MAGISTRATES COURT TASMANIA

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CORONIAL DIVISION

Record of Investigation into Death (Without Inquest)

Coroners Act 1995
Coroners Rules 2006
Rule 11

I, Robert Webster, Coroner, having investigated the death of Leonard Athol Long

Find, pursuant to Section 28(1) of the *Coroners Act* 1995, that

a) The identity of the deceased is Leonard Athol Long;

b) Mr Long died as a result of an injury sustained in a fall;

c) Mr Long's cause of death was a subdural haematoma; and

d) Mr Long died on 4 February 2022 at Hobart, Tasmania.

In making the above findings I have had regard to the evidence gained in the investigation into Mr Long's death. The evidence includes:

- The Police Report of Death for the Coroner;
- The Tasmanian Health Service (THS) Death Report to Coroner;
- Affidavits as to identity and life extinct;
- Report of the forensic pathologist Dr Donald Ritchey;
- Medical records obtained from the Tasmanian Health Service (THS);
- Affidavits of the senior next of kin Sandra Long;
- THS Final Root Cause Analysis (RCA) report; and
- Report of the coronial medical consultant Dr Anthony Bell MB BS MD FRACP FCICM.

Background

Mr Long was 73 years of age (date of birth: 18 January 1949), married to his wife Sandra and he was retired at the date of his death. During his working life he had worked in retail. A report

from a cardiologist in 2013 indicated Mr Long, who was then 64 years of age, was remarkably well, he was quite physically active and he played soccer with his boys.[1]

The THS medical records indicate Mr Long underwent a mechanical mitral valve replacement of the heart which was performed for infective endocarditis on a rheumatic valve in 1989 at the Alfred Hospital in Melbourne. The history was there had been some paravalvular leakage at that time, which had continued since then. Mr Long advised he had progressed quite well in recent years, however in 2014, he presented with a respiratory infection as well as a new onset of rapid atrial fibrillation. An echocardiogram at the time showed normal left and right ventricular sizes with low normal systolic function, severe left atrial dilation, and a well-functioning mechanical mitral valve prosthesis with paravalvular leak. Other significant medical history included an extensive right chest wall and right axilla dissection for melanoma in about 1980, and an emergency ruptured abdominal aortic aneurysm repair in 1990, which involved a right nephrectomy. In addition, Mr Long had significant left varicose veins and he had a high ligation in about 2006.

More recently, the mitral valve replacement was redone in 2015 and he had cholangitis which required multiple ERCP's[2] and hospital admissions between 22 June and 14 July 2020, and 1 to 6 December 2020. A bile duct stent was removed on 6 January 2021 and Mr Long spent almost 2 weeks in hospital from 16 November 2021 where he was treated for epididymo-orchitis[3] without abscess.

Circumstances Leading to Death

On 30 January 2022, Mr Long presented to the Emergency Department of the Royal Hobart Hospital (RHH) after a fall in the context of a three-week history of dysuria[4] and the hospital admission during the previous November. Upon investigation, it was determined Mr Long was suffering from a urinary tract infection which was treated with antibiotics.

On the second day of his admission, Mr Long experienced a "near miss" fall, where he struggled to keep his balance while standing up and he slid down to the floor. He did not sustain any injuries. On the third night of his admission, he had an unwitnessed fall while getting

[1] THS records page 1335.
[2] Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure that combines upper gastrointestinal (GI) endoscopy and x-rays to find and treat problems of the bile and pancreatic ducts.
[3] Epididymo-orchitis is inflammation of the epididymis (the tube which stores and transports sperm) and/or testicle (testis).
[4] Pain or discomfort experienced during urination.

out of bed. He reportedly bumped his head on the nearby blood pressure machine as he fell. He was assessed by medical officers and did not display any injuries or symptoms of injury, except for a sore head. The following night he experienced a significant drop in his level of consciousness and a code blue was called so he was urgently reviewed. On that review, a computerised tomography (CT) scan of Mr Long's brain revealed a large subdural haematoma (SDH); that is bleeding in the brain. He was provided with further treatment.

A neurosurgical procedure was discussed with Mr Long's family and it was indicated there was a high risk that post operatively, Mr Long might be left with a disability and/or he might die. It was therefore decided against operative management and it was subsequently decided by Mr Long's family, in consultation with the doctors, to withdraw medical supports. This occurred and Mr Long died shortly thereafter. His death was certified at 1:12pm on 4 February 2022.

Investigation

The THS Death Report to Coroner notes that during Mr Long's admission, his atrial fibrillation resolved and that was thought to be in the context of infection. Warfarin was continued during his admission due to the past history of the mechanical mitral valve replacement. It was queried whether the extensive CT brain findings could have been prevented if imaging was performed earlier; that is at the time of the fall.

The very experienced forensic pathologist, Dr Donald Ritchey, conducted a post-mortem examination on 7 February 2022, at which time he also examined Mr Long's medical records. He noted Mr Long was admitted with an infection and that he fell in the hospital and hit his head on 2 February 2022. He noted the results of the CT scan. As a result of these investigations, Dr Ritchey determined that the cause of death was the SDH which was caused in the fall. It was also noted Mr Long was in receipt of warfarin by way of anticoagulation and that he had atherosclerotic and hypertensive cardiovascular disease. I accept Dr Ritchey's opinion.

The coronial medical consultant Dr Anthony Bell noted Mr Long's medical history as set out above and also indicated Mr Long had undergone a right total knee replacement and that he had been diagnosed with hypertension in 2010 and atrial fibrillation in 2014. In 2020, he was diagnosed with chronic cholecystitis and cholelithiasis, and had a biliary stent removed in January 2021. On 7 November 2021, Mr Long was diagnosed with acute urinary retention (900 ml bladder) and a catheter was inserted in the Emergency Department for community follow up. In addition, Dr Bell noted Mr Long was prescribed warfarin (an anticoagulant), 2 mg Monday

to Friday, 3 mg Saturday and Sunday because of his mechanical cardiac mitral valve and that he was also prescribed amitriptyline and metoprolol.

The relevant history was as follows. Mr Long went to the toilet at home and fell, lowered himself to ground and was unable to get up. Mr Long felt his left leg was weak. Ambulance Tasmania transported him to the RHH. His vital signs were stable, however Mr Long exhibited a rapid ventricular response to atrial fibrillation. Clinical examination was unrewarding but for a swollen left testicle. Blood tests showed an acute kidney injury. Inflammatory markers suggested bacterial infection. A urine culture grew Klebsiella oxytoca and a diagnosis of urosepsis was made. Accordingly, antibiotic treatment was commenced. Overnight urinary retention occurred and a urinary catheter was inserted. Mr Long slowly improved. On 30 January 2022 (a Sunday), warfarin 3 mg was administered which was Mr Long's usual dose. Due to a high INR[5] caused by over anticoagulation the dose was reduced to 1 mg. The INR continued to rise and the warfarin was not administered on 1 February 2022 or again during the hospital admission.

On 1 February 2022, Mr Long fell at 2:05pm. Before the fall, his blood pressure was systolic 110 mmHg dropping to 98 mmHg on standing which signified postural hypotension. When found, Mr Long was sitting on the floor, alert and orientated. He denied striking his head. Vital signs were stable and his neurological examination was normal. Neurological observations were commenced. The INR was elevated at 5.4 (over anticoagulated). A trial form which was an inpatient post fall clinical pathway was filled out, but the medical assessment section of that form was not completed. This included questions about known coagulopathy and if that or other boxes were ticked, then a CT scan of the brain was to be ordered.

Mr Long had a further fall at 12:25am on 2 February 2022. Again, the medical assessment section of the inpatient post fall clinical pathway was not correctly filled out and a CT scan of the brain was not ordered. Mr Long remained neurologically stable on 2 February 2022.

On 3 February 2022 at 1:00am, a code blue was called as Mr Long was found in a diminished conscious state. He had fixed and dilated pupils. The airway was not protected and he was intubated. An urgent CT of the brain showed an acute subdural haematoma covering the entire right hemisphere with midline shift, entrapment hydrocephalus and uncal herniation. The INR

[5] INR stands for 'international normalised ratio'. It is a blood test that measures how long it takes a person's blood to form a clot. The test results help doctors work out the best dose of warfarin a patient should take.

was elevated (over anticoagulated) and the effects of warfarin were to be reversed with 10 mg of vitamin K, but the dose was not administered. Mr Long was transferred to the intensive care unit (ICU). Due to a poor prognostic outcome and after discussion with the family surgery was considered not to be a viable option. Mr Long was supported to allow family to visit him before he passed away which occurred on 4 February 2022.

Dr Bell also noted Dr Ritchey's findings and opinion.

Dr Bell goes onto say head trauma is the most common cause of a SDH, with the majority of cases related to motor vehicle accidents, falls, and assaults. In addition, trivial or minor head trauma is frequently identified as an antecedent to acute or chronic SDH in susceptible patients with cerebral atrophy or other risk factors such as anticoagulation. The use of antithrombotic agents increases the risk of SDH, as illustrated by a case-control study of 10,010 patients with a first-ever SDH. An increased risk of SDH was associated with the use of warfarin (and other vitamin K antagonists).

Dr Bell says SDH can be a neurological emergency that may cause irreversible brain injury and death caused by haematoma expansion, elevated intracranial pressure (ICP), or brain herniation. Patients with acute or chronic SDH require an urgent initial assessment of clinical status to determine the need for surgery and the medical interventions needed to mitigate adverse outcomes.

For some patients with a chronic or small acute SDH and no signs of increased ICP who are receiving anticoagulation for a compelling indication such as a mechanical heart valve, the risk-benefit calculation may favour continued anticoagulation with close observation of neurological status. For such patients, anticoagulation using heparin during the acute setting should occur whenever possible because it is typically quicker to reverse in the event of haematoma expansion.

Dr Bell noted Mr Long was treated with long term warfarin for a mechanical mitral valve replacement. The antibiotic sulfamethoxazole-trimethoprim (SMZ-TMP) was commenced for treatment of the urinary tract infection. The drug interaction is significant and considered to be drug interaction category D; that is the doctor is to consider changing therapy in those circumstances.

However, Dr Bell says according to one study he looked at which evaluated pre-emptive warfarin dose reduction, the average INR did not significantly increase following the initiation of

SMZ-TMP when warfarin doses were pre-emptively reduced by 10-20% prior to SMZ-TMP initiation. Only two of eight patients whose warfarin doses were pre-emptively reduced had an INR over 4.0 after SMZ-TMP, versus eight of nine patients in the control group, where warfarin doses were only adjusted based on observed INR values after SMZ-TMP initiation. Also, none of the eight SMZ-TMP-treated patients had a sub-therapeutic INR during concurrent therapy.

Dr Bell noted the THS had introduced a trial form titled "inpatient post fall clinical pathway". This form carries the same data as found in the Western Australian Health Department guidelines for head trauma and is based on the Canadian CT head injury/trauma rule and the New Orleans criteria.

In Dr Bell's opinion, this case highlights what he calls several traps for doctors. The first is that the notes record concern about head trauma even though a head strike was denied. This was good management by the doctor, as even deceleration may cause a subdural bleed in this situation, and the accuracy of the history from the patient cannot be ensured.

The next trap is that if a patient is suspected of head injury, even mild and is anticoagulated (in this case over anticoagulated), a CT scan of the brain should be performed. For example, the Canadian CT head injury/trauma rule indicates which patients require a CT scan of the brain. Patients on anticoagulation are specifically excluded from the rule, however the accepted policy has become that all patients on anticoagulation are scanned where there is a concern about head injury. Mr Long was also older than 65 years, so that together with the concern about a head injury means he qualified for a scan under this rule or protocol. The other validated system is the New Orleans criteria. If Mr Long had presented to the Emergency Department, Dr Bell says a CT scan of the brain would almost certainly have been done. Dr Bell says as the patient was on a general medical ward and treated by general medicine doctors (night resident and Medical Unit A ward round), a CT scan of the brain was not done because those doctors are not experienced in this area. Had the new trial form been completed by the medical staff, the need for a CT scan of the brain would have been obvious.

The next issue highlighted by Dr Bell is what does a normal neurological examination indicate and what is the value of neurological observations for 24 hours? The main problem is in the elderly where the brain has shrunk and the bleeding inside the skull does not cause immediate pressure effects. The brain is often uninjured and therefore there are no clinical signs of focal brain injury. As the bleeding continues, the pressure increases causing ischaemia of the brain and often the brain stem (decreased conscious state) and pressure on the 3rd cranial nerve

which causes pupillary dilation. This was seen in this case. These signs are late, with the period between injury and signs being referred to as the lucid period. Dr Bell says this again reinforces the need for brain imaging due to the lack of clinical assessment.

The use of SMZ-TMP with warfarin is, in Dr Bell's opinion, arguable. SMZ-TMP was administered on the advice of the infectious diseases team on the basis of the known bacteria sensitivities to antibiotics. The pharmacy review of medications warned the medical team of the interaction. Due to the interaction considerable attention needed to be given to the warfarin dosing. Despite this Mr Long became over anticoagulated. When the subdural haematoma was proven the administration of vitamin K was required. The drug was prescribed but the records do not show that vitamin K was administered.

Finding an early SDH would have led to the reversal of warfarin's effect and either anticoagulation using heparin or no anticoagulation with the inherent risks involved in that strategy.

The THS RCA identified a number of deficiencies in the management of Mr Long. However the significant failure in this case was the failure to fully implement the post fall pathway leading to the failure to CT scan Mr Long's brain. This failure is reflected in the Resident Medical Officer's (RMO) notes after this fall that his or her impression was Mr Long had postural hypotension, however, it was noted Mr Long had mild head pain[6] and that he showed signs of confusion[7]. The fall was not followed up by the medical unit A team in the morning. It was simply noted.[8]

Dr Bell concluded the medical team did not appreciate the consequence of the fall in this patient and the RMO made an incorrect decision in not completing the inpatient post fall clinical pathway form. If it had been properly completed, then a CT scan would have been performed. The ward round was only interested in the postural hypotension. The drug interaction should have been managed better, by changing the antibiotic therapy or better still never starting the SMZ-TMP. I accept Dr Bell's opinion.

A copy of this decision was forwarded to the THS for comment. No response was received.

[6] THS records page 1376.
[7] THS records page 1417.
[8] THS records page 1377.

Comments and Recommendations

The only **recommendation** I make is the use of the inpatient post fall clinical pathway form be fully implemented by the THS and that it be completed by medical staff each time an inpatient suffers a fall. Otherwise, the circumstances of Mr Long's death are not such as to require me to make any further comments or recommendations pursuant to Section 28 of the *Coroners Act* 1995.

I convey my sincere condolences to the family and loved ones of Mr Long.

Dated: 18 October 2024 at Hobart in the State of Tasmania.

Magistrate Robert Webster
Coroner