospital to be blinded to this previous assessment."[xl] While the jargon of cognitive psychology is not utilised in the study, this comment demonstrates that the authors were intuitively aware of the potential for error to be caused by being led astray by the preconceptions of others.

What has been done since Elu's death?

161. Following Elu's death, a Root Cause Analysis investigation was conducted by the Children's Hospital in accordance with Division 6C of the *Health Administration Act 1982*. The RCA team made five recommendations, each of which has been adopted:

- Any child presenting twice within 24 hours to any hospital with fever is to be considered for admission, investigation and is to be referred to senior Emergency Department staff;
- Senior Emergency Department staff to be responsible for discharge of patients;
- All children with an Emergency Department stay of longer than four hours are to be held in a special area of the department and reviewed by senior staff before discharge;

- All children discharged from Emergency Departments to be followed up the next day by the Children's Hospital clinic, by GP phone contact or by patient phone contact;

- All reviews by doctors must fully document all important signs, symptoms and *negative findings*, clinical progress, investigations ordered, results of investigations and management plans (emphasis added).

162. In her letter of February 2010, Dr McCaskill also outlined several measures taken by the Children's Hospital. The recommendation made by the RCA team that a child presenting twice within 24 hours with the same illness be considered by a Registrar was refined. It appears that the 24-hour limit is no longer part of the protocol. A consultant or fellow (specialist physicians) must be involved in the diagnosis of a child presenting three times with the same illness and admitted if this occurs overnight.

163. The infrastructure of the hospital has been upgraded. An observation area has been constructed next to the Emergency Department. Children can be admitted to it for up to 24 hours for observation and review by senior physicians. This relieves pressure on inpatient beds and enables doctors to conduct prolonged observation of sick children.

164. The computerised triage questionnaire has been recalibrated. Triage nurses will now enter a list of presenting symptoms and signs but will not offer any diagnostic opinions that may result in junior doctors in Emergency Departments failing to conduct an unbiased differential diagnosis.

165. The large study conducted by the Children's Hospital appears to be a very important step towards more accurate diagnoses of sick children. The study showed that;

> … in combining the demographic items and clinical symptoms and signs relating to febrile illness, the physicians tended to underestimate the likelihood of serious bacterial infection. There were too many relevant signs and symptoms for doctors to assimilate effectively; instead, they tended to discount the information and underestimate the probability of serious disease. As such, the full diagnostic value of current clinical tests was often not reached.[xli]

166. The authors of the study, however, regard that tendency as "potentially correctible". They said:

> … a computer assisted diagnostic decision tool such as that developed in this study could be used to determine the likelihood of serious bacterial infection. Doctors in the emergency department would enter the clinical findings into a computer program and the risk calculation would be generated for them. On the basis of the level of risk, treatment could commence or be withheld until further information is available. The model developed in our study could be calibrated to a low threshold of diagnosis (high sensitivity), for example, which should result in more children with serious bacterial infection receiving

> antibiotics and at an earlier stage of their illness. The trade-off would be a lower specificity, however, resulting in additional testing and treatment for children who do not have serious bacterial infection.[xlii]

167. The study found that the computerised diagnostic model improved the chances of a correct diagnosis of serious bacterial illness, outperforming the clinical judgment of junior doctors[xliii].

168. The value of checklists for reducing error rates in addressing complex problems has been well understood for many years but has been highlighted by recent studies.[xliv] Because they distil past experience, usually of others, the inexperienced practitioner is enabled to avoid, at least to some degree, having to learn from his or her own mistakes. They enable practitioners, experienced or otherwise, to sequence complex operations correctly. As in the Westmead study, with the aid of algorithms and computerised technology, they enable practitioners to gauge some types of probabilities more accurately.

169. They may not, however, be the answer to all the problems of complexity: "an algorithm will only distinguish the set of conditions which could have been foreseen. If an unforeseen event occurs, the operator will not be helped by algorithmic procedures."[xlv] Rare events, if they are not foreseen and are not prepared for, may negate the usefulness of a checklist. One of the difficulties of patient-based medical training may be that some conditions are so rare that, by definition, junior doctors do not see them often.

170. One of the limitations of the Westmead study was that, despite the very large cohort of patients, so few cases of meningitis and a small number of other serious bacterial infections were seen that they were excluded from the study. Vaccination has greatly reduced the incidence of bacterial meningitis. The paradoxical effect has been to also reduce the chances of junior clinicians developing experience of diagnosing it. This creates an issue for the training of clinicians.

171. NSW Health has a project underway of redesigning rostering systems in hospital with the aim of ensuring improved supervision of junior medical staff and better patient care.[xlvi] More extensive or intensive supervision of junior doctors rotating through Emergency Department, combined with diagnostic tools such as the Children's Hospital has developed, is likely to reduce error rates.

172. The discussion of the response to Elu's death has so far touched on systems issues. It is also very important to note the effect of Drs Rasheed and Govender making public statements of apology to the Pele family at the conclusion of their evidence during the

inquest. In Mrs Pele's statement to the court she thanked the two doctors for their apologies. She was gracious in accepting their apologies on behalf of the family and offering the family's forgiveness, saying, among other things, "We believe you have learned from your mistakes and hope you remind others so they can learn too." It was evident that the ability of the young doctors to publicly apologise in the way they did meant a great deal to the family and was helpful to them in coping with their burden of sadness.

173. On the other hand, Mrs Pele was disappointed by the response of Dr Ho and some other witnesses. She asked them to deeply reflect on Elu's death and to "accept you have made serious mistakes". She said that the family would pray for those clinicians and hoped that they would improve their "thinking, training and learning."

What more can be done?

174. I commend the hospital and the Area Health System for the improvements introduced following Elu's death. More, however, can done to reduce the chances of a recurrence of this tragedy. During final submissions, Counsel Assisting floated four potential recommendations. Each was addressed to the Children's Hospital and the Area Health Service. Counsel for the hospital and Area Health Service responded to them in his written submissions. The potential recommendations were, in summary, that:

- the Children's Hospital and Area Health Service review their guidelines to provide for the assessment by senior staff of children presenting with any signs of toxicity before such children are discharged;

- the hospital and Area Health review their guidelines to provide for annual training of clinical staff in Emergency Departments in relation to the detection of meningitis, including the possibility of children presenting without signs of meningism and with normal vital signs, and in relation to the appropriate tests to be conducted;

- the hospital and Area Health Service review the efficacy of CRP and other tests, whether alone or in combination, in improving the diagnosis of serious bacterial infection;

- the hospital and Area Health Service review the literature concerning meningitis they distribute to parents (or carers) on discharge of children with any sign of toxicity. The document given to parents ought include clear, succinct instructions on what to look out for and the importance of returning immediately to a doctor if signs or symptoms are seen.

175. Counsel for the hospital and Area Health Service submitted that I should not adopt the first draft recommendation in its specific terms because (a) the hospital has already largely implemented that measure and (b) NSW Health's response to the Garling Report may cover the situation.

176. While I accept that the Children's Hospital has already instituted changes to its assessment of children being discharged, it is not clear that the Area Health Service has done so. How Bankstown Hospital or other general (non-teaching) hospitals now manage the discharge of children also needs review. Neither the Garling Report nor NSW Health's response appears to deal directly with practice at discharge. Unsurprisingly, given the terms of reference of the Garling Inquiry, its recommendations were directed at more general issues as is the response, the "Caring Together" report. I therefore propose to make the recommendation.

177. In relation to the second proposed recommendation, Mr Windsor brought the relevant parts of the Garling Report and also a project of the NSW Clinical Excellence Commission called "Between the Flags" to my attention. The latter is designed to enhance the care and management of deteriorating children (including those with meningitis). He suggested that "the focus of this proposed recommendation may perhaps be better directed to training in relation to the recognition of the sick or deteriorating child (which would include a child with meningitis) rather than just focusing on a child with meningitis."

178. The "Between the Flags" program appears to be a very good program. It is largely built around checklists on standard observation charts. This is an excellent innovation. Nevertheless, it is not clear that it include any specific material on the early detection of meningitis in children. Mr Windsor's suggestion of a more general recommendation has some force because, as Dr Raftos argued, had Elu been managed as a *toxic* child his chances would have been improved even without a definite diagnosis of meningitis.

179. One of the principal aims of this inquest, however, is to assist clinicians in improving their diagnostic skills in relation to meningitis. Whether training specifically in relation to meningitis would be more effective than a more general approach is difficult for me to say. I suspect, however, that awareness and mindfulness of meningitis is likely to be more acutely triggered if it is treated a separate subject or, at the very least, as a distinct sub-category rather than being incorporated in the more diffuse exercise of diagnosing sick or deteriorating children. I concede that specialists in clinical education may take a different view and support Mr Windsor's approach. I propose therefore to make the recommendation originally drafted but with the qualification that the hospital "consider" providing annual training in specifically in relation to the detection of meningitis.

180. Mr Windsor did not support the third draft recommendation because of the conflict between the expert opinions of Drs Raftos and McCaskill. In short, his submission was that Dr McCaskill's view – discussed above – ought prevail. This is a question for experts and further research appears to be needed. That is the thrust of Counsel Assisting's proposed recommendation. I note that the British meningitis guidelines, which formed part of the evidence, include CRP tests as one of the standard investigations in suspected meningitis cases. In my view, Counsel Assisting's proposed recommendation is a sound one and I will make it.

181. In relation to the fourth proposed recommendation, Mr Windsor submitted that this question was already addressed in NSW Health's response to the Garling Report[xlvii]. To a significant degree that is correct. The Garling Report recommended that, on discharge from hospital, patients be given a document in plain language that outlined (a) the details of their medications; (b) the details of their care plan; (c) resources available to them and (d) their follow-up appointments.[xlviii] Counsel Assisting's proposed recommendation, however, incorporates the additional suggestion that the document warn the parent or carer of signs and symptoms that ought prompt an immediate return to a doctor or the hospital. This is a more specific and refined suggestion than the Garling recommendation. I propose to adopt it.

182. In the Westmead study, discussing its policy implications, the authors remark:

> Diagnostic decision-making has received little attention compared with therapeutics despite the universally accepted "medical mantra" of the importance of history taking and physical examination for all patients. Given the complexity of this process and the sheer number of clinical symptoms and signs elicited (including multiple thresholds at multiple and varying times during the illness), it is highly likely that errors in judgment occur when combining these clinical features.

183. I commend the Children's Hospital for the care and intensity of its study – one of the largest ever conducted in the world – and its desire to improve the diagnostic skills of the junior medical staff who train in the hospital.

184. The Westmead study found that a "generally unwell" appearance was the strongest marker or sign of serious bacterial infection. Other strong markers found were raised temperature, no fluid intake in the previous 24 hours, increased capillary refill time and chronic disease. A factor not listed was parental concern.

185. In the NSW Health guidelines[xlix] and Professor Fulde's manual on emergency medicine[l], parental concern is identified as a significant indicator of a child being sick. The clinical guidelines state, "Generally, parents know their children best and recognise when they are unwell. Always listen to parents' concerns."[li] Although it may be implicit in the fact that a parent has brought a child to an Emergency Department that the parent is concerned, the nature and degree of a parent's concerns may be helpful in diagnosing a toxic child. I propose to recommend that consideration be given to including an appropriate inquiry (necessarily subjective but potentially indicative) in the triage questionnaire measuring the degree of parental concern.

186. I also propose recommending that the Children's Hospital consider whether this factor can and should be built into its computerised diagnostic tool.

187. One indicator of the seriousness of parental concern and a child's illness may be the number of recent attendances at hospitals and on GPs. I propose recommending that the triage questionnaire also include that inquiry and that consideration be given to including it in the diagnostic tool.

188. Given the strength of the findings of the Westmead study, I also propose to recommend that NSW Health consider rolling out the diagnostic tool to all NSW hospital Emergency Departments. Finally, given that children with insidious or slow-moving forms of meningitis are likely to present first to a GP, I will recommend that NSW Health consider ways in which the diagnostic tool (or a version of it) may be made available to primary carers.

189. The problem of diagnosing rare conditions is not an insurmountable training challenge. Case studies can be very useful exercises but simulations are probably an even better method of training practitioners how to respond correctly to rare events. In another

inquest, I was given evidence of a multi-media training module ("SCORPIO") developed by the Royal Prince Alfred Hospital for training its staff in handling neo-natal emergencies.[lii] I recommend that, if it has not already done so, the Children's Hospital consider developing a training module in which clinicians not only discuss but *practice* the diagnosis and treatment of rare but serious bacterial infections in simulated settings.

190. I note that the Garling Report recommended the establishment of a NSW Institute for Clinical Education and Training and that NSW Health's response has been to support the recommendation. If so, NSW Health might consider adopting this recommendation in respect of the new Institute.

191. The insidious difficulty of misdiagnosis due to cognitive error is more problematic because the errors are made subconsciously. They are also likely to be made when the cognitive load is high or when the thing being looked for is only seen rarely.[liii] Metacognition is the science of thinking about thinking. Despite the inherent difficulties in developing clinicians' awareness of their own thinking in the clinical setting, I understand that in some universities and teaching hospitals the study of cognitive psychology has been introduced into the medical syllabus with a view to reducing medical error rates.[liv] To some degree, the principles of metacognition and awareness of cognitive error are built into the practice of differential diagnosis and are thus an integral part of a medical education. Nevertheless, I recommend that, if it has not already done so, the Children's Hospital consider formally integrating the study of cognitive bias and error into its teaching and training syllabus.

Conclusion

194. "Evidence-based medicine", with its emphasis on scientific method, is, correctly, the dominant paradigm in clinical diagnosis. Diagnosis, however, is art as well as science. Open-mindedness, experience, intellectual curiosity, respect for others and sensitivity to their genuine concerns are defences against leaping to conclusions, the diagnostic errors that sometimes prove fatal.

195. In her statement to the court, Mrs Pele said "There is nothing worse than carrying your baby, caring and guarding it so jealously and dreaming of its future, only to have it ripped away from you. The pain of losing a child is so incomprehensible by someone who has

not experienced such a loss, there are no words to describe it. We have tried many times to describe the feeling of Elu's loss and we have never managed to fully describe it."

196. I am sure that everyone who heard her speak in court was moved by her words and pain. It would be foolish for a coroner to think that he or she could eliminate that pain or provide "closure" to a family who have lost a child like this. I hope, however, that it may be some small measure of comfort to the Pele family to know that this Court and all those who have taken part in this inquest have taken Elu's death very seriously and hope that some good will come of it so that the risk other families suffering the same experience will be reduced.

197. I now turn to the formal findings and recommendations I propose to make under the Coroners Act.

Findings

198. Pursuant to s 81 of the *Coroners Act 2009*, I find that Isaraelu Pele died on 18 December 2007 at Bankstown Hospital, Bankstown, New South Wales of bacterial meningitis that had not been diagnosed by a number of clinicians who had examined him.

Recommendations

199. Pursuant to s 82 of the *Coroners Act 2009,* I make the following recommendations:

To the Minister for Health:

- I recommend that the Royal Alexandra Hospital for Children (the Children's Hospital at Westmead) and the Sydney South West Area Health Service review their guidelines to provide for the assessment by senior staff of children presenting with any signs of toxicity before such children are discharged;

- I recommend that the Children's Hospital and Area Health Service review their guidelines to provide for annual training of clinical staff in Emergency Departments in relation to the detection of meningitis, including the possibility of children presenting without signs of

meningism and with normal vital signs, and in relation to the appropriate tests to be conducted;

- I recommend that the children's Hospital and Area Health Service review the efficacy of CRP and other tests, whether alone or in combination, in improving the diagnosis of serious bacterial infection;

- I recommend that the Children's Hospital and Area Health Service review the literature concerning meningitis they distribute to parents (or carers) on discharge of children with any sign of toxicity. The document given to parents ought include clear, succinct instructions on what to look out for and the importance of returning immediately to a doctor if signs or symptoms are seen.

- I recommend that the Children's Hospital and Area Health Service the consider amending their triage questionnaire to include an inquiry as to the number of recent attendances made by children at hospitals or on General Practitioners in relation to the same illness.

- I recommend that the Children's Hospital and Area Health Service consider amending their triage questionnaires to include an inquiry seeking to measure the degree of parental concern.

- I recommend that the Children's Hospital consider whether a measure of "parental concern" can and should be built into its computerised diagnostic tool for serious bacterial infection.

- I recommend that NSW Health consider rolling out the Children's Hospital's computerised diagnostic tool to all NSW hospital Emergency Departments.

- I recommend that NSW Health consider ways in which the Children's Hospital's computerised diagnostic tool (or a suitable version of it) may be made available to primary carers.

- I recommend that, if it has not already done so, the Children's Hospital consider developing a training module in which clinicians not only discuss but *practice* the diagnosis and treatment of rare but serious bacterial infections in simulated settings.

- I recommend that, if it has not already done so, the Children's Hospital consider formally integrating the study of cognitive bias and error into its teaching and training syllabus concerning differential diagnosis.

Magistrate Hugh Dillon
Deputy State Coroner

Endnotes

[i] *The Suppliant Women* lines 1120-1121.

[ii] See NSW Health *Management of meningitis in infants and children: Clinical practice guidelines* (2005) p.3.

[iii] Marjorie Lazoff MD "Meningitis" eMedicine Emergency Medicine: see emedicine.medscape.com/article/784389-overview viewed 01/03/10.

[iv] NSW Health (2006) p.6.

[v] Professor of Medicine at the University of Sydney and Member of the Court of Examiners, Australasian College of Emergency Medicine.

[vi] Paediatric physician, Emergency Department, Westmead Children's Hospital.

[vii] "Childhood emergencies" in Gordion WO Fulde (ed) *Emergency Medicine: Principles of Practice* 5th ed, Elsevier, Sydney 2009 p.503.

[viii] Kernig's sign: the patient's hip is flexed and knee extended. Inability to do these things without pain is a sign of meningitis. Brudzinki's sign: the patient's neck is flexed. If this is followed by the patient's hips and knees also flexing it is a positive sign of meningitis.

[ix] See NSW Health *Management of acute bacterial infection in infants and young children*, Sydney 2005 p.2.

[x] See Groopman, J. *How Doctors Think* Scribe, Melbourne, 2007 pp. 65, 75. [See further discussion at pp35ff of these findings.]

[xi] NSW Department of Health *Clinical Practice Guidelines – Management of acute bacterial meningitis in infants and children*, January 2005 p.8.

[xii] *Meningitis Fact Sheet* from the Children's Hospital at Westmead – p.1.

[xiii] *Meningitis Fact Sheet* from the Children's Hospital at Westmead – p.1.

[xiv] NSW Department of Health *Clinical Practice Guidelines – Management of acute bacterial meningitis in infants and children*, January 2005 p.3.

[xv] NSW Department of Health *Clinical Practice Guidelines – Management of acute bacterial meningitis in infants and children*, January 2005 p.4

[xvi] NSW Department of Health *Clinical Practice Guidelines – Recognition of a Sick Child in Emergency Departments*, January 2005 – p.3; NSW Department of Health *Clinical Practice Guidelines – Management of acute bacterial meningitis in infants and children*, January 2005 p.3; see also Fulde "The seriously ill patient: tips and traps" op cit at p351: "Repeated questions or protests, eg the patient, the patient's mother, anybody who keeps telling you 'they are sick' or 'this is not normal for the patient' are a key indicator of pathology going on."

[xvii] NSW Department of Health *Clinical Practice Guidelines – Acute management of infants and children with fever*, January 2005 – p.7

[xviii] NSW Department of Health *Clinical Practice Guidelines - Acute management of infants and children with fever*, January 2005 – p.5.

[xix] NSW Department of Health *Clinical Practice Guidelines – Management of acute bacterial meningitis in infants and children*, January 2005 p.9

[xx] NSW Department of Health *Clinical Practice Guidelines Acute management of infants and children with fever*, January 2005 – p.8;

[xxi] NSW Department of Health *Clinical Practice Guidelines - Acute management of infants and children with fever*, January 2005 – p.12.

[xxii] See Craig, J et al "The accuracy of clinical symptoms and signs for the diagnosis of serious bacterial infection in febrile young children: prospective cohort study of 15,781 illnesses" BMJ 2010; 340: c1594 published 20/04/10 http://www.bmj.com/cgi/content/full/340/apr19_2/c1594 viewed 27 April 2010. The study found that of over 15,000 children under 5 diagnosed by the Children's Hospital Westmead about seven *per cent* had been suffering from serious bacterial infections, only six children in total had been diagnosed with meningitis.

[xxiii] *The Checklist Manifesto: how to get things right* Profile Books, London, 2010, p.9

[xxiv] Fulde "The Seriously ill patient: tips and traps" in Fulde (ed) op cit p.352.

[xxv] Report of 20 December 2008.

[xxvi] S Lesley Forster, Gordion W.O. Fulde & Sally McCarthy "Emergency department administration, legal matters and quality care" in Gordion W.O. Fulde (ed) op cit p.724.

[xxvii] See Weingart, S et al "Epidemiology of medical error" *British Medical Journal* Vol 320 18/03/2000 774-777 at p. 775.

[xxviii] "Diagnosis: what doctors are missing" *New York Review of Books* Vol 56, No 17 05/11/2009.

[xxix] Weingart et al. op cit p. 776.

[xxx] Craig et al. op cit p.1 of 12 of PDF version.

[xxxi] Ibid p11 of 12.

[xxxii] Ibid Fig 2 p.4 of 12.

[xxxiii] See, for example, Tversky, A & Kahneman "Judgement under uncertainty: heuristics and biases: bias in judgments reveals some heuristics of thinking under uncertainty" *Science* Vol. 185, No.4157 (1974); Croskerry, Poovaiah "The Cognitive Imperative: Thinking about how we think" *Academic Emergency Medicine* Vol 7, No.11 (2000); Redelmeier et al "Problems for clinical judgment: introducing cognitive psychology as one more basis science" *Canadian Medical Association Journal* Vol 164, No.3 (2001); Groopman, J *How Doctors Think* Scribe, Melbourne, 2007.

[xxxiv] Redelmeier, D "The Cognitive Psychology of Missed Diagnoses" *Annals of Internal Medicine* Vol 142, No.2 (2005) 115-120 at p.115.

[xxxv] *The Human Contribution: Unsafe acts, accidents and heroic recoveries* Ashgate, Farnham UK, 2008 p.45.

[xxxvi] Groopman (2009) op cit.

[xxxvii] Reason, op cit. p.45.

[xxxviii] Redelmeier op cit p.115.

[xxxix] Groopman (2009) op cit.

[xl] Craig et al. op cit. p3 of 12 in PDF version.

[xli] Ibid p.9 of 12.

[xlii] Ibid p.9 of 12.

[xliii] Ibid p.11 of 12.

[xliv] See, for example, Haynes, A et al "A surgical safety checklist to reduce morbidity and mortality in a global population" New England J of Med (2009) 360: 491- 499; Gawande, A *The Checklist Manifesto: how to get things right* Profile Books, London 2010.

[xlv] Reason, J *Human Error* Cambridge University Press, Cambridge 1990 p.243.

[xlvi] "Caring together – Health Action Plan for NSW" Sydney, 2009 p.26: response to Garling recommendation 41.

[xlvii] "Caring together – Health Action Plan for NSW" Sydney, 2009.

[xlviii] Recommendation 61(a)-(d).

[xlix] "Recognition of a sick child in Emergency Departments", Sydney 2005 p.1, 2; "Acute management of infants and children with fever", Sydney 2005 p.3; "Management of acute bacterial meningitis in children", Sydney 2005 p.3.

[l] Fulde, G "The seriously ill patient: tips and traps" in Fulde (ed) op cit p.351.

[li] "Recognition of a sick child in Emergency Departments", Sydney 2005 p.2.

[lii] Inquest into the death of Alisha Jamal, Sydney Coroners Court, 23 March 2010.

[liii] Wolfe, JM et al. "Cognitive psychology: Rare items often missed in visual searches" *Nature* (2005) 435, 439-440.

[liv] See, for example, Hershberger, PJ et al "Understanding and addressing cognitive bias in medical education" *Advances in Health Sciences Education* (1997) 1: 221-226; Redelmeier DA et al "Problems for clinical judgment: introducing cognitive psychology as one more basic science." *Canadian Medical Association Journal* (2001) 164(3): 358-360.