CORONERS COURT
OF NEW SOUTH WALES

Inquest:	Inquest into the death of Jarrod Wright
Hearing dates:	5 – 9 November 2018
Date of findings:	17 December 2018
Place of findings:	NSW Coroners Court - Glebe
Findings of:	Magistrate Elizabeth Ryan, Deputy State Coroner
Catchwords:	CORONIAL LAW – cause of death – cellulitis and hypoxaemia - was nursing/patient ratio in ICU appropriate – was hypoxaemia appropriately treated – are changes needed to hospital's monitoring and alarm systems.
File number:	2016/355820
Representation:	Counsel Assisting the inquest: P Dwyer of Counsel i/b Crown Solicitors Office. South Western Sydney Local Health District: P Rooney of Counsel i/b McCabe Curwoods Solicitors. Dr R Chin: C Jackson of Counsel i/b Avant Law. Dr W O'Regan and Dr A Wagh: T Berberian of Counsel i/b HWL Ebsworth Lawyers. Registered Nurses L Irvine, C Thebridge and A Dawson: M Byrne of NSW Nurses and Midwives' Association.

Findings:	**Identity** The person who died is Jarrod Wright born 23 April 1974. **Date of death**: Jarrod Wright died on 9 July 2016. **Place of death**: Jarrod Wright died at Liverpool Hospital, Liverpool NSW 2170. **Cause of death:** Jarrod Wright died as a result of cardiac arrest following hypoxic ischaemic encephalopathy, likely due to E.coli septicaemia. **Manner of death:** Jarrod Wright died as a result of natural causes, in circumstances where his condition of hypoxaemia was not appropriately managed in hospital.
Recommendation:	To the Executive Director of the South Western Sydney Local Health District: That consideration be given to releasing as a Policy Directive, the Guideline titled Nursing Workforce in ICU issued in November 2016.

Table of Contents

Section 81(1) of the *Coroners Act 2009 (NSW)* [the Act] requires that when an inquest is held, the Coroner must record in writing his or her findings as to various aspects of the death.

These are the findings of an inquest into the death of Jarrod Wright.

Introduction

1. Jarrod Wright was 42 years of age when he died in Liverpool Hospital on 9 July 2016.

2. Jarrod had been admitted to hospital on 30 June 2016 suffering a painful right leg. He was diagnosed with infection and was treated intravenously with antibiotics. He appeared to be recovering well. However on the morning of 3 July he suffered severe respiratory distress and was transferred to the Hospital's Intensive Care Unit.

3. During the afternoon and evening of 3 July Jarrod became very agitated. At 10.15pm he was discovered lying across his hospital bed unconscious and severely hypoxic, having evidently removed the leads which gave him access to his oxygen support and his antibiotic medication. Tragically he had suffered very significant brain damage as a result of oxygen deprivation. After

Jarrod's family were consulted, his life support was removed on 9 July. He was pronounced deceased at 6.20pm that evening.

Issues at the inquest

4. The inquest examined the following issues:

    - what was the medical cause of Jarrod's death?
    - was his care and treatment appropriately managed at Liverpool Hospital?

The role of the Coroner

5. Pursuant to section 81 of the Act a Coroner must make findings as to the date and place of a person's death, and the cause and manner of death.

6. In addition the Coroner may make recommendations in relation to matters which have the capacity to improve public health and safety in the future, arising out of the death in question.

Jarrod's life

7. Jarrod was born on 23 April 1974 in Sydney. He and his two sisters Amanda and Kelly were raised by their parents Raymond and Lynette.

8. As an adult Jarrod worked as a foreman, landscaper and bricklayer. His sister Amanda described him as a lively, talented person who could excel at most things he tried, whether academic, sporting or creative. She said he suffered '*a few bad years'* with drug and alcohol use, but mostly pulled through with the support of his loving family, in particular his father Raymond.

9. Jarrod was close to his family and at the time of his death he was living with Raymond and Lynette in Narellan Vale. He loved going out fishing with Raymond, building things in the garage, and devoting his time to his nieces and nephews who adored him. He was also a keen volunteer and was about to commence unpaid work with the Rural Fire Service.

10. Jarrod's death came as a terrible shock to his family. He was much loved and they miss him deeply. It was very important for them to understand how it was that he died, and whether anything might be done to help prevent such a tragedy from happening to another family.

Events of 30 June 2016

11. Jarrod awoke on the morning of 30 June 2016 with a bruise-like mark on his right upper leg. He went to work but the mark on his leg increased and began to cause him a great deal of pain. At about 9.30am he rang his father and asked him to collect him from his worksite.

12. Seeing how much pain Jarrod was in Raymond drove him straight to Camden Hospital's Emergency Department. There the medical staff decided Jarrod needed an urgent transfer to Liverpool Hospital. Their provisional diagnosis was that he may have necrotising fasciitis. This rare and dangerous bacterial infection affects the tissue that surrounds muscles, nerves and blood vessels. It spreads quickly in the body and can cause death due to sepsis and organ failure.

13. Before transferring Jarrod, Camden Hospital took blood samples and commenced him on intravenous antibiotic treatment. Their brief period of care and treatment of Jarrod was acknowledged at the inquest to have been entirely appropriate.

At Liverpool Hospital: on the Orthopaedics Ward

14. Jarrod remained at Liverpool Hospital from his arrival at 3pm on 30 June, until his death there on 9 July.

15. At about 5pm on 30 June Jarrod was examined by Dr Dean Morris, who was then an Orthopaedics Registrar at Liverpool Hospital and now ??. By this time tests had detected the Escherichia coli [E.coli] bactaerium in Jarrod's blood stream.

16. After examining Jarrod Dr Morris rang his on call supervisor, Orthopaedics Consultant Dr Raymond Chin, to form a Treatment Plan. They were uncertain at this stage whether Jarrod's leg infection was the result of necrotising fasciitis or alternatively of cellulitis, an infection of the skin and the area just beneath it. They considered the latter significantly more likely, as Jarrod's tissue did not show signs of infection below the level of the subcutaneous region. For this reason they decided not to undertake surgical exploration of Jarrod's thigh, which is necessary where necrotising fasciitis is indicated.

17. The Treatment Plan they formed for Jarrod was to:

    - admit him into the care of the Orthopaedics Ward
    - develop a blood culture
    - order an urgent CT scan of Jarrod's right thigh to look for evidence of necrotising fasciitis or an abscess
    - continue Jarrod's treatment with the three antibiotics meropenem, clindamycin and vancomycin, delivered intravenously.
    - review Jarrod's case with the hospital's Infectious Diseases Team.

18. At the inquest there was a consensus of expert opinion that the cellulitis diagnosis was correct. Jarrod's CT scans did not show features consistent with necrotising fasciitis. In addition over the following days his leg infection responded well to the antibiotic treatment. By 2 July he had regained almost full movement of his right leg, and the redness and swelling had receded. Jarrod's vital signs, with the exception of his oxygen saturation, had returned to normal levels. The court heard that antibiotic treatment alone was most unlikely to have achieved these results if Jarrod had necrotising fasciitis.

19. Further, the expert witnesses at the inquest confirmed that the antibiotics prescribed for Jarrod at Camden and Liverpool Hospitals were the appropriate ones for the treatment of E.coli infection, as well as for patients with either cellulitis or necrotising fasciitis.

20. Although Jarrod's infected thigh continued to improve while on the Orthopaedics Ward, two complications began to emerge. These were problems with receiving antibiotics which caused Jarrod to miss some doses; and the development of respiratory distress.

Missed antibiotic doses

21. On 1 and 2 July Jarrod's nurses had difficulty maintaining intravenous access for his antibiotics. The cannula inserted into his inside elbow for this purpose repeatedly 'tissued', meaning the fluid was infusing into the tissues surrounding the entry site. Other access sites on his body were sought, with mixed success.

22. At the inquest Ms Juliann Smolders, who was the Nursing Unit Manager on duty during the night of 1 July, said she had raised with medical staff the problem with Jarrod's tissuing. She was not able to recall whether there was discussion of an alternative access route. Dr Chin's evidence was that he was not informed of the difficulty. However he said he wouldn't expect to be informed of it, as ordinarily it would be resolved on the ward.

23. The result was that while on the Orthopaedics Ward Jarrod did not receive all of his prescribed doses of antibiotics. He missed his doses of meropenem and clindamycin on the mornings of 1, 2 and 3 July, and may have missed his night dose of these two medications on 1 July.

24. What contribution if any did missing these doses make to Jarrod's death? This question is addressed later in these findings.

Jarrod's hypoxaemia

25. The second and more serious complication which emerged was hypoxaemia, which is an abnormally low level of oxygen in the blood. Throughout the night of 2 July Jarrod needed to receive oxygen through nasal prongs due to his reduced levels of oxygen saturation. By 7.30am the next morning he was suffering serious respiratory difficulty, with saturation at the critically low level of 55%. A medical emergency was declared and he was transferred to the Intensive Care Ward.

26. Here Jarrod was reviewed by Dr Angus McNally, a junior ICU Registrar, and then by Senior ICU Registrar Dr Atul Wagh. Jarrod had received a chest x-ray at 7.55am. This showed fluid accumulating in the tissues and air spaces of his lungs, which suggested infective pulmonary oedema. If acute, this condition can lead to fatal respiratory distress or cardiac arrest due to

hypoxia. When a repeat x-ray was performed at 9.58am Jarrod's lung abnormalities had worsened.

27. The ICU management plan now focused on improving Jarrod's respiratory function, while finding and treating the underlying cause of the pulmonary oedema.

28. In Dr Wagh's opinion Jarrod's chest x-ray suggested he was suffering acute respiratory distress syndrome, or ARDS. This is a type of respiratory failure characterised by rapid onset of inflammation in the lungs. Severe sepsis is the most common trigger. Jarrod's doctors thought it unlikely the source of sepsis was his leg infection because this had been settling. They suspected an abdominal or pelvic source, and were keen to expedite a CT scan of these areas.

29. Soon after his arrival in the ICU Unit Jarrod's difficulties with receiving IV antibiotics were remedied. Dr Wagh inserted a PICC line, which is a line inserted into a peripheral vein. It is considered appropriate only if an IV cannula is not effective, as it is more invasive and carries an increased risk of clotting and infection.

30. To improve Jarrod's respiratory function Dr McNally and Dr Wagh placed him on CPAP ventilation. This method of oxygen support delivers pressurised air on a continuous basis to the patient's airways through a mask attached to a machine. Like an oxygen mask, it is considered a non-invasive form of airway support because it is administered through a face mask rather than an endotracheal tube.

Events of the afternoon, 3 July

31. During the afternoon and evening of 3 July Jarrod's levels of agitation and anxiety mounted significantly. This was most likely due to the combined effects of an unfamiliar environment, pain, and withdrawal from alcohol. In hindsight it was clear to all that during this period Jarrod's agitation began to impact very adversely on his medical care. Specifically, it made him unable and unwilling to cooperate with the oxygen support he needed for his hypoxaemia. Jarrod's recurring episodes of non-compliance with his oxygen support, coupled with his critical need for this therapy, presented a very difficult situation for clinical staff to manage. The way in which the hospital attempted to manage this situation lies at the heart of what went wrong that night.

32. As regards Jarrod's emotional condition that afternoon, there is a disparity between the accounts given by his doctors compared with those of his nurses.

33. During the afternoon Dr Wagh and Dr McNally continued to see Jarrod on an informal basis. Dr McNally recalled that Jarrod was *'moderately agitated'* in the afternoon, and that his oxygen saturations were '*borderline low but not critical'* at an average of 88-89%. To ensure a more reliable oxygen flow, Dr

McNally asked the nursing staff to encourage Jarrod to use his CPAP *'if he would tolerate it.*' Alternatively he was to use a non-rebreather mask. This is a face mask and bag attached to an oxygen tank, which some patients find easier to tolerate than a CPAP machine. It does however rely on the patient to be able and willing to take in air independently.

34. Although they could not recall the details, Dr McNally and Dr Wagh were aware that in the early evening Jarrod was prescribed the sedative medication dexmedetomidine, which they presumed was in response to reports of increasing agitation.

35. Jarrod's nurses presented a far more detailed picture of his deteriorating emotional condition. On arrival in ICU Jarrod was allocated to Registered Nurse Carl Thebridge, who involved himself closely in Jarrod's care. RN Thebridge was also responsible for the care of a second ICU patient in another room. The question whether this nursing/patient ratio was appropriate is addressed later in these findings.

36. Although Jarrod had been reasonably settled in the morning, around 1pm or 2pm the situation changed. He became increasingly frustrated with his non-rebreather mask, then refused to use it at all. RN Thebridge noted with alarm that whenever Jarrod removed the mask his oxygen saturations dropped to as low as 60% on room air. With some difficulty RN Thebridge persuaded Jarrod to replace it, explaining to him its importance in enabling him to get enough oxygen. He also said he informed the ICU Registrars of his concerns (he was unable to recall which doctor) and secured a prescribed dose of the sedative diazepam to help settle Jarrod.

37. At about 3pm Jarrod's challenging behaviour reasserted itself when he needed to use the toilet, but was told he should use a bedpan instead. Angry and frustrated, he took off his Blood Pressure cuff and refused to replace it or to take any further diazepam.

38. When RN Thebridge returned from his meal break at 6.15pm he discovered from the relieving nurse that Jarrod had insisted on going to the bathroom and had disconnected himself from his monitor. Jarrod was breathless, with oxygen saturations at 82%. He reacted angrily when RN Thebridge insisted on remaining in his room to ensure his saturations returned to an acceptable level. RN Thebridge again called for the assistance of the ICU Registrars. It seems to have been at this point that medical staff prescribed the sedative dexmedetomidine, in the form of an infusion.

39. Soon afterwards RN Thebridge briefed the nurse who was to succeed him in Jarrod's care, RN Anthony Dawson. Together they persuaded an agitated Jarrod to persevere with his oxygen support and to receive his dexmedetomidine infusion.

40. RN Dawson was rostered for the night shift of 7pm to 7.30am. For the first three hours of his shift he felt unable to leave Jarrod's side in order to tend to his second patient. He described Jarrod as highly agitated. Jarrod

continually attempted to remove his oxygen mask, causing his saturations to drop to levels of 60-80% on room air. In accordance with protocol, RN Dawson remained with Jarrod while the dexmedetomidine infusion was in progress.

41. According to RN Dawson, during the evening ward round the Senior ICU Registrar instructed him to increase Jarrod's ventilation pressure. RN Dawson said he explained the difficulties they had experienced getting Jarrod to tolerate even the existing settings of ventilation; however the senior registrar was dismissive.

The critical incident

42. Around 10pm Jarrod fell asleep, and RN Dawson felt able to leave the room to assess his other patient. Fifteen minutes later he returned to Jarrod's room. Jarrod was lying across his bed. His monitoring leads were still connected to his body but they had been pulled out of the bedside module, which was normally connected to his monitor and which ensured his oxygen and antibiotic supply. Jarrod's oxygen mask was off and he was not receiving any oxygen or respiratory support. RN Dawson saw a trail of blood and faeces on the floor leading from the bathroom door, which was open.

43. Jarrod's skin had a bluish discoloration, he was unresponsive, and he was breathing in a shallow manner. RN Dawson immediately replaced his oxygen mask and raised an alarm.

44. Jarrod's care was escalated to life support. He was intubated, and given chest compressions and adrenaline. But although the resuscitation team achieved a return to spontaneous circulation, Jarrod had received very significant brain damage due to his lack of oxygen. On 9 July Jarrod's family made the very difficult decision to remove him from his life support. He was pronounced deceased that night.

Expert evidence

45. The inquest heard evidence from the following expert witnesses regarding the cause of Jarrod's death and the appropriateness of his care and treatment:

    - Associate Professor Richard Lee, instensive care specialist and anaesthetist.

    - Dr Bernard Hudson, infectious diseases physician and microbiologist.

    - Dr Anthony Smith, orthopaedic surgeon.

46. In addition evidence was heard from Dr William O'Regan, consultant staff specialist within Liverpool Hospital's ICU. Dr O'Regan also held this position when Jarrod was in the care of Liverpool Hospital ICU, and had some involvement in his care.

What was the medical cause of Jarrod's death?

47. After Jarrod's death, limited autopsy orders were made consisting of an external examination and a toxicological analysis of his post mortem blood samples. These examinations were conducted by forensic pathologist Dr Allan Cala without the benefit of Jarrod's hospital records. Dr Cala initially found the cause of Jarrod's death to be an underlying septicaemia.

48. After having the opportunity to review the hospital records Dr Cala provided two supplementary reports. He amended the cause of death to: *'Hypoxic ischaemic encephalopathy (hypoxic brain damage) following cardiac arrest due to sepsis following cellulitis of the right thigh'.*

49. At the inquest Associate Professor Lee was of the view that the medical evidence better supported a cause of death as follows: *'Cardiac arrest following hypoxic ischaemic encephalopathy likely due to E.coli septicaemia'*. Put simply, Jarrod failed to receive sufficient oxygen to maintain his cardiac function. The immediate triggering event was the removal (most likely by himself) of his oxygen support. However the reason why he required oxygen support was most likely related to the effect of the E.coli bactaerium in his body.

50. Dr Hudson's opinion as to the cause of Jarrod's death was generally in accordance with this formulation.

51. As to what the source of Jarrod's E.coli septicaemia was, Associate Professor Lee and Dr Hudson were agreed that this could not be identified. They thought it was unlikely to have been his thigh cellulitis, as this was resolving by the time he developed respiratory distress. Dr Hudson speculated that further post mortem examination might have identified in Jarrod's liver, spleen or kidneys an underlying cause for the E.coli infiltration, noting that E.coli generally has its source in the abdomen or pelvic region. Associate Professor Lee agreed it was possible Jarrod had been suffering an intra-abdominal sepsis which had caused or contributed to his lung abnormalities and consequent hypoxaemia. In the absence of clear evidence however, it was not possible to diagnose a distinct source for the E.coli septicaemia.

52. Dr O'Regan and Dr Chin agreed that the primary source of Jarrod's E.coli infection remained unknown, but that it was unlikely to have been his thigh infection.

53. The weight of expert opinion therefore enables the following finding as to the cause of Jarrod's death: '*Cardiac arrest following hypoxic ischaemic encephalopathy likely due to E.coli septicaemia'.*

Was Jarrod's care and treatment in ICU appropriately managed?

54. The inquest examined the appropriateness of Jarrod's care and treatment in ICU, focusing on three main areas as follows:

- the appropriateness of the 1:2 nursing ratio
- whether Jarrod's hypoxaemia was appropriately treated
- the adequacy of the ICU's alarm and monitoring systems.

The nursing/patient ratio

55. Throughout the day and evening of 3 July Jarrod was being nursed in ICU on a 1:2 ratio, meaning that he was in the care of a nurse who was also responsible for a second ICU patient.

56. At that time there was a local hospital guideline regarding nurse/patient ratios, titled *Nursing Workforce in ICU Guideline*. This stated that patients who were ventilated or critically ill required a 1:1 nursing ratio. According to the guideline, such patients included:
    - intubated and ventilated patients
    - patients on non-invasive ventilation
    - patients who were restless, agitated and clinically unstable.

57. Jarrod was not a ventilated or intubated patient. He had however been directed to have CPAP ventilation, a non-invasive form of ventilation. It appears however that the above Guideline was interpreted in such a way that a patient on CPAP ventilation was not always considered to require 1:1 nursing. In Dr O'Regan's opinion, at that time such a patient would have justified a 1:1 ratio only if he or she was also unstable and agitated.

58. Associate Professor Lee was critical of the failure to provide Jarrod with 1:1 nursing while in the ICU. In his opinion Jarrod was suffering a severe hypoxaemic lung condition. He emphasised the observations of nursing staff that whenever Jarrod's oxygen support was removed his saturations levels fell to between 60% and 80%. Associate Professor Lee noted that at the same time, such was his agitation Jarrod was incapable of cooperating consistently with his essential oxygen support.

59. Associate Professor Lee acknowledged that Jarrod presented a difficult but not uncommon problem in ICU: that of a patient too agitated to be cooperative but suffering severe respiratory failure. In his opinion this needed to be recognised as a precarious situation, calling for a high level of surveillance. He went so far as to state that by the evening of 3 July, the difficulties involved in managing Jarrod's combination of agitation and severe hypoxaemia justified a decision to intubate him:

    'At this point in time there was in fact no further escalation of [oxygen] support feasible without intubating him and instituting invasive positive pressure ventilation'.

60. In his opinion, at the very least continuous nursing observation was clearly required.

61. It is fair to note that at the inquest all the medical and nursing witnesses agreed that in hindsight, Jarrod's condition in ICU was such that he required

1:1 nursing. This was acknowledged by Dr O'Regan, Dr Wagh and by Registered Nurse Linda Irvine, who was the Nursing Unit Manager on the night of 3 July. It was their evidence that at the time, they were not aware of the severity of Jarrod's agitation or the extent to which it was placing him at risk.

62. It is to be inferred that had the medical and senior nursing staff been so aware, they would have acknowledged Jarrod met at least one of the existing criteria for 1:1 nursing, namely that he was '*restless, agitated and clinically unstable*.' The evidence leaves no room for doubt that Jarrod's emotional condition met that criterion. I conclude that while Jarrod was in ICU he did not receive an appropriate nursing care allocation.

63. As for the reasons why this happened, these have much to do with a lack of effective communication regarding Jarrod's nursing needs, coupled with a lack of clarity as to the criteria for 1:1 nursing. I have mentioned the evidence that despite the above Guideline, at that time patients on non-invasive ventilation were not always considered to need 1:1 nursing.

64. As regards communication issues, in their evidence Registered Nurses Thebridge and Dawson gave credible explanations for not actively seeking help with Jarrod's nursing care. RN Thebridge told the court he had found himself caught up in the demands of Jarrod's care with little opportunity to reflect on what was needed. RN Dawson's evidence was that in his experience, requests for assistance usually had to be made with little notice and for this reason could rarely be met. Further, he said he had previously had the experience of requesting assistance and having his professional skills questioned.

65. To its credit, Liverpool Hospital has acknowledged the failures of communication and clarification evidenced that evening. Since Jarrod's death the ICU nursing ratio Guideline within the South Western Sydney Local Health District has been revised and amended. In addition to the above criteria, the 1:1 nursing ratio is now to be applied to patients on continuous IV sedation. The court heard that this category would include those receiving the infusion of dexmedetomidine which Jarrod commenced receiving in the early evening of 3 July.

66. The court also heard that, again as a consequence of Jarrod's tragic death, additional nursing resources are progressively being applied to Liverpool Hospital's ICU. By mid-2020 there will be an additional supernumerary nurse to assist in each of the four areas of the ICU, on a 24 hour basis.

Was Jarrod's hypoxaemia appropriately treated?

67. I have noted above the opinion of Associate Professor Lee that on 3 July the ICU medical staff ought to have seriously considered the step of intubating Jarrod to ensure his adequate ventilation. In his oral evidence Associate Professor Lee went further, asserting that by the evening of 3 July this course ought to have been taken. In his opinion, by then the senior ICU medical

team should have regarded Jarrod's situation as a medical emergency, justifying mechanical ventilation by means of endotracheal intubation.

68. At the inquest the senior ICU team of Dr O'Regan and Dr Wagh gave their evidence at an earlier stage than Associate Professor Lee. Thus there was not an opportunity to seek their response to his assertion that endotracheal intubation ought to have been performed. However both doctors had read Associate Professor Lee's report in which he stated that this course should have been seriously considered. Both responded that Jarrod's saturation levels were acceptable, provided his non-invasive ventilation was maintained. In their view the preferred response to his instability would have been continuous monitoring by way of 1:1 nursing. In this context Dr Wagh noted the risks to the patient which accompany intubation, such as infection and bleeding. In addition, it may safely be assumed that Jarrod was unlikely to have consented to being intubated.

69. Given the above evidence, in my view it is not open to make a finding that by the evening of 3 July Jarrod's condition necessitated endotracheal intubation. It appears to me that this was a clinical decision on which minds might reasonably have differed.

70. What is not open to doubt however, is that Jarrod's hypoxaemia was not appropriately managed within the ICU that afternoon and evening. I accept that at the very least the proper management of his condition required constant surveillance in the form of 1:1 nursing. This has been acknowledged by senior medical staff and managers at Liverpool Hospital and the South Western Sydney LHD. The LHD has responded with the above change to the nursing Guidelines and the provision of additional nursing staff to the ICU.

71. These steps have been taken with the sincere aim of learning from past mistakes and improving the safety and the care of patients like Jarrod. Very likely, had these changes not been made they would have been the subject of recommendations arising out of this inquest. I sincerely hope that Jarrod's family draw some comfort from knowing that positive changes have come out of his very sad death.

The ICU's alarm and monitoring systems

72. Jarrod's family wanted to know how it was that a critically unwell patient like Jarrod was able to detach himself from his essential oxygen support, without any alarm sounding to prompt nursing or medical staff.

73. The court heard evidence about this from Mr Robin Arian, one of the hospital's biomedical engineers. Mr Arian described the monitoring system in use at the hospital in 2016. In brief, it was designed so that when a patient detached leads from his or her body an alarm would sound at the central nurses' station. However this would only happen if the module normally connected to the patient's monitor remained in place. When Jarrod was found in a hypoxic state by RN Dawson his module had been removed from its monitor, most likely by Jarrod himself. Thus no central alarm was activated.

74. The court heard that since Jarrod's death the hospital's monitoring equipment is being progressively upgraded. New software and hardware will ensure that even when a module is detached, a central alarm will sound at the nurses' station. The new equipment is planned to be in place throughout the LHD by mid-2019.

Did Jarrod's missed antibiotic doses contribute to his death?

75. The remaining question is whether the antibiotic doses which Jarrod missed while in the Orthopaedic Ward played any part in his deterioration and death. Although the court heard expert evidence on this point, there was not a clear consensus. In Dr Hudson's opinion, considering the overall context of Jarrod's illness the missed doses were unlikely to have had a significant adverse effect on his outcome.

76. Associate Professor Lee disagreed, emphasising the importance with sepsis of receiving antibiotics in the right amount and at the right time. However he qualified this with the comment that effects were difficult to predict with individuals. And further, that while in Jarrod's case the antibiotic management was '*not ideal',* one needed to take into account that his general condition was not good, in particular his poor liver function which made him vulnerable to continuing infection. Furthermore he acknowledged there would have been difficulty arranging for Jarrod to receive a PICC line on 2 July, as this was the weekend and there would need to be access to a specialist service.

77. There is therefore not a clear basis to conclude that Jarrod's missed doses contributed to his death. What role if any the missed doses had to play in the persistence of Jarrod's E.coli bacterium remains unclear.

Question of recommendation

On behalf of the NSW Nurses and Midwives' Association it was submitted that there would be benefit in upgrading the revised Guideline referred to in paragraph 65 into the status of a Policy Directive. The South Western Sydney LHD was invited to make submissions in response to this proposal, but has not done so.

The effect of this proposal would be to give the ICU nursing ratios set out in that document the status of a mandatory directive and not merely a guideline. It would apply throughout the South Western Sydney LHD.

I accept there would be benefit in this proposal. It has the potential to enhance patient care in Intensive Care Units in at least two ways. The upgrade in status to a Directive would emphasise the importance that is placed on this aspect of patient care. Secondly, the status of the policy as a Directive would remove the difficulties Jarrod's nurses felt that night in asking for appropriate help with the care of a highly agitated patient.

Conclusion

78. I thank Jarrod's father, mother and sisters for their participation in this inquest, and for their moving statement about his life and how much he meant to them. I offer the sincere sympathy of all of us at the Coroner's Court for the loss of their son and brother.

79. I am aware that the inquest was attended throughout by senior members of the LHD and Liverpool Hospital, including Dr O'Regan. Mr Rooney on behalf of the LHD has apologised to Jarrod's family for the shortfalls in the Hospital's care of him. It is clear that what happened has been taken seriously by those who were responsible for his care. They and the LHD have responded with important changes which I am sure will improve the safety of patients like Jarrod.

80. I thank the assistance given to the inquest by the Counsel and legal representatives, in particular Counsel Assisting the inquest and the Crown Solicitor's Office. I also thank the Officer in Charge, Senior Constable Trent Barrett, for his investigation of the matter and assistance throughout the inquest.

Findings required by s81(1)

As a result of considering all of the documentary evidence and the oral evidence heard at the inquest, I am able to confirm that the death occurred and make the following findings in relation to it.

Identity
The person who died is Jarrod Wright, born on 23 April 1974.

Date of death:
Jarrod Wright died on 9 July 2016.

Place of death:
Jarrod Wright died at Liverpool Hospital, Liverpool NSW 2170.

Cause of death:
Jarrod Wright died as a result of cardiac arrest following hypoxic ischaemic encephalopathy, likely due to E.coli septicaemia.

Manner of death:
Jarrod Wright died as a result of natural causes, in circumstances where his condition of hypoxaemia was not appropriately managed in hospital.

Recommendation

To the Executive Director of the South Western Sydney Local Health District:

That consideration be given to releasing as a Policy Directive, the Guideline titled Nursing Workforce in ICU issued in November 2016.

I close this inquest.

E Ryan
Deputy State Coroner
Glebe

Date 17 December 2018