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 31st day of March 2015, the 1st, 2nd and 7th days of April 2015 and the 17th day of July 2015, by the Coroner's Court of the said State, constituted of Anthony Ernest Schapel, Deputy State Coroner, into the death of Marjorie Irene Aston.

The said Court finds that Marjorie Irene Aston aged 86 years, late of 28 Branwhite Street, Woodville South, South Australia died at the Royal Adelaide Hospital, North Terrace, Adelaide, South Australia on the 5th day of January 2013 as a result of right subdural haematoma due to blunt head trauma with contributing excessive warfarin anticoagulation. The said Court finds that the circumstances of her death were as follows:

1. Introduction and cause of death

1.1. Marjorie Irene Aston was 86 years of age when she died on the evening of 5 January 2013 at the Royal Adelaide Hospital (RAH). She had been admitted to the hospital earlier that same day. Mrs Aston had lived alone in a house situated at 28 Branwhite Street, Woodville South. That morning Mrs Aston's son, Mr Barry Aston, had spoken to his mother on the phone. She had told him that she had suffered a fall and had hit her head on the end of the bed. Mr Aston had been present when at about 11am his wife Angela had spoken on the phone to his mother. That would be the last conversation that Mrs Aston had with either her son Barry or his wife. Later that day at around 5pm Mr Aston and his wife attended at Mrs Aston's premises at Woodville South. When there was no answer at the door they let themselves in. They found Mrs Aston slumped in an armchair. She was alive but unresponsive. An ambulance was

called and she was conveyed to the RAH. She died at approximately 8:45pm at the hospital.

1.2. Mrs Aston had a previous medical history that included frequent atrial extrasystoles that were asymptomatic. She had also experienced bowel cancer. In 2010 Mrs Aston had been seen by a cardiologist for her atrial fibrillation (AF), but it was not until the end of 2012 that it was determined that this condition was unremitting and for that reason, for the first time, she was prescribed the anticoagulant drug warfarin. This was prescribed in substitution for Cartia (aspirin) which she had been taking for her condition up to that point. Mrs Aston was prescribed warfarin on 19 December 2012 at a dosage of 5mg per day and it appears that she took her one tablet every day until 3 January 2013 when her general practitioner advised her to stop taking it. She would die two days later. In the period between 3 January and 5 January Mrs Aston had suffered her fall. The circumstances in which she came to be prescribed warfarin and the circumstances in which she would consume it in the pattern I have described will be the subject of some discussion in these findings.

1.3. A post-mortem examination was conducted in respect of Mrs Aston by Dr John Gilbert who is a forensic pathologist at Forensic Science South Australia. In his report Dr Gilbert expresses the cause of Mrs Aston's death as '*right subdural haematoma due to blunt head trauma with contributing excessive warfarin anticoagulation*'[1]. The salient pathological findings were that Mrs Aston had a large right subdural haematoma consistent with having originated 24 to 48 hours prior to her death. Dr Gilbert attributed Mrs Aston's death to the right subdural haematoma which appears to have arisen from relatively minor head trauma due to her fall at home on 4 January 2013. Specialist brain examination by a neuropathologist[2], Dr Grace Scott, also revealed the presence of a subarachnoid haemorrhage within the brain. There were other relevant findings including submucosal haemorrhages in the renal pelvicalyceal systems. There were mediastinal and renal haemorrhages present attributable to excessive anticoagulation with warfarin. Histological examination of the renal hilar haemorrhages indicated that they were approximately five to seven days old and thus pre-dated the subdural haematoma. Dr Gilbert expresses the opinion that the subdural bleeding was very likely to have been contributed to by excessive anticoagulation with warfarin. Dr Gilbert noted that there had been a recent

[1] Exhibit C2a
[2] Exhibit C4a

history of frank blood in Mrs Aston's urine which appeared to be the result of the submucosal haemorrhages in the renal pelvicalyceal systems.

1.4. The notion that Mrs Aston's intracranial bleeding was precipitated by a fall is supported by Dr Gilbert's findings that there was a 3cm diameter area of subcutaneous and subgaleal bruising in the midline of the occipital region of the scalp and a 5cm area of similar bruising of the right parietal eminence. This evidences some trauma to her head.

1.5. I have found that the cause of Mrs Aston's death was right subdural haematoma due to blunt head trauma with contributing excessive warfarin anticoagulation.

2. Background

2.1. I have referred to Mrs Aston's history of AF and the fact that she was prescribed warfarin for that condition. AF is a condition of the heart that involves an abnormal rhythm in respect of the heart's atria. It was diagnosed in Mrs Aston's case by way of constant electrocardiogram over a period of 24 hours. AF is not necessarily of itself a fatal condition. However, the rhythmic disturbance can cause blood clots to form in the atria of the heart. If a clot or part of a clot is dislodged from the atrium it may advance through the bloodstream and lodge within the blood vessels in the brain. This may result in a stroke. In order to prevent or minimise the rapidity of clotting within the atria, the anticoagulant drug warfarin is prescribed to patients suffering from AF. I was told during the course of this Inquest that since these events other less harmful drugs have become available to control the complications of AF. The placement of a patient on a warfarin regime is a serious clinical development in the patient's wellbeing. It results in a condition known as anticoagulation. Coagulation is the process by which the blood clots. Clotting is a natural feature of the body's processes. It reduces or stops bleeding. Anticoagulation occurs when the blood's clotting capabilities are altered. The effect of warfarin upon the blood's clotting properties is to lengthen the time over which clotting will occur. This means that bleeding may be less controllable in a patient who has been anticoagulated. Sites at which such bleeding might occur include the bladder, which may be evidenced by blood in the urine, and also the brain. A bleed within the brain in an elderly person caused say, by trauma, may result in a catastrophic and fatal brain haemorrhage such as a subdural haemorrhage or subarachnoid haemorrhage. A person who is

undergoing a warfarin regime and who is exhibiting blood within the urine would pose a clinical question whether that person's anticoagulation levels are being properly controlled.

2.2. Warfarin administration is undertaken by the patient him or herself. It is generally administered by way of a daily tablet that is prescribed by a medical practitioner and supplied by a pharmacist in the usual manner. In Mrs Aston's case it was prescribed in the form of 5mg tablets to be taken once daily at night. Mrs Aston was supplied with 50 such tablets by a pharmacist in Findon. The drug, as labelled on the container, states that it is '*Marevan 5mg WARFARIN TABLETS*'. The information on the bottle states that it originally contained *'50 TABLETS'*. The direction on the container states as follows: *'Take ONE tablet at night STRICTLY as directed by the doctor'*. If such a pattern of consumption was maintained in literal accordance with the prescription over an extended period of time, as it was in Mrs Aston's case, a dangerous situation regarding the patient's health would very likely arise because the patient's anticoagulation might develop to a catastrophic level. For this reason strict and careful supervision by a medical practitioner of a patient's anticoagulation levels should be instigated at the first available opportunity after warfarin consumption commences. It should then be closely monitored.

2.3. To enable a warfarinised patient's anticoagulation level to be measured, a blood test that establishes what is referred to as the patient's INR level is conducted. The INR of a patient reflects the rate at which the patient's blood will coagulate. The higher the level, the slower the blood's coagulation. INR is stated as a numerical figure. The evidence is that a normal INR level is 1. However, a therapeutic anticoagulation level for a patient experiencing AF is between 2 and 3. Warfarin is taken in a quantity and dosage that is designed to maintain the patient within that INR range. It was said in evidence that levels in excess of 5 can be considered dangerous. A level of 12 is certainly considered to be dangerous and would require medical intervention.

2.4. In order to maintain an appropriate therapeutic level of anticoagulation, in the initial stages of anticoagulation therapy a medical practitioner would need to check the INR level on a number of occasions during the first week of the therapy and to adjust the dose of warfarin accordingly. In due course a recommended dosage will be identified that will hopefully maintain the patient within the therapeutic level. Thereafter INR checks might be required less frequently.

2.5. There are methods by which anticoagulation caused by warfarin therapy can be reversed. This would in the first instance require the consumption of warfarin to be ceased. Certain reversal measures would then be implemented, such as the administration of vitamin K. This would be conducted in a hospital setting. The need for active reversal of anticoagulation, as distinct from the temporary cessation of warfarin consumption, would depend on the clinical presentation of the patient and the patient's existing INR level.

2.6. As seen earlier, Mrs Aston was prescribed warfarin on 19 December 2012. According to the information on the bottle, she acquired it from a pharmacist on the same day. I think it highly likely that in the nature of things she consumed her first tablet that evening. By the time of her death on 5 January 2013 it is apparent that Mrs Aston had self-administered about 16 tablets. Out of the 50 tablets that had been supplied by the chemist on 19 December 2012, 34 tablets remain within the container. If she had consumed her first warfarin tablet on 19 December, and had thereafter consumed them in accordance with the prescription at a rate of one tablet per day, the sixteenth tablet would have been taken on Thursday 3 January 2013. It was on this day that Mrs Aston was advised by a medical practitioner to cease taking her warfarin. This advice was tendered to her in circumstances that I will describe. I have referred to INR testing. Mrs Aston underwent an INR test on 21 December 2012. According to the SA Pathology (formerly known as IMVS, the Institute of Medical and Veterinary Science) request form relating to this test, the blood specimen for testing was taken from her at 10:40am that day. If Mrs Aston had taken warfarin in accordance with the dosage instructions, by the time the specimen was collected from her she would have taken one tablet on the evening of 19 December and another on the evening of 20 December 2012. Her INR on 21 December was determined to be 1.9 which is just under the lower end of the therapeutic spectrum for AF. The evidence was that this INR level was reflective of a relatively rapid onset of anticoagulation. Mrs Aston would not undergo any further INR testing until she was admitted to the RAH on 5 January 2013 with a catastrophic bleed on and in the brain, undoubtedly contributed to by excessive anticoagulation. Her INR in hospital was measured to be 12. As indicated, it is probable that Mrs Aston had been consuming the 5mg warfarin tablet on a daily basis between 19 December and 3 January 2013 when she was told to stop taking it. In my view, and I so find, this pattern of consumption undoubtedly resulted in her grossly excessive anticoagulation. In that

period her INR should unquestionably have been monitored and the dosages of her warfarin either varied or temporarily suspended until her INR level had stabilised within the appropriate therapeutic range.

2.7. This Inquest examined the circumstances in which Mrs Aston was prescribed warfarin, the circumstances in which she began taking it and the circumstances that conspired to see Mrs Aston not being monitored for INR levels between 21 December 2012 and 5 January 2013 when she was admitted to hospital in extremis and died.

3. Mrs Aston is seen by Professor John Horowitz

3.1. Professor Horowitz is a cardiologist and clinical pharmacologist. He graduated in medicine at Adelaide University in 1971. He has a PhD in Clinical Pharmacology. He qualified as a specialist physician in cardiology and clinical pharmacology in 1979. He spent two years at Harvard University as a Research Fellow in cardiology and clinical pharmacology. He has practised as a cardiologist and clinical pharmacologist since 1979. He has published widely in respect of issues connected with drugs in heart disease. He has a particular interest in the management of AF. He is Director of Cardiology at the Queen Elizabeth Hospital and has been so since 1988. He is Professor of Cardiology at Adelaide University as well as at the University of South Australia and at the Aberdeen University in Scotland. He was also Director of Cardiology at the Lyell McEwin Hospital for a 15 year period ending in about 2007.

3.2. As Director of the Cardiology Unit at the Queen Elizabeth Hospital (the QEH) Professor Horowitz manages the range of heart diseases that presents to that hospital and he is available to consult on difficult drug problems arising within the hospital, particularly related to cardiac drugs. The QEH Cardiology Unit letterhead, as depicted on letters written by Professor Horowitz in respect of his patient Mrs Aston, reveal a large professional membership of that Unit.

3.3. Professor Horowitz reviewed Mrs Aston at the QEH on Wednesday 19 December 2012. It was on this occasion that Professor Horowitz determined that Mrs Aston needed warfarin in respect of chronic AF that had been revealed by a 24 hour period on a Holter monitor. On that occasion Professor Horowitz also ceased Mrs Aston's previous drug, Cartia.

3.4. Professor Horowitz provided a statement to police on 18 January 2013[3]. As well, he gave oral evidence at the Inquest.

3.5. During the course of the Inquest a question was raised as to whether it may have been more appropriate, if not safer, for Professor Horowitz to have advised Mrs Aston's general practitioner that Mrs Aston required a warfarin regime and to have left it to the general practitioner to both initiate, prescribe and then manage the warfarin regime including the monitoring of INR levels and the titration of dosages. I will return to the discussion about that issue in due course, but it is as well to state here that regardless of which medical practitioner initiated the warfarin regime, be it Professor Horowitz or Mrs Aston's general practitioner, there can be no suggestion that Mrs Aston's warfarin regime for AF was inappropriate. In fact, the Court finds that the warfarin regime was appropriate, as was the initial dosage.

3.6. Professor Horowitz told the Court that at the 19 December consultation, and in Mrs Aston's presence, he dictated a letter to her general practitioner, Dr Fong Liew of the Woodville South Medical Centre situated at 4 Woodville Road, Woodville South. The letter to Dr Liew which is dated 19 December 2012, but probably not typed on that day, stated that Mrs Aston had gone into AF and that under those circumstances she needed warfarin. The letter advised that Professor Horowitz had ceased Mrs Aston's Cartia administration and that he had '*arbitrarily*' started her on 5mg a day of warfarin. The letter advised that Mrs Aston would undergo her first INR test in two days time, which would be 21 December 2012. The letter also asserted that Professor Horowitz had explained to Mrs Aston that she would need monitoring '*until the dose is right*', the implication being that Dr Liew should be responsible for that monitoring.

3.7. This letter would not reach Dr Liew by ordinary mail until 9 January 2013. It was not transmitted by any other means. I heard evidence that the location of Dr Liew's general practice was in very close proximity to the QEH where Professor Horowitz saw Mrs Aston, separated only by a car park. I also understood from the evidence that Mrs Aston used a walking frame and travelled in taxis for the most part. As seen earlier she lived alone.

[3] Exhibit C15

3.8. In his oral evidence Professor Horowitz told the Court that on 19 December he had impressed upon Mrs Aston the need for monitoring. To reinforce this, he wrote her a note in his own hand that was designed to bring home to her the dangers associated with warfarin administration. The note simply said '*Atrial fibrillation* – *warfarin rat poison*'. The reference to rat poison was a reference to Professor Horowitz having told Mrs Aston that the active component of warfarin was that used in rat poison. This advice was tendered to her in association with advice that she needed to have her INR levels monitored regularly by her general practitioner. In the same regard Professor Horowitz told Mrs Aston that she needed to have her first INR test in two days time and that she should make an appointment to see her general practitioner on that same day. I note that 21 December 2012 was a Friday. Professor Horowitz also provided Mrs Aston with an SA Pathology request form to enable her to secure an INR test[4]. The request form stated the originating practitioner to be Professor Horowitz. The clinical notes simply stated *'Warfarin'* and the test requested was simply *'INR'*. The request form was dated *'19/12/12'* and bears a PRIORITY stamp. There was a box marked URGENT which was ticked. There is provision on the form for the result of such a test to be copied to an entity nominated by the requesting practitioner. The '*copy to*' box on this form was not completed. An issue in the Inquest arose as to whether Dr Fong Liew, Mrs Aston's general practitioner, should have been copied into this process so that Dr Liew could be furnished with the result of the INR test as soon as possible. This in itself, quite apart from Professor Horowitz's letter to Dr Liew, would have alerted Dr Liew to the fact that Mrs Aston had been placed on warfarin by Professor Horowitz, that an INR test had taken place and that there would be a need for him as Mrs Aston's general practitioner to ensure that contact was made with her for the purposes of further monitoring.

3.9. I return to the question of Professor Horowitz's letter to Dr Liew. Professor Horowitz told the Court that although he dictated the letter in Mrs Aston's presence on 19 December 2012, he would not have expected it to be typed for some days, and it would not necessarily be posted through the QEH system on the same day that it was typed. The end result, and in fact expectation, would be that the letter would not reach Dr Liew through the ordinary post for several days. The letter would neither be faxed nor emailed to its intended recipient; such modern means of transmission not being routine in his practice. As seen the letter would not be received until

[4] Exhibit 10, page 25

Wednesday 9 January 2013. This date was stamped on the letter within Dr Liew's practice. Dr Liew himself endorsed the letter with the date '*9.1.13*'. This receipt was some four days after Mrs Aston's death. I should add here, however, that despite the non receipt of the letter until that date, Dr Liew had been made aware of Mrs Aston's warfarinisation for the first time on Thursday 3 January 2013 when he visited her at home in circumstances that I will describe in due course. Nevertheless, I accept that Dr Liew had not received the letter from Professor Horowitz by Thursday 3 January 2013 which is still more than a fortnight after it was dictated. The receipt of the letter in Dr Liew's rooms on 9 January 2013 was in keeping with the general expectation that Professor Horowitz described in respect of letters that he dictated and which were to be sent to general practitioners. The delay in the case of this particular letter may have been elongated by the Christmas/New Year period. I do note, however, that earlier correspondence from Professor Horowitz to Dr Liew in November 2010, consisting of a letter dated 2 November 2010, was stamped received in Dr Liew's rooms on 11 November 2010. This is consistent with the usual pattern of dispatch and receipt of letters between Professor Horowitz and Dr Liew. Thus, letters dictated by Professor Horowitz stood a very good chance of being overtaken by events as they would be here, tragically as it transpired for Mrs Aston. For reasons that will become apparent, the archaic means of transmission of Professor Horowitz's letter was a contributing factor in Mrs Aston's death.

3.10. I digress here to state that the Court was furnished with an audio recording of a telephone conversation between Mrs Aston and Healthdirect Australia (Healthdirect), which is a telephone medical service. The telephone conversation, which lasts several minutes, occurred on the morning of the day of Mrs Aston's death, namely Saturday 5 January 2013, and at a time before Mrs Aston's dramatic clinical deterioration later in the day from her brain haemorrhage. My impression of Mrs Aston in that conversation is that she was a coherent woman who could impart relevant information clearly and could understand readily what she was told. I mention this because there can be no suggestion that Mrs Aston did not at least have the capacity to understand Professor Horowitz's advice to her that she should regard warfarin as a dangerous substance that required monitoring and that she should attend SA Pathology for an INR test and arrange to see her general practitioner the same day. In the event we know that Mrs Aston did attend IMVS for her INR test on 21 December 2012, but it is equally clear that she did not see her general practitioner as she had been instructed by

Professor Horowitz. This may have had a lot to do with the nature of Mrs Aston's clinical relationship with Dr Liew.

3.11. It is therefore necessary at this point to describe the relationship that Mrs Aston had with her general practitioner, Dr Liew and of what transpired between her and Dr Liew in the period that followed her consultation with Professor Horowitz. Dr Liew explained this relationship in the course of his oral evidence. Dr Liew stated that Mrs Aston had been a patient of his since 26 May 2010. As far as he knew, Mrs Aston had not actually attended the Woodville South practice at any time. Their consultations had involved Dr Liew visiting her home. He told the Court that many of these visits were at his own instigation. It is therefore possible that when Mrs Aston was told by Professor Horowitz to arrange a consultation with Dr Liew, and when she heard Professor Horowitz dictate his letter to Dr Liew, Mrs Aston had an expectation that Dr Liew would soon contact her to initiate the required monitoring regime in accordance with their usual practice. After all, one would be entitled to expect that a letter that is dictated in one's presence would reach its intended recipient within something less than three weeks. That Mrs Aston was waiting for Dr Liew to initiate contact is supported by the evidence of her son, Barry Aston. Mr Aston told the Court that following his mother's initial blood test after her consultation with Professor Horowitz, she seemed to be waiting for Dr Liew to contact her.

3.12. In the event what is known is that, as revealed by telephone records, Mrs Aston ultimately phoned Dr Liew's rooms during 3 January 2013 and that Dr Liew later that day saw Mrs Aston at her home. However, by then it is apparent that Mrs Aston had seen blood in her urine and, as well, may have also experienced constipation that could have raised some concern in her mind having regard to a previous history of bowel cancer. It is also clear that there was no consultation between Mrs Aston and Dr Liew at any time between 19 December 2012, when Professor Horowitz saw her and dictated his letter to Dr Liew, and 3 January 2013 when Mrs Aston contacted Dr Liew's practice by phone which resulted in Dr Liew visiting her at home that evening. Thus Professor Horowitz's expectation that Mrs Aston would arrange to see Dr Liew on Friday 21 December 2012 may have been somewhat misplaced having regard to the type of clinical relationship that she had with Dr Liew, involving as it did a probable expectation on Mrs Aston's part that Dr Liew himself would initiate that contact despite Professor Horowitz's advice that she should arrange to see Dr Liew

after her blood test. It may well be that Mrs Aston had a reasonable expectation that Professor Horowitz's letter would reach Dr Liew within a reasonable time having regard to the fact that it was only the Wednesday of that week when it was dictated. Contrary to that reasonable expectation, the letter took an unreasonable length of time to reach Dr Liew due to the methodology by which Professor Horowitz's letters to general practitioners were processed and sent. One cannot help but wonder what the point of Professor Horowitz's letter was if he did not expect it to be received until well after Dr Liew had been informed of Mrs Aston's warfarinisation by Mrs Aston herself. As indicated earlier, the receipt of any such letter was always going to be overtaken by events and if Mrs Aston had chosen to initiate contact with Dr Liew as Professor Horowitz had instructed, receipt of the letter in January would not have informed Dr Liew of anything he would not already have gleaned from his patient as augmented by whatever further enquiries he would need to make at his own initiative.

3.13. In his statement Professor Horowitz acknowledged that he knew that the letter that he dictated and sent to Dr Liew could take up to ten days to reach him, and possibly take as long as two weeks if things went badly. For these reasons he did not '*trust the letter*' and so handwrote the note for Mrs Aston which he believed had said something like '*started on warfarin, please monitor*'. As already seen, the letter did not say anything about monitoring as such. He said that if he had entertained any doubts about Mrs Aston's intellectual capacity he would have telephoned the general practitioner and in this case had seen no reason to do so.

3.14. There was an aspect of Professor Horowitz's evidence about his methodology of communicating with general practitioners that was open to question. He repeatedly insisted that it was common or uniform practice for a specialist such as himself to communicate with a general practitioner in the way that he did in Mrs Aston's case, that is to say by sending a letter by ordinary post and providing oral advice to the patient. He was at pains to argue that the manner in which he endeavoured to ensure that Mrs Aston was monitored by her general practitioner, involving as it does not any direct communication with the general practitioner in this case, was a practice that around the world was the norm and that '*to suggest that I was in any way egregious by it is to condemn the general practice regarding the use of warfarin worldwide*'[5]. He stated that what he did was in no way different from the norm of specialist

[5] Transcript, page 91

practice. He reproachfully suggested that counsel assisting, Ms Kereru, should be arguing whether or not what he did '*deviated from normal standards of care*'[6]. When asked by me whether he had endeavoured to ascertain from his professional colleagues within the Cardiology Unit at the QEH, as listed on his letterhead, whether his practice was the accepted practice at the time and was therefore their practice as well as his, Professor Horowitz insisted that those practitioners were all people whom he had trained, implying, one supposes, that they would, and perhaps even should, subscribe to the same methodology as himself[7].

3.15. The Court is bound to say that 20-20 hindsight is not required to reach a conclusion that Professor Horowitz's practice was a practice that was fraught with imprecision, bound to fail in due course and one that in all of the circumstances was to be heartily deprecated. I would have grave difficulty in describing it as a professional clinical practice. The method of communication with a general practitioner of the kind under discussion here is to my mind simply an administrative practice and one which should be taking advantage of all available modern technology.

3.16. In his statement Professor Horowitz frankly acknowledged that if Mrs Aston's INR had gone unchecked, and if she was a slow metaboliser of warfarin, 5mg per day in a two and a half week period for a small old lady would result in her INR levels '*being dangerously high*'. The underlying bases for that assertion are all accurate in the sense that it accurately describes Mrs Aston's unchecked pattern of warfarin consumption and, having regard to the rapidity at which she achieved an INR of 1.9, there is good reason to believe that she was not a rapid metaboliser. For reasons that I will mention in a moment I am not entirely certain that Professor Horowitz's oral evidence on the same issue bore the same level of candour.

3.17. In his statement Professor Horowitz acknowledged that blood in the urine of a person could imply the need for hospitalisation. If a patient's INR was 4 instead of 2.5, stopping the warfarin for a couple of days and dropping the dose down might be sufficient, but if the INR was 8 then the patient would need to be sent to hospital.

3.18. It is clear from Professor Horowitz's statement and his oral evidence that after his consultation on 19 December 2012 he had no knowledge of any further development in respect of Mrs Aston's INR monitoring, or lack of it, by Dr Liew.

[6] Transcript, page 92
[7] Transcript, page 99

3.19. In Professor Horowitz's oral evidence he told the Court that Mrs Aston's INR of 1.9 on 21 December 2012 meant that she was '*already almost loaded with warfarin*'. He would have expected a level of 1.7 or l.8, meaning that if he had seen the INR of 1.9 after two days he would have lowered the dosage to about 3mg or 4mg. Professor Horowitz also stated that an INR above about 4 starts to become dangerous and at 5 it is '*worth reversing*'[8]. In fact he went on to later say that an INR above 5 with actual bleeding would have caused him to use a reversal agent. Professor Horowitz said that he would have been nervous about sitting on a 5mg dosage if after just two days Mrs Aston was almost therapeutic.

3.20. Professor Horowitz in his oral evidence insisted that although he would have been concerned if Mrs Aston's INR had exceeded 5, it was not known how high an INR level she actually ultimately achieved and added that it was very important that the Court realise this. In saying this it was evident that until it was pointed out to him in Court, Professor Horowitz had not known that when Mrs Aston presented at the RAH on 5 January 2013 her INR was recorded as 12[9]. He said that he would be astonished that someone who had an INR of 1.9 after two days would end up with a steady state INR of 12. He used the word '*bizarre*'. He said that there would be a need for some additional factor such as liver failure. The evidence that Professor Horowitz gave which does not neatly sit with his assertion in his witness statement to the effect that over a period of two and a half weeks an INR level would become dangerously high at a rate of consumption of 5mg per day unchecked, consisted of the dogmatic assertion that if a patient after two days had an INR of 1.9, in 16 days or so the INR should have reached a plateau. He said that the plateau would have been reached in about seven days and would not be as high as 10. He suggested that the plateau may have been a level of about 3.5. He said:

> '5 mg, yes. If you give me official - if you say I would like you to know that she was started on 5 mg a day and her level after two days was 1.9, then there is a reasonable expectation that her steady state INR would be somewhere between 2.5 and 3.5.' [10]

When asked as to when that would be achieved he said '*whenever you – at more than 10 days; at 10 days, 20 days or 20 years*'. For reasons that will become apparent I have rejected that evidence.

[8] Transcript, page 62
[9] Transcript, page 64
[10] Transcript, page 71

3.21. It will be observed that Professor Horowitz's 'plateau' of 3.5 is a figure that is above the therapeutic range for AF, but which on the evidence is not one that would be viewed as dangerous, and not one that would account for Mrs Aston's catastrophic brain haemorrhages. Professor Horowitz did add that a second drug might have altered the pattern. In this regard it will be seen that Dr Liew would ultimately prescribe for Mrs Aston the antibiotic trimethoprim for a suspected urinary tract infection. But Professor Horowitz believed that this would not have had a significant effect, and other evidence from an independent expert, Dr Peter Joyner whose evidence I will deal with herein, amounted to the same assertion. When counsel for Dr Liew, Mr Henchliffe, reminded Professor Horowitz of what he had said in his witness statement about INR levels becoming dangerously high when not monitored on 5mg per day, the Professor countered by saying that by '*dangerously high*' he meant a level of 5. Nevertheless, regardless of the estimate as to the level, it is plain that he acknowledged in his witness statement that there was the potential for an unmonitored INR level to become dangerously high in a woman such as Mrs Aston on a consistent daily dosage of 5mg of warfarin over the period in question. The flavour of his oral evidence on the same topic, is not as robust. I add here that other evidence was powerfully to the effect that regardless of the INR number that Mrs Aston ultimately would have reached, she must have reached a dangerously high level and that is what caused her brain haemorrhage and that if any plateau had been reached, it was one that was at or in excess of what Mrs Aston could safely tolerate. I have preferred that other evidence. I also prefer Professor Horowitz's analysis of the situation as described in his witness statement to what he said in his oral evidence.

4. Mrs Aston sees Dr Liew on 3 and 4 January

4.1. Dr Liew is a general practitioner. He obtained his medical qualifications from the University of Singapore in 1968. He has practised in Kuala Lumpur and with the Australian Defence Forces as an Army doctor. For some time he was an in-house doctor at General Motors Holden. He worked for five years at the Lyell McEwin Hospital in Accident and Emergency. At the time with which this Inquest is concerned he was practising within the Woodville South Medical Centre. There was another doctor working at that practice, a Dr Ng. The practice was open Monday to Friday. While Dr Liew did not work on Saturdays or Sundays, Dr Ng normally worked on a Saturday morning until midday. However, on the weekend following Dr

Liew's consultations with Mrs Aston, namely the weekend of 5 and 6 January 2013, Dr Ng was not working.

4.2. Dr Liew explained his clinical relationship with Mrs Aston in the terms that I have already described. On the occasion of the consultation of 3 January 2013 Dr Liew said that he could not recall whether she had asked him to visit her or whether he visited her simply to check, but it seems more probable than not that Mrs Aston called him.

4.3. By Thursday 3 January 2013 it is clear that Mrs Aston was experiencing blood in her urine. It appears that this, along with another possible concern about bowel cancer, provided the impetus for Mrs Aston to initiate contact with Dr Liew. In Mrs Aston's telephone records there is a call from her home telephone to Dr Liew's surgery at 2:14pm on 3 January 2013. This would be consistent with Mrs Aston, in the period since 19 December 2012, having waited for Dr Liew to either call her or visit her at her home, and as seen, her son Barry was under the impression that his mother was in fact waiting for Dr Liew to make contact with her. Mrs Aston had told her son that she could not work out why she had been taken off Cartia with which she had been happy and had indicated to him that she was not happy with warfarin. Mr Aston said in evidence that he did not know why she was unhappy with the new drug. Mr Aston believed that he knew that his mother had undergone one blood test at the time, but he did not know what the reading was as his mother had never mentioned the result[11]. On 3 January 2013 Mr Aston became aware through a phone call or calls with his mother that she felt unwell and that she had blood in her urine. She said that she had constipation and felt sick. This information seems to have been imparted to Mr Aston after Dr Liew had seen Mrs Aston that evening. When Mr Aston gave evidence I accepted his assertions to the effect that both before and after 3 January 2013 he had an imperfect understanding of the significance of warfarin administration. Although it appears that as of January 3 he understood that Dr Liew intended to commence testing Mrs Aston for INR levels, and that she had been advised not to take warfarin for the time being, he did not have an appreciation of any present danger that his mother may have been in.

[11] Transcript, page 20

4.4. Dr Liew provided a statement[12] to police and gave oral evidence at the Inquest. Dr Liew's handwritten clinical notes[13] of his consultation were tendered to the Inquest.

4.5. A clinical note dated 11 December 2012 demonstrates that Dr Liew knew that Mrs Aston would be seeing Professor Horowitz for the Holter monitor test. However, there is no further note to suggest that Dr Liew knew of the result of that test prior to his attendance on Mrs Aston at her home on 3 January 2013. As indicated earlier Professor Horowitz's letter was date stamped received on 9 January 2013. There is no indication in the file that Dr Liew had been copied into the INR result of 21 December 2012, and as seen, Professor Horowitz's request form did not ask that Dr Liew be copied into the result. In his evidence Dr Liew testified that he knew nothing of the fact that Mrs Aston had been placed on warfarin or that he was required to monitor its administration. I accept that evidence. The clinical note of 3 January 2013, made in his own hand, begins by referring to the fact that Mrs Aston had been started on warfarin at 5mg on 19.12.12 by Professor Horowitz. This much could either have been gleaned from Mrs Aston herself or from the container that the tablets were in which were described as Marevan. The container is clearly marked Marevan 5mg. Significantly Dr Liew noted in the clinical record that '*and I know nothing of this*'. That was underlined. There is no suggestion that this was added after the event of Mrs Aston's death. I am comfortably satisfied that prior to 3 January Dr Liew did not know anything about Mrs Aston having been placed on warfarin and that he was required to monitor it. At best, it may have been within Dr Liew's contemplation at some point that this might be an eventuality, but he had no actual knowledge of it in my view.

4.6. Dr Liew's note of 3 January goes on to refer to a complaint of constipation for three days. The note also refers to '*frank haematuria*' which is a reference to visible blood within the urine. The note also refers to Dr Liew's suspension of warfarin, meaning that he advised her that she should not take it again. The consultation appears to have commenced at 7:10pm. Mrs Aston gave Dr Liew an indication that she was due to take the next warfarin tablet at 9pm. It would be this administration that would be avoided. It would seem unlikely that she would take her nightly tablet contrary to the advice that she was given by Dr Liew. Dr Liew noted that he advised Mrs Aston on

[12] Exhibit C17
[13] Exhibit C11

the implications of warfarin administration and of the requirement to maintain the INR in a correct range between 2 and 3. There is a reference to a need to obtain an INR the following day.

4.7. In his oral evidence Dr Liew elaborated upon the notations in his clinical notes. He told the Court that Mrs Aston had said that the Professor had put her on medication which was making her bleed. She was naturally referring to the warfarin. There appeared to be an association in her mind between that medication and her bleeding. Dr Liew performed a dipstick urine test which confirmed blood in the urine, but Dr Liew appears to have been equally as concerned about the possibility of a urinary tract infection. The dipstick test appeared to indicate white cells consistent with infection in the urine. As a result of his suspicion that there was a urinary tract infection he prescribed the antibiotic trimethoprim.

4.8. Dr Liew told the Court that he also suspected that the blood in Mrs Aston's urine was related to her consumption of warfarin and it was for that reason that he advised her to stop taking it. He said that he was surprised to learn that Mrs Aston had been on warfarin since 19 December 2012 without him personally being advised of that by Professor Horowitz. He said that he would have expected to have been advised of that immediately so that he could assume the close monitoring of her dosage[14]. Although Dr Liew wanted to take a blood sample from Mrs Aston in order to have her INR level ascertained as soon as possible, having regard to the hour he decided that he would take the sample the following day. He considered whether Mrs Aston's situation required hospitalisation but did not think it was necessary.

4.9. The following day, Friday 4 January 2012, Dr Liew returned to Mrs Aston's house. This attendance occurred at about 1:50pm that day. Dr Liew observed that Mrs Aston's urine was much lighter and not so bloody. I do note, however, that within his written clinical note he described the blood as '*still like rose syrup'*. He formed the opinion that the bleeding was diminishing. He took the blood sample. Dr Liew used a particular type of tube to take the blood sample. Ultimately the sample would not be tested at SA Pathology because when the sample was received there, it was determined that there was insufficient blood in the tube. I will come back to that in a moment.

[14] Transcript, page 171

4.10. Dr Liew completed an SA Pathology request form of the same type that Professor Horowitz had used in December. The form which would have accompanied the blood sample to SA Pathology stated that the requested test was for '*INR*'. The clinical notes simply stated '*on Warfarin*'. The request form was not marked urgent. The salient feature of this request form is that it was completed by Dr Liew in precisely the manner in which a routine INR blood test would be requested. It would be read by SA Pathology in that same manner. But the difficulty was that this was no routine INR blood test. It was an INR test requested against a clinical presentation of suspected urinary bleeding as a result of warfarin anticoagulation and a lack of INR testing since the one and only test on 21 December 2012 which had occurred two days following the initial administration of warfarin. So SA Pathology were to know nothing of those additional key matters of relevance.

4.11. In the course of Dr Liew's evidence there were a number of standout issues on which he was closely questioned. They were, firstly, why between Friday 4 January and Sunday 6 January 2013 Dr Liew had not chased up the result of his INR test. Secondly, whether Dr Liew had a full appreciation of the fact that since 19 December 2012 Mrs Aston had been consuming 5mg of warfarin on a daily basis without interruption and, save and except for the INR test of 21 December 2012, without monitoring. Thirdly, why he had not included within the SA Pathology request form the crucial additional matters that I have identified in the preceding paragraph

4.12. As to the first of those issues it is necessary to describe what occurred in relation to the blood sample that Dr Liew took from Mrs Aston on the Friday afternoon. In this regard I heard evidence from Mr Adrian Griffiths who is the Section Head of Automated Haematology at SA Pathology. Although Mr Griffiths had no personal involvement in the processing of the blood sample in question, he was able to speak to certain records that had been maintained in respect of the processing of the sample. There was no doubt that the sample and the request form were collected from Dr Liew's surgery on the Friday afternoon. Equally there is no doubt that a technician did not test the sample, the reason being that the sample was considered to be inadequate. There was no direct evidence about the asserted inadequacy, but equally there is no reason to suppose that the view taken of the sample was incorrect. The other matter that needs to be taken into consideration is that, as earlier indicated, the request form did not suggest that there had been any particular urgency associated

with this request for analysis and so the actual importance of the testing of the blood sample for INR would not have been appreciated within SA Pathology. On the face of the request form, it was a routine INR test, meaning that if a sample was thought to be inadequate a further sample could be requested and taken without any need for urgency. If on the other hand the request had been described as urgent, or the reason for the INR testing in terms of its actual clinical need had been identified in the document, there may well have been a different approach to this particular sample.

4.13. Mr Griffiths dealt with a number of matters in his evidence. Firstly, documentation that he referred to demonstrated that attempts were made in any case to call Dr Liew to let him know that the tube that he had submitted was under filled. It is apparent that work was undertaken in relation to this sample at around 4pm on the afternoon of Friday 4 January 2013 and that the under filling was then identified. There was reference in the computerised records of SA Pathology that the sample was considered to be under filled and that an attempt was made to contact Dr Liew's surgery that afternoon about the matter. The contact was unsuccessful. A note was left for SA Pathology Saturday morning staff to attempt to phone the surgery that morning. There is reference to an unsuccessful attempt at 11am; the surgery was said to be closed. There was a further note left for a further attempt to be made on the Monday morning. There was a question as to whether or not an attempt was made, or ought to have been made, to contact Dr Liew at his home, but I am satisfied that in all of the circumstances, as known to SA Pathology staff, there would have been no pressing need for them to have done so. In the event Dr Liew would not become aware of the assessment that the blood sample was under filled until after Mrs Aston's death when he returned to work the following week.

4.14. Secondly, the question remains as to what may have transpired if the sample had been properly filled and then tested or if, alternatively, the request form had signified to SA Pathology a sense of urgency. Mr Griffiths suggested that in the latter situation a slight under filling of the sample may have been ignored and the sample analysed. If the INR reading was at a dangerous level the result would have been worthwhile reporting, or at least effort would have been made to contact the doctor to ensure that something further could be done. Critical INR levels might even involve contacting police if the doctor or the patient could not be contacted direct. Indeed, anything above therapeutic range would have been telephoned through. I understood that if the

urgency had been signified a result would have been available within the hour and Dr Liew may well have been contacted on 4 January 2013[15]. The effect of Mr Griffiths' evidence was that if the sample had been properly filled, or if the requesting document had indicated urgency and/or the reason for that urgency, SA Pathology would have taken further steps to contact Dr Liew on the Friday.

4.15. All this of course begged the question as to why Dr Liew himself would not have chased the result of the INR test having regard to Mrs Aston's circumstances. He said that it had simply slipped his mind over the ensuing weekend[16]. He agreed that if he had not received the result of the blood test on the Friday that it was possible that he would not receive it until the Monday and further agreed that to have waited for an INR result for that period would have been too long[17]. He said his failure to chase up the result was an '*omission on my part*'[18]. Asked by me to explain in his own words what it was that had slipped his mind, he said that he should have followed through with the result. He said:

> 'Normally yes, yes. It went out of my mind. If I had - it was in my mind I would have - yes I would have done so, keep a close - normally that's what I do but I can't explain why that weekend has to be like that, no excuse.' [19]

4.16. As to why Dr Liew did not tick the urgent box on the request form, he offered that he may have been in a bit of a rush and acknowledged that he should have marked it as urgent. He also acknowledged that he should have included information about the fact that Mrs Aston had blood in her urine[20]. He agreed that this was another '*omission on my part*'[21].

4.17. There was one particular aspect of Dr Liew's evidence that troubled the Court. It concerned Dr Liew's level of awareness, as of 3 and 4 December 2013, of Mrs Aston's warfarin consumption pattern since 19 December and the fact that her INR had not been monitored other than on 21 December. It has to be said that, to begin with, I detected an undue tone of evasiveness on the part of Dr Liew in respect of both issues. He said that it never entered his mind as to whether or not her warfarin had

[15] Transcript, page 137
[16] Transcript, page 174-180
[17] Transcript, page 209
[18] Transcript, page 210
[19] Transcript, page 210
[20] Transcript, page 208
[21] Transcript, page 208

been checked since it had started on 19 December 2012[22], a wholly unlikely statement having regard to the fact that this would be one of the first things that a concerned medical practitioner in Dr Liew's circumstances would ask of a patient. He also said that he did not know when Professor Horowitz had commenced the warfarin administration when that too would have been another important question to ask and a matter that could easily have been established simply by looking at the date on the warfarin tablet container, which was 19 December 2012. Dr Liew suggested that the important matter on his mind was the bleeding in the urine. Naturally this was important, but another important consideration for Dr Liew would have been to establish whether there was an appreciable risk of a more catastrophic bleed to which the amount of warfarin that Mrs Aston had been taking unchecked would be relevant. In his evidence Dr Liew eventually suggested that he probably would have asked Mrs Aston when the warfarin had been commenced, but could not remember[23]. Dr Liew also stated that he did not calculate the number of tablets that Mrs Aston may have taken since she started. This could have been easily established by asking Mrs Aston whether she had taken one per day, or even by way of counting the number of tablets remaining in the bottle. Asked as to whether he was concerned as to whether or not Mrs Aston had been monitored since being placed on warfarin, he said that he would expect it to be monitored because anybody who started warfarin would be monitored very closely over the next few weeks. This assertion was contrary to an assertion within his written statement given on 23 January 2013 that '*I was concerned that Mrs Aston had been taking 5mg of warfarin without any regular monitoring*'[24]. Dr Liew suggested that by that he had not meant to imply that he knew that she had not been monitored, but then went on to tell the Court that he had presumed that she had not been monitored because he had known nothing about it. When pressed he said that he was in fact concerned, '*definitely so*', that she had not been monitored. For the Court's part I was surprised that Dr Liew would not have readily acknowledged the obvious, namely that he must have known that Mrs Aston had not been monitored for INR and that she had been taking warfarin in full accordance with the prescription since 19 December.

4.18. There were two further matters about which Dr Liew gave evidence. I have referred to the issue as to whether Dr Liew had considered hospitalisation for Mrs Aston in

[22] Transcript, page 194
[23] Transcript, page 197-198
[24] Exhibit C17, page 5

light of her clinical presentation and history of warfarinisation. On this topic Dr Liew, both in his statement and in his oral evidence, referred to a previous experience with another elderly patient on warfarin who had presented with blood in his urine. He had sent that patient to hospital where his warfarin was stopped. The bleeding had then ceased. The patient was then re-commenced on warfarin and sent home. He contacted Dr Liew to say that the bleeding had started again. Dr Liew again had told the patient to stop taking warfarin until further notice. Again the bleeding stopped. In Mrs Aston's case Dr Liew had suspected that her bleeding had been occurring in the lining of the bladder wall and that stopping her warfarin would stop the bleeding as it had with his previous patient. However, the distinguishing feature between Mrs Aston's case and Dr Liew's previous experience was that in Mrs Aston's case she had been consuming 5mg of warfarin on a daily basis without monitoring for a period of approximately two and a half weeks. This meant that for all Dr Liew knew, she could have accumulated a catastrophic INR which in fact would turn out to be the case. Whereas in the previous case there had been no suggestion that the patient had been over warfarinised or that his INR had exceeded accepted limits. He had simply bled and the bleeding had stopped when the warfarin was stopped. With respect, it is difficult to discern what comfort Dr Liew could have derived from that previous experience. I do not believe that Dr Liew had equated two sets of such differing circumstances.

4.19. The other matter of possible significance is Dr Liew's prescription of the antibiotic. An extract from the MIMS publication was tendered to the Court[25]. There it is said that the antibiotic in question, trimethoprim, may potentiate the anticoagulant activity of warfarin. It states '*careful control of anticoagulant therapy during treatment with trimethoprim is advisable*'. On the other hand, Professor Horowitz expressed a belief that he did not think that it would interact significantly with warfarin. The independent expert, whose evidence I will mention presently was of a similar view. Suffice it to say, the antibiotic was contraindicated as far as the literature is concerned and would have been better left unprescribed. Clearly the overwhelming consideration in Mrs Aston's presentation for Dr Liew was the bleeding in her urine and the fact that she had been commenced on, and had been consuming on a daily basis, an unchecked quantity of warfarin with her anticoagulation levels also having gone unchecked. The possibility of a urinary tract infection was something of a side issue.

[25] Exhibit C17a

5. The events of 5 January 2013

5.1.1. On Saturday 5 January 2013 a number of phone conversations between Mrs Aston and her son and his wife occurred. In one of those calls Mrs Aston said that she had experienced a fall and had hit her head at the end of the bed. Mrs Aston was advised to attempt to call her doctor, and it is apparent that she unsuccessfully attempted to do this but in the event she was able to speak to a person at Healthdirect. This call commenced at 10:22am and lasted several minutes. An audio recording of the call was played in Court and a transcript of that conversation was tendered in evidence[26]. I have referred to this conversation earlier. Mrs Aston began by informing the operator that before Christmas she had been placed on warfarin and that she now had blood in her urine. She referred to a Dr Liew as having treated her. She was asked whether the doctor was aware that she had blood in her urine and she said that he was so aware and that he had come to her home to treat her. She said that she had experienced a fall at about 10:30 the previous evening. She said that when her legs had gone wobbly she had hit her head on the end of the bed. She said that she had struck her head on the back and on the side. Although she had what she described as a '*dull sort of head at times*', she said that she did not really have a headache. She said that she also had a large bruise on her arm. It is plain that Mrs Aston associated the bleeding in her urine with the warfarin administration and that she made that association clear to the operator. She said that her breathing was normal, that she was not currently bleeding, although she had a bruise, that she had not experienced any seizures, was not confused, was ambulating, that her speech was clear and that she was alert. She described no alarming symptoms. She said that she did not lose consciousness at the time of her fall. She said that she would be able to keep an eye on herself and advised that her son and daughter-in-law would be coming to her house after they had been to a birthday luncheon. She was advised by the operator to call 000 for an ambulance if she developed sleepiness, vomiting, difficulty with walking or double vision, and she was advised not to drink alcohol. Mrs Aston was also advised that if any symptoms worsened or if she experienced dizziness she should call back or call a doctor immediately. The conversation concluded by Mrs Aston telling the operator that she was going to spend the day watching the cricket.

[26] Exhibit C18b

5.2. The salient features of the conversation were that Mrs Aston had experienced a fall, had experienced a blow to her head, that she was on warfarin and that she was experiencing blood in the urine. She was otherwise asymptomatic. Importantly, during the conversation it was established that she had seen her doctor about the issue concerning blood in her urine and that her son and daughter-in-law would be attending at her premises later in the day. One matter that was not discussed during the conversation was whether Mrs Aston's INR had been monitored, a matter that an operator for Healthdirect should have an appreciation of. On the other hand, it may have been reasonable for the operator to have assumed that INR monitoring had been ongoing. The fact that Mrs Aston had said that her doctor had been coming and treating her could well have engendered in the mind of the operator a belief that anticoagulation monitoring was a matter that was in place and that her anticoagulation was subject to proper control notwithstanding the haematuria.

6. The evidence of Dr Peter Joyner – an independent expert

6.1. Dr Joyner has a Bachelor of Medicine and a Bachelor of Surgery from the Adelaide University in 1969. He has a Diploma of Obstetrics and also a Fellowship of the College or Rural and Remote Medicine. After a period of practice in metropolitan Adelaide, Dr Joyner moved to Mannum in 1976 where he has since been in general practice. Dr Joyner is Director of Emergency Services for Country Health SA. His responsibilities with Country Health SA include oversight of their emergency services. He is Chair of the Credentialing Committee in respect of applications by medical practitioners to practise in country hospitals. He has given expert evidence in medico-legal matters in a number of jurisdictions in this State. I regarded Dr Joyner as an expert in the practice of general medicine. I add here that I also regarded Professor Horowitz and Dr Liew as experts in their respective fields.

6.2. Dr Joyner is a general practitioner who independently reviewed the circumstances of Mrs Aston's death. Dr Joyner provided a written report[27] and gave oral evidence.

6.3. Dr Joyner was critical of a number of aspects of Mrs Aston's management by Professor Horowitz and Dr Liew. Before dealing with those matters I should mention that Dr Joyner was of the firm opinion that on the assumption that Mrs Aston had taken 5mg of warfarin per day, by 3 January 2013 her INR would have reached a

[27] Exhibit C18a

potentially very dangerous level of 10 or 15 or even more[28]. He suggested that when her initial response to the consumption of warfarin was taken into consideration, it was difficult to imagine that her level would not have been at a dangerous level even after just one week. Dr Joyner did agree that Mrs Aston's INR might plateau, but suggested that the plateau would occur not until dangerous levels of 10 or more had been reached. In fact Dr Joyner stated that he had not encountered patients '*plateauing out*' in the normal expected range. His experience was that this always occurred in the toxic range[29]. In cross-examination, counsel for Dr Liew, Mr Henchliffe, invited Dr Joyner to comment on Professor Horowitz's expectation that the INR would have plateaued between 2.5 and 3.5. Dr Joyner told the Court that he did not agree with that conclusion. He told the Court that he had treated many patients over the years, both in the initiating and the monitoring of INR levels. For that reason I regarded Dr Joyner as equally qualified as Professor Horowitz to speak about expected INR levels. Dr Joyner pointed out that Professor Horowitz's views were not supported by the literature or by the guidelines that relate to the manner in which INR levels should be monitored and dosages of warfarin titrated. Dr Joyner expressed the very firm view that one could not accurately predict that a dose of 5mg per day would plateau at a safe level, and added the compelling observation, '*otherwise all the standard recommendations for repeat testing, very carefully in the first couple of weeks, wouldn't need to be there*'[30].

6.4. Asked as to the possible effect of the prescription of the antibiotic trimethoprim, Dr Joyner told the Court that he would not have used the antibiotic because the primary issue as far as Mrs Aston was concerned was the need to establish her INR. He told the Court that the therapeutic guidelines would indicate that while antibiotics can cause an increase in the INR level in some people, it takes about five days for that to occur as it takes that amount of time for the antibiotic to affect the enzymes in the liver which in turn affect the action of warfarin. He was of the view that if Mrs Aston had taken an antibiotic following its prescription by Dr Liew it would not necessarily have altered things. In this regard Dr Joyner's evidence was not dissimilar from that of Professor Horowitz insofar as the Professor did not believe that the antibiotic would have made a significant contribution to Mrs Aston's anticoagulation.

[28] Transcript, page 242
[29] Transcript, page 243
[30] Transcript, page 267

6.5. Dr Joyner did not express any surprise that by 5 January 2013 Mrs Aston's INR level was 12. He regarded that as an extremely dangerous level. Moreover, given that this level was recorded following the probable period of abstinence after Dr Liew had advised her to stop taking it, her INR level would have been at least 12 or even higher when she experienced her fall. In the event I have preferred and accepted Dr Joyner's evidence. I find that Professor Horowitz's evidence that one would only expect a plateauing of INR to occur between the range of 2.5 to 3.5 to be highly unlikely and would bring into question the need for any monitoring at all when dosages of 5mg or less are prescribed in the first instance, the compelling point made by Dr Joyner. Dr Joyner is an independent expert and that also in my view lends support to the notion that his evidence should be preferred. I have accordingly found that by 3 January 2013 when Dr Liew saw Mrs Aston, her INR was at a very dangerous level, whatever its number may have been, and that her excessive level of anticoagulation was a significant contributing factor to the bleed not only within her urine but to the brain haemorrhage as well.

6.6. Dr Joyner was of the view that the following matters associated with Mrs Aston's clinical management were questionable:

- Professor Horowitz's reliance upon Mrs Aston to initiate contact with her general practitioner for the purposes of monitoring. Dr Joyner believed that the letter to Dr Liew was inadequate and that a simple phone call to Dr Liew would have been more appropriate and would have prevented '*the whole cascade of events*'. Similarly, a facsimile could have been sent. For the Court's part an email also would have been sufficient. Dr Joyner regarded Professor Horowitz's method of communication as an unsafe practice, regardless of whether it was standard practice or not. In mitigation Dr Joyner recognised that Mrs Aston may have presented to Professor Horowitz as a coherent and very organised person and for that reason may have been misled into relying on her completely. The Court would add to that that Mrs Aston's clinical relationship with Dr Liew, whereby she would have expected him to contact her, may not have been appreciated by Professor Horowitz;
- Dr Joyner thought it would have been a sensible idea for Professor Horowitz not to have initiated the warfarin administration himself but to have requested the general practitioner to undertake the initiation and follow through by way of

monitoring. However, the Court would make the observation that Professor Horowitz's own initiation of warfarin therapy could not have been questioned if there had been direct, speedy and effective communication with Mrs Aston's general practitioner;

- Professor Horowitz should have copied Dr Liew into the INR request so that Dr Liew was advised of the INR result of 21 December 2012;
- The INR of 1.9 after two days of warfarin therapy raised a concern that Mrs Aston was sensitive to this medication such that her warfarin dosage should have been reduced at that stage;
- The period of time between 21 December 2012 and 3 January 2013 over which Mrs Aston was consuming warfarin and her INR was not being monitored was completely at variance with any recommendation about warfarin usage. Several INR estimations in the first week should have been obtained;
- The information within Dr Liew's SA Pathology request form was inadequate. It should have been marked urgent. In addition, the form should have signified an existing clinical presentation of haematuria and have raised the possibility of high INR having regard to the fact that the patient's INR had gone unmonitored for two weeks;
- Dr Liew should have taken the trouble to ensure that the INR result that he had requested was made available to him. Positive steps to do this would have revealed the need for him to take another blood sample from Mrs Aston;
- The question as to whether Mrs Aston may have required hospitalisation to reverse the high INR needed to be resolved before the weekend and it was not resolved.

6.7. Dr Joyner was also asked to comment upon the interaction between Mrs Aston and Healthdirect during the telephone conversation that took place on the morning of Saturday 5 January 2013. I am not certain that Dr Joyner was in any sense critical of the manner in which the Healthdirect operator dealt with Mrs Aston. However, he did say that in his view the combination of circumstances, namely a fall with a head injury, the fact that the patient was an older person, that the patient was on warfarin and that there were already signs of bleeding in the urine, had all conspired to place Mrs Aston at high risk and could have given rise to a recommendation by the

Healthdirect operator that Mrs Aston should present to a hospital and be evaluated[31]. One could possibly add to that observation a need for an operator in these circumstances to specifically establish through questioning whether the patient had been properly monitored for INR levels in the recent past.

6.8. Finally, Dr Joyner expressed the view that Mrs Aston's death was preventable at a number of levels. Her death would have been preventable if she had been the subject of appropriate INR monitoring between 21 December 2012 and 3 January 2013[32] and, secondly, if there had been a correct recognition of her critical levels either on the night that she was seen by Dr Liew or the following day when he took her blood sample. Dr Joyner was of the view that generally speaking an INR level such as Mrs Aston's could have been reversed and in a relatively straightforward manner. He opined as follows:

> 'So I would say that I would have every expectation that if those levels had been taken on those days and she been referred to the Queen Elizabeth Hospital, that she would have survived with no ill effects.' [33]

Dr Joyner also expressed the view that even after Mrs Aston's fall, having regard to the fact that she was coherent and clear on the telephone on the morning of 5 January 2013, her death may even have been preventable at that point. He said that at the time of her telephone conversation with Healthdirect the brain haemorrhage had not occurred or if it had started it was increasing slowly such that if at that point she had presented to hospital the high INR could have been identified and reversed. A CT of Mrs Aston's head would have been conducted and if there was bleeding, and if a stable clot had been formed and no significant problems existed at that time, her condition could have been watched and probably left alone. If Mrs Aston were to have deteriorated it may have been possible to drain the haemorrhage to prevent pressure build-up. He believed that this may have been the last window of opportunity for Mrs Aston's life to have been saved. Dr Joyner, however, added the rider that in these circumstances the saving of her life would not necessarily have been guaranteed.

6.9. I have accepted Dr Joyner's evidence.

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[31] Transcript, page 259
[32] Transcript, page 38
[33] Transcript, page 251

7. Conclusions

7.1. On 5 January 2013 Mrs Marjorie Aston died at the Royal Adelaide Hospital. Her cause of death was right subdural haematoma due to blunt head trauma with contributing excessive warfarin anticoagulation.

7.2. On 19 December 2012 Mrs Aston had been placed on warfarin therapy by Professor John Horowitz. Thereafter Mrs Aston consumed one 5mg warfarin tablet on each of the succeeding days until 3 January 2013. The consumption of warfarin over that period caused a state of anticoagulation in Mrs Aston's blood that reached a dangerous level. As a result Mrs Aston, at first, experienced blood in her urine. On 3 January, on the advice of her general practitioner Dr Liew, Mrs Aston ceased taking warfarin. On the evening of 4 January 2013 Mrs Aston struck her head on the end of her bed. I find that this impact, in conjunction with Mrs Aston's dangerous level of anticoagulation, resulted in her experiencing a right subdural haematoma that would prove to be fatal. I find on the balance of probabilities that the level of anticoagulation caused by the consumption of warfarin was a substantial causative factor in Mrs Aston's death.

7.3. On 3 January 2013 Mrs Aston was prescribed the antibiotic trimethoprim. This drug had a potential to increase the anticoagulant activity of warfarin. I find that it did not contribute significantly to Mrs Aston's level of anticoagulation. Nor did it contribute substantially to the cause of Mrs Aston's death.

7.4. On 21 December 2012 Mrs Aston had undergone an INR test that revealed an INR of 1.9. By the time Mrs Aston's blood sample was taken for the purposes of this test she had consumed two 5mg tablets of warfarin. The INR level of 1.9 was nearly twice that of a normal INR level and was almost within the therapeutic range for the condition of atrial fibrillation for which it had been prescribed. Thereafter, INR levels were not tested for nor identified until Mrs Aston was admitted to hospital with an acute subdural haematoma on 5 January 2013. At that time her INR level was 12. This INR level was one that presented extreme danger to Mrs Aston's wellbeing having regard to its potential to give rise to fatal haemorrhage within the skull. Mrs Aston's INR levels should have been monitored between 21 December 2012 and 5 January 2013 in accordance with usual and requisite medical practice. I find that if her INR levels had been monitored in accordance with usual clinical requirements for

the monitoring of warfarin administration, her warfarin dosages would have been adjusted with a view to establishing and maintaining Mrs Aston's INR level within the therapeutic range. The proper adjustment of her dosages would have prevented her INR level from entering into a dangerous and life threatening range. Her death thereby would have been prevented.

7.5. The failure for Mrs Aston's INR levels to be monitored between 21 December 2012 and 5 January 2013 were due to the following circumstances:

- Professor Horowitz's questionable reliance on Mrs Aston's ability or inclination to contact her general practitioner, Dr Liew, at the first appropriate opportunity;
- Mrs Aston's failure to contact Dr Liew, as instructed by Professor Horowitz, on or soon after 21 December 2012 in order to advise Dr Liew of the fact that she had been placed on warfarin therapy;
- Mrs Aston's reliance upon the usual practice that had developed between her and Dr Liew that Dr Liew would normally contact her, giving rise to an expectation on her part that Dr Liew would initiate contact with her in relation to the question of INR monitoring; coupled with Dr Liew's lack of knowledge from any other source that Mrs Aston had been placed on warfarin therapy;
- Professor Horowitz's failure to copy Dr Liew into his request form in respect of the initial SA Pathology INR test;
- Professor Horowitz's failure to communicate with Dr Liew on or soon after 19 December 2012 by phone, facsimile or email to advise Dr Liew that he had placed Mrs Aston on warfarin therapy and that there would be a need for Dr Liew to monitor Mrs Aston's INR level;
- The inordinate time that it took for Professor Horowitz's letter of 19 December 2012 addressed to Dr Liew to be seen by Dr Liew, by which time Mrs Aston had died;
- Dr Liew's failure to fill the blood sample tube to a level that could unequivocally be regarded as sufficient for the purposes of INR testing;
- Dr Liew's failure on 3 and 4 January 2013 to have proper regard to, and give sufficient weight to, the combined circumstances that Mrs Aston was experiencing blood in her urine, that she had been consuming warfarin at 5mg per day on each and every day since 19 December 2012 and that in the intervening period

Mrs Aston's INR levels had not been properly monitored, and that therefore serious consideration needed to be given to the need for anticoagulation reversal in a hospital;

- Dr Liew's failure to identify within the SA Pathology request form for INR testing that the patient Mrs Aston had been experiencing blood in her urine and that her INR level had not been tested since the commencement of her warfarin therapy on 19 December 2012, thereby implying within the document that this was a routine INR test absent of any underlying concerning clinical circumstances;
- Dr Liew's failure to make any enquiry on either Friday 4 January or Saturday 5 January 2013 about the result of the INR test that he had requested.

7.6. In my view Mrs Aston's death could and should have been prevented either by the implementation of appropriate INR monitoring following her placement on warfarin therapy, or by the taking of timely and appropriate action between 3 January and 5 January 2013 to establish her INR, which action could and should have resulted in Mrs Aston being admitted to hospital for anticoagulation reversal.

7.7. I do not believe that any act or omission on the part of Healthdirect contributed to Mrs Aston's death. If the Healthdirect operator had enquired of Mrs Aston and had established that Mrs Aston's INR levels had not been properly monitored since the commencement of warfarin therapy on 19 December 2012, it may have prompted the operator to advise Mrs Aston to admit herself to hospital as soon as possible. However, to my mind it would be a counsel of perfection to suggest that this enquiry inevitably should have been made. I draw this observation to the attention of Healthdirect, as well as the observations made by Dr Joyner in the course of his evidence as outlined above.

8. Recommendations

8.1. 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.

8.2. In making the following recommendations the Court recognises that due to the advent of other drugs used in the management of anticoagulation, the use of warfarin may diminish.

8.3. The Court makes the following recommendations:

1) That these findings and recommendations be brought to the attention of the Chief Executive Officer of the Royal Australian College of General Practitioners, the Chair of the South Australian State Committee of the Royal Australian College of Physicians and the President of the Australian Medical Association (SA);

2) That consideration be given to revision of the practice whereby specialist medical practitioners in the first instance prescribe warfarin in the expectation that a general practitioner will thereafter manage the patient's warfarin therapy. Consideration should be given to the issue as to whether the general practitioner, on the advice of the specialist, should both initiate and manage the patient's warfarin therapy;

3) That specialists be advised not to place undue reliance on the patient him or herself advising the general practitioner that warfarin therapy has been initiated by the specialist;

4) That in circumstances where the specialist initiates warfarin therapy but does not intend to manage that therapy, the specialist should immediately advise the patient's general practitioner, by the most efficient method of communication available, that warfarin therapy has been initiated and that the general practitioner is expected to manage that therapy. In this regard the practice of communicating with general practitioners by way of ordinary post should be curtailed and be replaced by a means of communication that would include email and/or facsimile transmission. Any such communication should contain a request that the general practitioner, by return, acknowledge the communication. It may be necessary in some cases for the specialist to communicate with the general practitioner by phone;

5) That in cases where warfarin therapy may be indicated, general practitioners who refer patients to a specialist should advise the specialist that they expect to be informed of the initiation of warfarin therapy by the most efficient and rapid

means available. They should also advise the specialist that they expect to be copied into any INR test results that have been obtained by the specialist;

6) That medical specialists initiating warfarin therapy and who also initiate INR testing ensure that the patient's general practitioner is copied into the results of any INR test;

7) That general practitioners be reminded that where patients who are undergoing warfarin therapy display unexplained bleeding, especially in cases where INR monitoring has not been conducted on a satisfactory basis, there is a need to carefully consider whether the patient should undergo reversal of anticoagulation at the earliest possible opportunity. In cases of doubt the general practitioner should seek a second opinion;

8) That medical practitioners be advised to include in request forms for INR testing all information relative to any clinical presentation that the patient might exhibit and which is consistent with possible excessive anticoagulation, and also to include information that no previous INR testing has taken place where that may be the case.

Key Words: Warfarin; INR Monitoring;

In witness whereof the said Coroner has hereunto set and subscribed his hand and Seal the 17th day of July, 2015.

Deputy State Coroner