CORONERS ACT, 2003

SOUTH *AUSTRALIA*

FINDING OF INQUEST

An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 21st, 22nd and 25th days of March 2011 and the 15th day of November 2011, by the Coroner's Court of the said State, constituted of Mark Frederick Johns, State Coroner, into the death of Susan Marie Tilka.

The said Court finds that Susan Marie Tilka aged 52 years, late of 47 Henderson Avenue, Pooraka, South Australia died at the Royal Adelaide Hospital, North Terrace, Adelaide, South Australia on the 13th day of January 2008 as a result of haemorrhage from a tracheal-innominate artery fistula complicating a tracheostomy following cerebral infarction. The said Court finds that the circumstances of her death were as follows:

1. Introduction

1.1. Susan Marie Tilka died on 13 January 2008 in the Royal Adelaide Hospital. She was 52 years of age. A post-mortem examination was conducted by Dr Karen Heath, a forensic pathologist with Forensic Science SA, who provided a report[1]. The cause of death was given as haemorrhage from a tracheal-innominate artery fistula complicating a tracheostomy following cerebral infarction (stroke), and I so find.

1.2. Ms Tilka suffered a stroke on 24 December 2007. She was found by her husband that evening and transported to the Royal Adelaide Hospital by ambulance just prior to midnight.

[1] Exhibit C2a

1.3. The following morning - Christmas Day - Ms Tilka was seen by the resident medical officer of the Stroke Unit. A CT scan was taken and it showed that Ms Tilka had a large ischaemic stroke affecting much of the large cerebral hemisphere and, in particular, the left middle cerebral artery region. It was noted that she was having difficulty protecting her airway. Ms Tilka was seen by the neurology consultant, Dr Kimber, at 9:30 that morning. Dr Kimber considered that Ms Tilka was at very high risk of cerebral oedema and he referred her to Dr Molloy for an emergency hemicraniectomy to relieve the swelling of her brain. A decompressive craniectomy was performed that day and Ms Tilka was transferred to the Intensive Care Unit at approximately 4pm. Ms Tilka was extubated on 27 December 2007.

1.4. On 2 January 2008 Dr Kimber noted that Ms Tilka was desaturating. She required light suctioning and a very high flow of oxygen which was not correcting her desaturation. Her chest was X-rayed and that demonstrated right lung consolidation. Ms Tilka had a poor cough and poor tracheal secretion clearance. It was decided by the Intensive Care Unit Team that in order to address her developing respiratory failure, a percutaneous tracheostomy should be performed. That occurred on 3 January 2008 and on 4 January 2008 she was transferred from the Intensive Care Unit to Ward S5 to be overseen by Dr Kimber.

1.5. Because she had a tracheostomy in place, Ms Tilka's care was shared between Dr Kimber and the Neurology Team and the Intensive Care Unit Team which maintained a supervisory role in relation to her tracheostomy. That supervision was carried out by an intensive care equipment nurse who visited her daily on the ward to ensure the integrity of the tracheostomy by checking the health of the wound and the integrity of the seal of the tracheostomy cuff.

1.6. There was no evidence before the Court as to the level at which the tracheostomy was placed. Associate Professor Young is the Director of the Intensive Care Unit at the Royal Adelaide Hospital. He had ordered the placement of the percutaneous tracheostomy. He expressed confidence that the tracheostomy was placed between the first and second tracheal rings[2]. There was no evidence to suggest that the tracheostomy was placed below the third tracheal ring. I mention that because the evidence showed that a tracheostomy placed below that level is associated with an

[2] Transcript, page 71

increased chance of tracheal-innominate fistula formation. I can exclude that as a possible cause of Ms Tilka's unfortunate death.

1.7. During the afternoon of 9 January 2008 a member of the Ward S5 nursing staff, Nurse Borchard, was attending to Ms Tilka when she noted blood associated with the tracheostomy. She said that she saw fresh blood above the cuff of the tracheostomy tube and she removed the blood and noted the quantity as approximately 3mls. In addition to that she described fresh blood seeping from the tracheostomy stoma.

1.8. Overnight on 9 and 10 January 2008, Nurse Hosho recorded blood stained sputum and the removal of darkish sputum with old blood from above the tracheostomy cuff.

1.9. On the morning of 10 January 2008 Dr Kimber inspected the tracheostomy and was informed of the bleeding. He formed the opinion that the bleeding was from the stoma[3].

1.10. Nurse Borchard gave evidence that she contacted the intensive care equipment nurse in relation to her observations of bleeding. This was consistent with the protocols in place. Nurse Borchard also informed the neurology intern. Nurse Hosho, who was the nightshift nurse, contacted the surgical medical officer on cover that night. The surgical cover recommended that the neurology team investigate the bleeding in consultation with an ENT consultant.

1.11. Following Dr Kimber's ward round on the morning of 10 January 2008 Ms Tilka was visited by the intensive care equipment nurse who inspected the tracheostomy. The nurse made a decision to deflate the cuff[4]. It can be inferred from the decision of the intensive care equipment nurse to deflate the cuff that he or she would not have done so without discussing Ms Tilka's condition, including the events of the preceding day, with an Intensive Care Unit clinician before proceeding. Clearly the intensive care equipment nurse considered that there was no indication for not deflating the cuff.

1.12. There is a further note of what appears to be relatively minor bleeding by the nightshift nurse, Nurse Hosho, in the very early hours of 11 January 2008.

[3] Transcript, page 31
[4] Exhibit C5, page 271

1.13. At 8:30pm on 12 January 2008 Ms Tilka had a catastrophic bleed from the tracheostomy site which resulted in her death.

1.14. The evidence of Associate Professor Young was that tracheoarterial fistula is a very rare event with an overall frequency of 0.7%[5]. Dr Leong, who was engaged by counsel assisting to provide an expert's report for the assistance of the Court, said that tracheoinnominate fistulas are very rare. He has never had to manage such a case. He is an Intensive Care Specialist at the Alfred Hospital in Melbourne. He said the Alfred Hospital Intensive Care Unit has had only one such event in the 10 years prior to late 2010. Associate Professor Young has been working in or around the Royal Adelaide Hospital Intensive Care Unit since 1989 and, in 22 years, he was only aware of two tracheoinnominate fistulas, including that of Ms Tilka[6].

1.15. On the other hand, it is not at all uncommon that there will be bleeding associated with tracheostomies, but not the catastrophic bleed associated with an innominate fistula. Associate Professor Young thought that the incidence of bleeding associated with tracheostomies is in the order of 22%[7]. The bleeding may occur as a result of the performance of tracheal suction or from the stoma site. Furthermore, minor bleeding during or shortly after tracheostomy is a frequent complication with a reported incidence of up to 37%[8]. This will be more likely to occur in a patient who is being anticoagulated as Ms Tilka was. Indeed, after the reported bleeding on the night of 9/10 January 2008, Dr Kimber thought that it may have been potentiated by anticoagulants and he ordered a reduction in the dose of the anticoagulants[9].

1.16. It would be as well to describe at this point, as best I can, the anatomy of the tracheoarterial fistula. Massive haemorrhage from and around the trachea is almost always due to erosion through the tracheal wall into a large artery[10]. The relevant arteries are in close proximity to the trachea but they are below the site at which the tracheostomy is supposed to be introduced to the trachea. Thus, the stoma site will be safely above the arteries so as to avoid a direct interference when the stoma is created.

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[5] Exhibit C8f
[6] Transcript, page 88
[7] Transcript, page 67
[8] Exhibit C8f
[9] Transcript, page 34
[10] Exhibit C8f, page 64

The arterial haemorrhage occurs as a result of an erosion of the arterial wall. It may be caused by too low a placement of the stoma as a result of which the anterior surface of the tube is placed in close proximity to the innominate artery. Pressure applied to the wall of the artery leads to its erosion, exacerbated by the continuous pulsation of the artery against the cannula, the rocking motion of the tube associated with mechanical ventilation and the movement of the patient[11]. In the present case the evidence does not suggest that there was any error in the site of the stoma and the mechanism of erosion described above is unlikely to have caused the haemorrhage. The other two possible explanations are that the balloon cuff of the tracheostomy tube might cause pressure necrosis resulting in a breach of the artery or, secondly, the tip of the tracheostomy cannula may rub against the wall of the trachea, resulting in erosion into the innominate artery after it has eroded the anterior trachea wall[12]. The evidence in this case is not sufficiently clear to enable me to reach a firm conclusion as to which of those was the mechanism of the haemorrhage. The fact that the cuff had been deflated more than a day prior to the acute bleeding suggests that the cuff was not to blame. However, I would prefer not to reach a conclusion on that matter.

1.17. The question which was explored in this Inquest was whether the events described above, and particularly the bleeding observed in the 3 days prior to the catastrophic event, were indicative of the catastrophic bleed which ultimately occurred. In considering this question I have had particular regard to Exhibit C8f, which is an article published by Messrs Schaefer and Irwin entitled 'Tracheoarterial Fistula: An Unusual Complication of Tracheostomy'. The article says that there are no well validated diagnostic tests to confirm or exclude the presence of tracheoarterial fistula. I have already noted that bleeding typically occurs around tracheostomy tubes. However it is not uncommon, according to Exhibit C8f, that catastrophic haemorrhage is preceded by bleeding that spontaneously stops. This bleeding, which is described as sentinel bleeding, may be only a few millilitres or up to several hundred millilitres of blood. It is a very important prodromal sign as it has been reported in 34% to 50% of all patients.

[11] Exhibit C8f
[12] Exhibit C8f

2. <u>Should the bleeding which was noted, particularly the night of 9/10 January 2008, have been regarded as sentinel bleeding, heralding the approaching disaster</u>?

2.1. Associate Professor Young gave evidence that, had he been informed of this bleeding episode, he probably would not have investigated it any further[13]. Associate Professor Young strongly suspected that this was not a genuine herald bleed, being only 3mls of blood. Instead, Associate Professor Young thought that the bleeding was likely to be from the site of the stoma.

2.2. On my reading of Dr Leong's report[14] and his evidence at Inquest, he is not strongly critical of the management of Ms Tilka. Dr Leong discussed whether the bleeding that was observed was a herald bleed. He acknowledged that there was a problem in deciding whether this was a herald bleed. He said:

> 'Did she have any superficial vessel that was bleeding within the tracheostomy wound? Did she have any bleeding source within the trachea itself not related to the fistula? I have no way of knowing if any of those things were present. Equally, given that it is described that herald bleed occur up to a number of days before a catastrophic event, given she turned out to have a tracheo-inominate fistula, to me it is significant there was a herald bleed the nature of the bleed in this case was characteristic of a herald bleed from the tracheo-inominate fistula.' [15]

In my opinion Dr Leong was favouring the view that the bleeding seen in the present case was probably a herald bleed, but he very fairly acknowledged that he could not say for certain[16]. Weighing the evidence of Dr Leong and Associate Professor Young on this subject, I believe it would be dangerous on the evidence I have seen to conclude that the bleeding was indeed a herald bleed.

2.3. Even if a herald bleed had been suspected at that stage, the question that then arises is what investigations might have been undertaken. Four investigations were put forward by Dr Leong as possibilities. The first was the use of fibre optic bronchoscopy to evaluate the airway. It was Associate Professor Young's belief that such an investigation was unlikely to have identified the bleed[17] and I note that Exhibit C8f suggested that fibre optic bronchoscopy should not be performed to exclude tracheoarterial fistula and that it has a low sensitivity as a diagnostic test. The

[13] Transcript, pages 90, 98
[14] Exhibit C9a
[15] Transcript, page 129
[16] Transcript, page 128
[17] Transcript, page 92

next possibility was to perform an angiography. However the difficulty with that procedure is that it would not reveal a problem unless the fistula was bleeding. Once again, Exhibit C8f states that, like bronchoscopy, angiography is of very limited diagnostic use. The third possibility was a clinical inspection of the tracheostomy stoma. In this respect, it should be noted that the intensive care equipment nurse was regularly carrying out stomal inspection.

2.4. The final possibility was removal of the tracheostomy tube which, in my opinion, simply would not have been warranted in the present case.

3. Conclusion

3.1. I conclude that there was no shortcoming in the treatment afforded to Ms Tilka and that her tragic death was not avoidable.

4. Recommendations

4.1. Pursuant to Section 25(2) of the Coroners Act 2003 I am empowered to make recommendations that in the opinion of the Court might prevent, or reduce the likelihood of, a recurrence of an event similar to the event that was the subject of the Inquest.

4.2. A number of protocols were produced in the course of the Inquest. I agree with counsel for Associate Professor Young that the protocols produced in this Inquest would benefit by a more prominent reference to bleeding as being a warning sign, in certain circumstances, of a catastrophic bleed and a trigger to ward nurses to engage with the intensive care equipment nurse to discuss that possibility.

4.3. I therefore recommend that the relevant protocols be reviewed to point out to ward nurses the potential for bleeding to be significant.

4.4. Associate Professor Young was clearly of the view that all nurses in wards who are looking after tracheostomies should complete the educative workbook[18] entitled 'Principles for Basic Tracheostomy Management Workbook' and I recommend accordingly.

[18] Exhibit C8g

4.5. As noted by counsel for Associate Professor Young, there is only one question raising the matter of bleeding in the workbook[19] where the workbook asks:

> 'After performing tracheal suction you notice the tracheal aspirate is blood stained. What action would you take?'

I recommend that the workbook be modified to raise the issue of blood appearing in circumstances other than the tracheal aspirate.

4.6. The above recommendations are directed to the Minister for Health.

Key Words: Tracheostomy

In witness whereof the said Coroner has hereunto set and subscribed his hand and Seal the 15th day of November, 2011.

State Coroner

Inquest Number 9/2011 (0051/2008)

[19] Exhibit C8g