CORONERS COURT OF THE AUSTRALIAN CAPITAL TERRITORY

Case Title:	**AN INQUEST INTO THE DEATH OF SIAUTO ELIUTA TUNUMAFONO**
Citation:	**[2018] ACTCD 19**
Dates of Hearing:	2 July 2014, 20 January 2016
Date of Findings:	29 November 2018
Before:	Coroner P.J. Morrison
Decision:	1. Siauto Eliuta Tunumafono died on 11 December 2013 at Calvary Public Hospital, Mary Potter Circuit, Bruce in the Australian Capital Territory; 2. The manner and cause of Ms Tunumafono's death is unascertained, but was probably fatal cardiac arrhythmia; and 3. Pursuant to s 52(4)(a)(i) of the *Coroners Act 1997*, a matter of public safety is found to arise in connection with this inquest.
Legislation Cited:	*Coroners Act 1997* (ACT)
Representation:	Mr J Walker of the ACT DPP as Counsel Assisting Mr J Henry of the ACT Government Solicitors Office for the Territory
File Number:	CD 306 of 2013

1. Siauto Eliuta Tunumafono was a 43 year old woman at the time of her death. She was found unresponsive at home by family members on 11 December 2013. Triple zero was called. Officers of ACT Fire and Rescue (ACTF&R) attended first and commenced providing treatment. They were followed shortly thereafter by officers of the ACT Ambulance Service (ACTAS) who took over treatment. Ms Tunumafono was then transported to Calvary Public Hospital in Bruce where she was treated further before a decision was taken to cease resuscitation efforts. Her death was reported to the Coroner because she died unnaturally in unknown circumstances: see *Coroners Act* 1997, s 13(1)(a).
2. A post mortem examination undertaken at a Coroner's direction was unable to ascertain a medical cause of death for Ms Tunumafono. The pathologist who conducted the examination opined that Ms Tunumafono most likely died from a fatal cardiac dysrhythmia, the cause of which could not be established.

3. At the request of her family I issued interim findings as to the cause of Ms Tunumafono's death on 18 November 2014.

4. An internal review conducted by ACTAS into the circumstances of Ms Tunumafono's death and their treatment of her identified that there was a delay in defibrillating Ms Tunumafono. This matter was promptly notified to me by ACTAS in February 2014. I acknowledge the proactive work done by ACTAS in this regard.

5. I directed that a hearing be held in this matter to focus on the events and treatment provided to Ms Tunumafono between 8:45pm and 10:48pm on 11 December 2013. As the manner and cause of Ms Tunumafono's death were sufficiently disclosed in the brief of evidence, the hearing proceeded with the brief being tendered without objection. Indeed, most of the facts were uncontested.

6. An independent expert, Associate Professor Drew Richardson, a locally practicing emergency physician, was commissioned to report on the emergency response treatment given to Ms Tunumafono. He provided two reports based upon his review of medical and other records and statements provided to him.

7. The facts on which Associate Professor Richardson's reports were based were largely not in dispute at the hearing. Relevantly, his first report says this:

> *Ms Tunumafono suffered an unwitnessed collapse at home between approximately 20:45 and 21:10 on 11 December. Sources vary between 20 minutes (ACTAS and Calvary) and 25 minutes (Police report) of time alone. She was clinically in cardiac arrest at approximately 21:10 when discovered by her partner (Police report) and the call to the ambulance was made at 21:22. CPR was commenced by the family at about that time (Police report) and continued by ACTF&R who arrived and attached the [automated external defibrillator] AED.*
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> > *COMMENT: The cause of death was cardiac arrhythmia / arrest, without underlying pathology being detected at autopsy. The expected prognosis from such an arrest depends heavily on the time to effective CPR and to defibrillation if indicated. A 25 minute period in cardiac arrest without CPR is essentially unsurvivable regardless of initial rhythm or treatment. A 10 minute period from arrest without effective CPR has a very low probability of a good neurological outcome. A 5 minute period of good CPR commencing at arrest and terminated with effective defibrillation has a "good" prognosis with 50-75% achieving hospital discharge. Thus whether there was any chance of survival in this case is dependent on the unknown length of time Ms Tunumafono was collapsed.*
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> *The ACTAS vehicle arrived at 21:31 and removed the [ACTF&R] AED prior to an automated shock being delivered. CPR, airway management and intraosseous access were undertaken, but no defibrillation despite later review showing it was indicated. The Ambulance Case Review states that "defibrillation was not however applied for a period of approximately 20 minutes, but there is no record in the contemporaneous ambulance handover nor Calvary medical notes of*

ambulance defibrillation occurring. The first defibrillation recorded was at 22:17 at Calvary.

> *COMMENT: This was clearly a breach of protocol by ACTAS and possibly ACTF&R. The Ambulance Case Review states that AED advised defibrillation at 21:24 (probably actually 21:31), and that the code summary from the ACTAS monitor (not supplied) showed VF [ventricular fibrillation] when the crew arrived (21:31). Thus protocol clearly indicates that defibrillation should have occurred at that time. If she had been defibrillated at 21:31 then that would have represented 9 minutes from the ambulance call on top of a range of approximately 11-36 minutes from her collapse to the ambulance call.*

At approximately 22:00 during ambulance transfer (stated in Calvary notes to be 2-3 minutes before hospital arrival) she developed a regular electrical heart rhythm, though it is disputed whether there was actually palpable cardiac output – Calvary notes say ambulance reported "return of spontaneous circulation" at that time but also say on examination "?output". By 22:10 the patient definitely did not have output and was treated as a case of Pulseless Electrical Activity (PEA), with CPR, drugs, and defibrillation when indicated to a total of 9 times. This was ultimately unsuccessful – she was declared dead at 22:48.

> *COMMENT: The Calvary rhythm strips show a variety of electrical rhythms, some of which responded briefly to defibrillation. The earliest is a sinus rhythm, which does not require defibrillation; the later ones are broad complex tachycardias (both regular and irregular). In the absence of any convincing evidence of ever achieving cardiac output, this can be all be considered evidence of a "dying heart". It also suggests but does not prove that earlier defibrillation may have been ineffective – it probably would have led to similar brief runs of good rhythm but no actual cardiac output.*

OPINION: Based on the patient response at Calvary, there is doubt as to whether earlier defibrillation would have resulted in a stable heart rhythm, but based on the Ambulance Case Review there is no doubt it was indicated and not done at 21:31. In assessing the prognosis of a relatively young patient with cardiac arrest, even if the heart responds to treatment, the neurological outcome is the usual determinant of survival. The earliest that defibrillation could have occurred was 9 minutes after the ambulance call and approximately 20 minutes after the cardiac arrest, but may have been up to 45 minutes from the arrest. At the lower end of this range the neurological prognosis was very poor; at the upper end survival would have been essentially impossible because of brain damage. In my opinion, the delay in defibrillation was not a likely contributor to the cause of death. Had defibrillation occurred when indicated, the prognosis would still have been very poor because of the prolonged time since collapse.

8. In his second report, Dr Richardson clarified that there were in fact five occasions of ventricular fibrillation evident on the rhythm strips for which protocol would have indicated defibrillation. He also clarified that there were inconsistencies between the clock accuracy recorded by each of the three defibrillators applied to Ms Tunumafono by ACTF&R, ACTAS and Calvary Hospital. This meant that the times on rhythm strips did not match other events such the recorded arrival times at the scene or at hospital. Dr Richardson also queried the wisdom of switching between ACTF&R and ACTAS protocols and defibrillators at the scene as an additional potential source of delay in treatment.

9. I read the references in Dr Richardson's reports to a "breach of protocol by ACTAS and possibly ACTF&R" as meaning contrary to best practice. After the receipt of this evidence, Counsel for the Territory confirmed that ACTAS and ACTF&R did not at the time of Ms Tunumafono's death have any written protocols about defibrillation.

10. I am obliged, by subsection 52(4) of the *Coroners Act 1997*, to state whether a matter of public safety is found to arise in connection with the inquest; and if a matter of public safety is found to arise—comment on the matter.

11. Counsel for the Territory concedes that errors were made in the treatment of Ms Tunumafono by ACTAS and ACTF&R. I read this reference to errors as being the failure to recognise the need to defibrillate when required as identified in the reports of Dr Richardson. The evidence supports that conclusion and I so find.

12. Both Counsel Assisting and Counsel for the Territory submit that these errors were not likely to have contributed to Ms Tunumafono's death. Again, the evidence supports that conclusion and I so find.

13. I also accept the submission that a number of factors contributed to the errors, including:

    a. The apparent confusion caused by the prompts provided by the ACTF&R defibrillator;

    b. The incompatibility of the ACTF&R and ACTAS defibrillators; and

    c. The difficulty of providing treatment in a stressful environment.

14. On that basis I make no adverse comment in relation to any of the individual ACTF&R or ACTAS officers involved. However, I consider that the lack of any written ACTF&R and ACTAS protocols about defibrillation constitutes a matter of public safety within the meaning of that term in the *Coroners Act 1997*.

15. Subsequent to the hearing I have been notified by the Territory that changes have been made so that defibrillators used by ACTAS and ACTF&R now have compatible pads. In addition:

    a. All ACT&R and ACTAS AED devices were reconfigured or replaced shortly after Ms Tunumafono's death to provide better guidance as to when a shock is indicated.

    b. Protocols have been developed about changing defibrillators when ACTAS take over treatment from ACTF&R.

c. ACTAS have continued to "*focus heavily on improving our cardiac arrest survival since this incident, by improving our models of care around roles in resuscitation, and regular simulation training for all paramedic staff*".

d. The ACTAS staff involved in Ms Tunumafono's treatment received targeted education, and the case was presented to an internal inservice session for the broader information of ACTAS officers.

16. On their face, these measures appear to address the matter of public safety which I have found to arise in this case. In those circumstances, I consider that no further recommendation by me is necessary.

17. By way of additional comment, it is apparent that it would be desirable for all electronic treatment equipment to be synchronised to a time standard. It is not uncommon that emergency treatment will be provided from multiple sources, as was the case here. Being able to properly compare the timing of historic observations and measurements would clearly be of benefit in patient treatment, as well as assisting in any later investigation or review. However, I make no formal recommendation in this regard.

18. I will forward a copy of my findings, recommendations and comments to the Attorney-General and the Minister for Emergency Services for their information. I propose also to publish my findings, recommendations and comments on the ACT Coroners Court website, together with any response I might receive from Ministers or Government.

19. I convey my sympathies to Ms Tunumafono's family and friends.

P.J. MORRISON
Coroner