



CORONERS COURT OF QUEENSLAND

FINDINGS OF INVESTIGATION

CITATION: **Non-inquest findings into the death of Horst NEITSCH**

TITLE OF COURT: Coroners Court

JURISDICTION: Brisbane

DATE: 4 November 2016

FILE NO(s): 2015/2054

FINDINGS OF: Christine Clements, Brisbane Coroner

CATCHWORDS: CORONERS: Health care related death, complication from elective percutaneous stenting of left of left descending artery, patient discharged too early following procedure, adequacy of documentation and communication

Summary

1. Mr Horst Neitsch was a 77 year old man who resided with his wife at 1168 Teviot Road in Jimboomba, Queensland. Mr Neitsch died on 29 May 2015 in the palliative care unit of the Princess Alexandra Hospital (PAH) in Brisbane, Queensland.
2. Mr Neitsch had a history of severe aortic valve stenosis (narrowing) with left ventricular dysfunction, hypertension, high cholesterol, fatty liver disease and peripheral vascular disease. He had previously undergone a surgical procedure to bypass narrowed or blocked arteries in his right thigh (right femoral popliteal bypass) for his peripheral vascular disease. This procedure was performed at the PAH on the 3 December 2014.
3. Mr Neitsch was previously a smoker until he quit approximately 15 years prior to his death.
4. Mr Neitsch was admitted to the PAH on 21 May 2013 for a coronary angiogram as a preparatory step to anticipated aortic valve replacement surgery. He died on 29 May 2013 following complications arising in the procedure. His death was therefore reported to the coroner as a health care related death.

Chronology of events

5. On 23 March 2015, Mr Neitsch was referred by his general practitioner to the Cardiology Department at the PAH. Mr Neitsch was referred for assessment of aortic valve stenosis and breathlessness. A small pulmonary mass was noted in the letter of referral at the apex of the left lung on x-ray (film date 3 March 2015) and on a previous CT scan of his chest (19 October 2014). This lesion had not been formally investigated. A recent right iliofemoral endarterectomy (which was also performed at the PAH on 3 December 2014) was noted.
6. Mr Neitsch was seen by a consultant cardiologist in the Cardiology Outpatients Clinic at Logan Hospital on Tuesday 7 April 2015.
7. The consultant cardiologist clinically examined Mr Neitsch, took his history. He noted the presence of left ventricular hypertrophy (LVH) with strain on the echocardiogram (ECG), and the left ventricle (LV) impairment on the ECG. His impression, was that Mr Neitsch had severe aortic stenosis. He considered that the measured gradient on the cardiac echocardiogram was likely underestimated in the setting of left ventricular dysfunction. The stroke volume was not provided in the echo report to confirm low flow severe aortic stenosis.
8. The consultant considered Mr Neitsch would require Aortic Valve Replacement surgery at the earliest opportunity and he required cardiac workup and referral prior to this surgery. The natural history of aortic stenosis is well recognised to progressively decline after the onset of left ventricular dysfunction.

9. The plan was as follows:
- Referral (to PAH) for a coronary angiogram to exclude concurrent coronary disease (which might either require angiographic intervention or a combined valve replacement/coronary artery bypass surgical procedure);
 - A repeat echocardiogram so that the (video) images would be on file at Logan Hospital for their records. This would allow the surgeons to review actual films, rather than just a report, should aortic valve replacement surgery be required;
 - A referral for surgical review;
 - Commencement of anti-failure treatment to optimise Mr Neitsch's condition prior to any possible surgery. The consultant cardiologist prescribed Lasix 40mg once daily (a drug to treat heart failure by way of fluid diuresis) and also on Bisoprolol 2.5mg daily (a beta blocker) for his symptomatic treatment of heart failure.
10. The consultant documented the history and findings in a Clinic letter. This included reference to the peripheral vascular disease (relevant to angiography access considerations) and the need for a specialist respiratory consult regarding the lung lesion.
11. He stated he was informed by Mr Neitsch that his GP had already arranged a consultation and he was to see the respiratory physician at Logan Hospital soon. The Clinic staff confirmed Mr Neitsch was seeing a respiratory physician the following week.
12. The consultant cardiologist noted that the respiratory physician would have access to the Clinic letter on file in the Logan Hospital records system. Thus he did not consider there was any need to arrange or expedite respiratory consultation and the respiratory physician's letter would be added to the Logan Hospital file in due course.
13. Given the need to expedite his heart related investigations because of progressive severe aortic stenosis, the cardiologist arranged for a cardiac angiogram to be performed in parallel with the respiratory investigations. The angiogram waiting list was about 6 weeks, so he decided to proceed rather than waiting for the respiratory consultation to be completed before deciding on the angiogram.
14. The Logan Hospital does not have a Cardiac Catheter Lab ('CCL') and all patients are referred to PAH for angiography (and also for cardiac surgery). Although public patients referred to PAH from Logan Hospital can have procedures done by any of the PAH Cardiologists, most patients from Logan Hospital had angiography procedures performed by either one of two cardiologist who also works at PAH and Logan.
15. The consultant cardiologist completed a booking referral for the angiogram at PAH, noting the indication (severe aortic stenosis) and that the plan was for

the procedure to be performed by the right radial route, (via an artery in the right wrist). This was his usual preferred method of access. The booking referral stated that Mr Neitsch had symptoms of shortness of breath and diagnosed severe aortic stenosis. It noted that cardiac catheterization was to be performed before he underwent aortic valve replacement. The clinical summary stated that Mr Neitsch had severe aortic stenosis with reduced ejection fraction.

16. His reason for preferring radial access was that bleeding complications at this site can be more readily controlled than at the femoral site. It also avoids having to transverse the lower artery tree. He noted that Mr Neitsch had peripheral vascular disease, which can affect all of the arteries. A radial approach avoided the known right femoral vascular disease and femoral popliteal bypass sites.
17. The indication of radial access on the form did not convey any information about alternative sites. There was also no indication on the booking form that the case was complex, or non-routine. The Consultant says that it was intended that the receiving consultant/proceduralist would have both the booking referral form as well as the clinic letter prior to the angiogram being performed. The clinic letter did warn of the issues of pre-existing peripheral vascular disease and pulmonary assessment.
18. Mr Neitsch was seen by the respiratory physician on Monday 13 April 2015 and again on 18 May. On reviewing the medical records, the consultant cardiologist considered that the respiratory physician's impression was that the lung lesions were not malignant and were diagnosed as possibly being a granuloma. The plan was to follow-up Mr Neitsch after a CT scan. Mr Neitsch's symptoms of shortness of breath had improved in the week since commencement of the heart failure treatment. He was also noted to have mild chronic obstructive airways disease which the consultant cardiologist thought would not preclude him from having an aortic valve replacement.
19. Mr Neitsch was initially listed for cardiac catheterisation on Wednesday the 13 May 2015 on that consultant cardiologist's list. He was however absent on that day and Mr Neitsch's booking was therefore transferred to the following week (21 May 2015), a list supervised by the second consultant cardiologist who had some spare capacity in his list to "make up" recently cancelled cases.
20. On the 21 May 2015, Mr Neitsch presented to the PAH. On arrival, he was assessed by the Cardiology Registrar who also obtained his consent prior to the performance of the angiogram.
21. The cardiology registrar had access to the one page booking form from the Logan Hospital which had been completed by the consultant cardiologist.
22. There was no attached correspondence of information available other than the booking form for angiogram.

23. Mr Neitsch indicated to the registrar that he had a history of peripheral vascular disease and had recently had vascular surgery on the right femoral artery. On examination, Mr Neitsch appeared well. He had normal breath sounds with no additional breath sounds on auscultation.
24. Assessment of his pulses for angiogram approach revealed absent pulses at the right femoral (thigh) and right dorsalis pedis (foot). On the left hand side there was a femoral pulse palpable but absent peripheral pulses.
25. Assessment of his radial arteries by Allen's test and also by oxygen waveform assessment revealed neither left nor right radial arteries were suitable for a radial approach.
26. The registrar obtained informed consent from Mr Neitsch after informing him of the risks of coronary angiogram including:
 - bleeding and bruising at puncture site;
 - damage to the arteries from the access site to the heart which may require surgical repair;
 - risk of abnormal heart rhythms which may require further treatment risk of heart attack and stroke;
 - risk of reaction to the x-ray contrast;
 - risk of renal dysfunction following administration of contrast;
 - risk of requiring emergency surgery or angioplasty and risk of death as a rare consequence of having this procedure.
27. Mr Neitsch signed the consent form following this discussion.
28. The Registrar stated he discussed the situation with the Interventional Fellow and advised him of his concerns about vascular access. He advised that radial arteries were not suitable, right femoral artery was not palpable and there was absent pulses distal on the left leg raising concerns about significant vascular access. The Interventional Fellow advised him he would review the patient prior to proceeding to angiogram.
29. The Registrar also advised second consultant cardiologist who was replacing the first cardiologist of his concerns about vascular access and that there was no available information or correspondence about the reason for angiogram other than the booking form.
30. When the second consultant cardiologist spoke with Mr Neitsch, he described symptoms consistent with severe aortic stenosis namely exertional dyspnoea (laboured or difficult breathing) and exertional chest pain. The second cardiologist looked for Mr Neitsch's echocardiogram on the Queensland Health electronic system and found that no record of the echocardiogram was available either at Logan Hospital or PAH.
31. The second cardiologist was not comfortable to proceed without the echocardiogram report or a referral letter showing the echocardiogram parameters to indicate severe aortic stenosis. He says that he therefore rang

his registrar at Logan Hospital to see whether this documentation could be located.

32. His Registrar found a referral letter from the original consultant cardiologist, dated 7 of April 2015 but could not locate the echocardiogram. The referral letter was faxed to the second cardiologist and arrived shortly before Mr Neitsch was ready to go for the angiogram.
33. The letter to confirm the echo parameters was reviewed and it was decided to go ahead with the procedure because the letter confirmed that the echo parameters were consistent with the symptomatic aortic stenosis. The second cardiologist was aware that vascular access may be difficult and decided to proceed with femoral access since his radial pulses were so poor.
34. He was also aware from Mr Neitsch's PAH records that he had undergone a right ileo-femoral endarterectomy six months previously. Therefore his preference was that the femoral access be via the left side because of the previous surgery on the right side. The second cardiologist did not access the previous angiographic and ultrasound examinations of Mr Neitsch because he was not aware of their existence and the femoral pulses were weak but still palpable. On questioning about his vascular disease Mr Neitsch did not volunteer any information about previous investigations.
35. The second cardiologist then asked an Interventional Fellow to carry out the angiogram. The Interventional Fellow was qualified and capable of performing coronary angiography independently and unsupervised. He had performed approximately 1000 procedures including between 300 and 400 since starting at the PAH earlier that year.
36. The second cardiologist advised Interventional Fellow of Mr Neitsch's history including that he had aortic stenosis, peripheral vascular disease and had recently had surgery on his right leg. He advised that had assessed Mr Neitsch and that he had palpable pulses in both lower limbs, but that the left pulses were weaker than the right. He had determined that the radial artery was unsuitable for catheterisation and therefore suggested to the Interventional Fellow to attempt catheterisation via right femoral artery.
37. The Interventional Fellow did not conduct his own examination of Mr Neitsch as he was already prepped and draped and ready to undergo the procedure.
38. The procedure for coronary angiography involves infiltrating local anaesthetic to the procedure site, in the region below the groin fold. A needle is then inserted under the skin and the artery is punctured to obtain arterial access. Arterial access is confirmed by checking for good flash back, which blood is spurting out of the needle once inserted. Once correct placement of the needle is confirmed a wire, known as a "J-wire", is passed through the needle into the artery. The needle is then withdrawn and a sheath is inserted over the wire.

39. According to the Procedure Report from the PAH, Mr Neitsch was anaesthetised at 08:31.
40. Upon insertion of the 'J-wire', the Interventional Fellow immediately encountered a lot of grittiness which indicated to him that that the wire was not in the right place or that there was calcium or some other obstruction in the artery preventing the clean passage of the wire. He attempted to re-adjust the needle and reintroduced the wire under fluoroscopy but there was still a lot of resistance and the wire would not pass. He therefore re-inserted the needle higher up the artery but noted that still the wire would not pass.
41. He consulted the second cardiologist and suggested that maybe radial arterial access should be considered, however upon assessment by the second cardiologist, the radial pulse was not considered to be good and therefore an attempt to gain access radially should not be made. Instead it was suggested that access via the left femoral artery be attempted.
42. Under the supervision of the second cardiologist, the Interventional Fellow attempted access via the left femoral artery. Good flashback was achieved however, he immediately encountered grittiness and so passage of the wire was performed under fluoroscopy. The wire passed through the femoral artery for a short distance with some resistance. Further resistance was encountered and the wire was not able to be passed into the iliac artery.
43. It was suspected that the obstruction was probably a fleck of calcium. This was because Mr Neitsch's arteries were extensively calcified. The two doctors then decided that it would be a good idea to take a quick look at the artery via femoral arteriogram. This is performed by injecting dye into the artery to assess opacification on radiographic imaging.
44. It was decided that if the artery looked significantly stenosed, (narrowed) then they would abandon further attempts at coronary angiography. As the wire would not pass into the artery any further, the Interventional Fellow took the needle out and attempted to insert a sheath to facilitate femoral arteriogram. He encountered difficulty in inserting the sheath, possibly due to the presence of calcification. After discussion with his colleague, it was decided that he would try a smaller dilator to dilate the tissues to assist the sheath to pass.
45. A 4 French dilator was inserted with some effort and grittiness could be felt during insertion. Once the dilator was in, the wire was removed and then connected to the contrast manifold.
46. Dye was then injected into the artery and it was immediately obvious that there was extravasation of the dye out of the artery, meaning the artery wall had been breached.
47. The vascular surgeons were immediately called to assist. Mr Neitsch lost blood pressure and was therefore administered with Aramine. Within about ten minutes, the vascular Fellow and Vascular Consultant arrived.

48. The vascular consultant considered that Mr Neitsch was stable enough on their arrival not to warrant open surgery as this would have placed more strain on his heart. He therefore proceeded to perform femoral angiography to diagnose the problem. Dye was injected into the existing sheath and it was established that the bleeding had stopped.
49. The angiogram showed there was extensive arterial wall disease with a large marble shaped deposit bulging into the lumen of the artery a few centimetres above the arterial entry point. The sheath had perforated the artery wall at the base of this round protruding plaque (usually described surgically as 'eccentric coralline plaque' because it looks and feels like hard round coral).
50. The vascular consultant considered that the shape of the plaque guided the sheath to its base where access was being gained and the perforation occurred as the sheath was being advanced. A guide wire was placed past the coralline plaque and a 4cm covered stent was expanded 2cm above and below the perforation to seal it off.
51. An angiography check showed a good result. It was at that time that a discussion took place about proceeding with the planned coronary angiogram. It was felt that Mr Neitsch was stable enough for the angiogram to proceed.
52. A coronary angiogram was then performed by the second consultant cardiologist and revealed severe triple vessel coronary disease.
53. Following the procedure, Mr Neitsch's care was handed over to Coronary Consultant.
54. At approximately 11:10 Mr Neitsch was admitted to the coronary care unit (CCU).
55. On admission, the nursing notes indicate that his blood pressure on arrival was 59/41 and that Mr Neitsch was feeling lightheaded. Aramine 1mg was given as a stat dose. Normal saline was administered at 1000mls per hour. The doctors were noted to be present at his bedside at that time.
56. His blood pressure was reported to have come back to 106/54. The sheath was noted to be insitu with significant bleeding at the site. The Interventional Fellow applied manual pressure to the artery. When the pressure was released, the bleeding would commence again. An inter-dwelling catheter was therefore inserted.
57. At 12:00 the sheath was removed by the Interventional Fellow and he remained applying pressure until 12:20 when this was taken over by nursing staff. At 12:10, his blood pressure was noted to be 73/50 therefore intra venous fluid (IVF) was increased to 100mls per hour and he was administered with 1mg of Aramine.
58. Haemostasis was achieved and it was noted that his right groin was bruised but that there was no haematoma or ooze. There was nil abdominal pain

noted. One unit of packed red blood cells was commenced at 13:00 to address the low haemoglobin level of 68.

59. Mr Neitsch was noted to be tired but easily rousable. His pedal pulses and circulation were poor due to the peripheral vascular disease. His urine output was initially slow but improved. Mr Neitsch reportedly complained about a 'burning sensation' in his chest during the sheath removal but this ceased without intervention.
60. At 17:30, Mr Neitsch was reviewed by the Cardiology Resident who noted at the time he had received two bags of packed red blood cells. Mr Neitsch denied any shortness of breath. On examination, his respiratory rate was 19, oxygen saturation was 96%, his heart rate 81 beats per minute and his blood pressure 96/59. It was noted that there were some chest crackles in the midzone. His jugular venous pressure (JVP) was approximately 3cm with pitting oedema.
61. The plan at that time was to administer 10mg of frusemide intravenously and then to repeat again at 19:00. He was for reassessment of his fluid status after the third bag of red blood cells.
62. During a nursing review at 20:00 that evening, Mr Neitsch reported "burning" and the ECG showed changes suggestive of cardiac ischemia. The ward call doctor was notified and gave a phone order for fentanyl.
63. At 04:45 on the 22 May 2015, the next Registrar was called to review Mr Neitsch for low blood pressure and chest pain. The registrar described Mr Neitsch as clammy and noted his blood pressure was 75/59, his heart rate was 110 and his oxygen saturation 96%. His ECG showed ST segment elevation in a lead and a VR and global ST depression elsewhere. However, he was noted to be talking in full sentences, was not in distress and was denying shortness of breath. Upon examination, he had dual heart sounds with an ejection systolic murmur and bibasal crepitations on lung auscultation. There was bruising to the left femoral puncture site with pulse felt. His abdomen was soft.
64. He was administered with 250ml of intravenous normal saline after which his blood pressure was systolic of 70mmHg. The registrar ordered 0.5mg of metaraminol (Aramine) (a short acting peripherally administered vasopressor) and his systolic blood pressure improved to 122mmHg.
65. The registrar ordered rechecking of his bloods and noted a haemoglobin level of 91. These bloods were recorded as collected at 04:30. The registrar contacted the on call Cardiology Registrar and then ordered ongoing fluid and provision for further metaraminol and intravenous fluid bolus.
66. The on call cardiology registrar attended the hospital to review Mr Neitsch at approximately 05:00 and found him to be maintaining an adequate blood pressure, though he remained tachycardic. There were no external signs of bleeding but recurrent internal bleeding remained a concern. He had no chest

discomfort at this time. His ECG was consistent with global cardiac ischaemia, in the setting of recent hypotension, hypovolaemia, severe aortic stenosis and coronary artery disease. On blood tests collected at 04:30, his troponin (cTnl) was modestly elevated at 1.3mcg/L.

67. The on call cardiology registrar made a plan to transfuse Mr Neitsch with a further unit of packed red blood cells and repeat his haemoglobin measurement. Serial cardiac enzymes were also to be collected.
68. A bedside chest x-ray was organised to assist in the assessment and management of his fluid status, given the large volume of intravenous therapy he had received.
69. At approximately 06:30, Mr Neitsch became hypotensive again. His blood pressure improved with a bolus of metaraminol but he remained tachycardic and had clinical signs of poor peripheral perfusion. The on call cardiology / coronary Consultant, was contacted. He requested that the on call cardiology registrar consult the intensive care unit team regarding ongoing inotropic support.
70. An arterial blood gas was taken and demonstrated a stable haemoglobin from 04: 30 at ~96g/dL. Subsequently, the main cause for recurrent hypotension was thought to be poor cardiac output due to severe aortic stenosis and cardiac ischaemia.
71. At approximately 07:30, Mr Neitsch was noted to have left-sided neurological deficits, predominantly left arm and leg weakness, consistent with a new stroke. He was not stable enough to undergo a CT scan of his head at that time. The on call cardiology registrar handed over Mr Neitsch's care to the CCU team, including the cardiology consultant on duty that day, and had no subsequent involvement in the patient's care.
72. At 08:00 on 22 May 2013, Mr Neitsch's care was taken over by another Specialist Cardiologist. He considered the diagnosis was cardiogenic shock secondary to severe aortic stenosis and underlying ischaemic cardiomyopathy with associated anaemia most likely from the procedural complications and likely new stroke.
73. A management plan was put in place which included:
 - An increase in inotrope therapy;
 - Maintenance of hydration;
 - Improve renal output;
 - Exclude active bleeding;
 - Transfuse packed cells and investigate for stroke.
74. The specialist cardiologist informed Mr Neitsch and his family members who were present that his prognosis was extremely guarded. A referral to the stroke unit had also been made and an echocardiogram ordered.

75. At 12:00 Mr Neitsch's condition had not improved. He had been persistently hypotensive for an extended period. The results of the echocardiogram concurred with the clinical assessment. The specialist cardiologist reviewed Mr Neitsch and made notes after a long discussion with Mr Neitsch, his wife and family. He informed Mr Neitsch and his wife and family that the pathological processes occurring were unfortunately most likely irreversible, and that his condition was such that it was appropriate to consider palliative care.
76. He also asked for a review by the intensive care team, cardiothoracic surgery team and the physician who had performed the coronary angiogram. This was to enable clinical concurrence with the assessment that Mr Neitsch's condition should be considered palliative.
77. At 13:00, Mr Neitsch was reviewed by a Cardiac Surgeon. He came to the conclusion that Mr Neitsch was not a suitable candidate for an emergency surgery which would have consisted of coronary artery bypass graft, aortic valve replacement and mitral valve replacement. There were several factors that contributed to his findings:
- Mr Neitsch was 77 years old, had severe aortic stenosis and severe three vessel coronary disease;
 - He was in cardiogenic shock from global ischemia which it was considered related to the vascular complications of his angiogram;
 - Mr Neitsch's left ventricular ejection fraction was 15% with moderate to severe mitral regurgitation;
 - Mr Neitsch had acute renal failure with calculated glomerular filtration rate of 47 mls/minute; and
 - Mr Neitsch was requiring inotropic support, had had a new stroke and had a background of class III shortness of breath prior to admission.
78. The cardiac surgeon considered that if Mr Neitsch underwent the emergency surgery there would have been a perioperative risk of mortality of 67.49%. This percentage was calculated using the Euroscore II Calculator. Even in the 1/3 chance of survival, the best case scenario would result in permanent nursing home placement. The cardiac surgeon said that he discussed these findings with the specialist cardiologist.
79. All treating clinicians subsequently agreed with the assessment that Mr Neitsch should be palliated, and comfort measures were employed and measures put in place, including making a do not resuscitate (DNR) order.
80. Mr Neitsch and his family were informed of his progress at each stage, and they were all in agreement with the management plan.
81. On 23 May 2015 at 09:30 a palliative care referral was made and a palliative care plan made.
82. On 29 May 2015, at 14:31, Mr Neitsch passed away.

83. A Cause of Death certificate was completed by another doctor and the cause of death listed as:
- 1(a) Stroke
 - 1(b) Cardiogenic shock; and
 - 1(c) Severe Aortic Stenosis and three vessel coronary artery disease.

Initial Clinical Forensic Medicine Unit advice

84. CFMU advice was sought from Dr Natalie MacCormick who advised that Mr Neitsch was at a higher risk of vascular complication from the coronary angiogram due to his peripheral vascular disease.
85. Dr MacCormick considered that the indication for doing a coronary angiogram in Mr Neitsch was very reasonable.
86. Dr MacCormick opined that it would have been prudent for Mr Neitsch to have been medically reviewed at 20:00 on 21 May 2015 when he experienced chest “burning” with acute ECG changes, especially given the complications he had experienced earlier that day. She considered it was very likely that he was suffering a cardiac event (type 2 myocardial infarction, as a result of blood loss in the context of severe aortic stenosis) which contributed to the subsequent cardiogenic shock. By the time he was seen in the morning he was in progressive cardiogenic shock. She opined that it is possible that if he had been medically reviewed 8 hours earlier, the hypotension and anaemia could have been managed more aggressively.
87. Dr MacCormick noted however that this may not have changed the outcome of this case. She did not have any concerns with the death certificate.
88. As a result of the CFMU advice it was determined the death was reportable.

Internal review by Princess Alexandra Hospital

89. The Director of Cardiology at PAH reviewed the medical care and management provided to Mr Neitsch and prepared a review for the Patient Safety and Quality Team. In summary, the Director of Cardiology was concerned that:
- There was no indication on the booking form [completed by the original consultant cardiologist] that the case was complex, or non-routine;
 - On the day of the procedure, Mr Neitsch’s outpatient letter from the Logan Hospital was not available nor was the echo result and they needed to be sought urgently from the Logan Hospital;
 - The admitting junior cardiology Registrar raised concerns about vascular access to the supervising consultant. Radial access was reconsidered, but because of poor radial pulses a decision was made to proceed via the femoral route. Neither the supervising consultant nor the interventional fellow, who participated in the procedure, accessed the Agfa angiographic images available on PAH Impax from the recent

vascular surgery. Specifically there was a right leg arterial Doppler examination available from February 2015, (following the vascular surgery performed in December 2014), as well as a CT angiogram which outlined the ilio-femoral anatomy from July 2014;

- The prime system failure identified that no individual clinician assumed total responsibility for the safe conduct of Mr Neitsch's assessment and investigation. While it appeared that the clinical problem was severe aortic stenosis, the patient was submitted to cardiac catheterisation prior to repeat conclusive echo documentation of the severity of the aortic stenosis; and
- Mr Neitsch was also submitted for cardiac catheterisation prior to formal evaluation of the pulmonary nodule, which could quite well have indicated pulmonary malignancy, which would have had a clear impact on the decision process regarding cardiac catheterization and plans for cardiac surgery.

90. The Director of Cardiology noted that the case had been thoroughly discussed and dissected with the clinicians involved. The interventional cardiology fellow had been counselled and retrained in safe techniques of femoral arterial access. He had also been re-counselled that under no circumstances could he attempt procedures on patients with whom he is not thoroughly familiar. All clinicians were made aware of the necessity for assumption of encompassing personal responsibility for the safe conduct of their cardiology patients.

The original consultant cardiologist's comments/improvement actions

91. The consultant cardiologist was asked to provide a statement to assist the coronial investigation and address the Director of Cardiology's concerns.
92. The consultant stated he has changed his process for angiogram referrals and clinic letters following Mr Neitsch's death.
93. The medical typist now marks the letter (cc) to the PAH CCL as a default if the patient is being considered for angiography at PAH. This means that the letters are now sent both to PAH (records) and the CCL.
94. It was also decided that, unless urgent, the referral is not sent until the Clinic letter is typed, so that both documents are sent simultaneously.

The interventional Fellow's comments/improvement actions

95. The Interventional Fellow was also asked to provide a statement to assist the coronial investigation and address the Director of Cardiology's concerns
96. The Interventional Fellow stated it was and is his usual practice to review a patient's admission notes, and all relevant documentation and imaging prior to performing any procedure on the patient. He said that he will normally also see and examine the patient first before performing the procedure.

97. He reiterated that the reason he did not do so in this case was because Mr Neitsch was already prepped and draped, waiting on the table to undergo the procedure .
98. He says that he did review the admission notes for Mr Neitsch but did not peruse the entire file to assess his background story.
99. He said that when admitting patients, it his usual practice, where a patient has peripheral vascular disease, to include detailed Information about the extent of the disease in his admission notes, including for example, the percentage of occlusion of the vessels.
100. He said that while the admitting Registrar's note did indicate that Mr Neitsch had peripheral vascular disease, there was no further information about the extent of the disease.
101. He acknowledged that he did not review the available imaging referred to by the Director of Cardiology. This would be his usual practice, however in this case the consultant cardiologist had provided handover of the patient, including direction about the proposed access route, Mr Neitsch was ready prepped and draped on the table, and he did not feel that there was an opportunity to perform a more detailed review of the available imaging.
102. The Interventional Fellow accepted that the imaging does provide better appreciation of the extent of the peripheral vascular disease and assists with planning. However, the presence of peripheral vascular disease would, of itself, not require immediate abandonment of any attempts at coronary angiography. He said that reviewing the images may perhaps have led him to use different wires for access.
103. He noted that there is always a risk of vascular perforation in any coronary angiogram, particularly in patients with peripheral vascular disease. In this case, even reviewing the images may not have entirely obliterated the risk of complication if they proceeded via femoral access.
104. He said that one of the options in this case, may have been to attempt radial arterial access, as femoral arterial access was problematic.
105. Interventional cardiology by way of femoral arterial access, including for coronary angiography, has been the main method of operation for many years. Many senior Consultant level practitioners, including those at PAH, were trained as femoral interventional Cardiologists.
106. He said that interventional cardiology by way of radial arterial access is a relatively new mode of operation.
107. He said that he understands that many interventional cardiology centres are moving away from a primarily femoral focused approached to radial procedures, in line with more modern methods.

108. In this case, he indicated that a femoral arterial approach would be preferred. He had performed an assessment of the deceased and formed a view that radial access was not appropriate. He had been trained in radial interventional cardiology methods, but was relatively new at PAH at the time of Mr Neitsch's admission, and in circumstance where many of the practitioners at PAH were not familiar with radial interventional cardiology methods, including the consultant cardiologist that day, and given the specific circumstances, the Interventional Fellow did not have the opportunity to make a full assessment.
109. He therefore deferred to the consultant cardiologist's direction as his supervising Consultant senior cardiologist, and proceeded via femoral access.
110. He noted that while abandonment of the procedure was an option, coronary angiography is the gold standard investigation and the only way to properly test and diagnose coronary artery disease. There is no other way of doing it. Without coronary angiography, it would not have been possible to assess Mr Neitsch's coronary artery disease and proceed to any form of surgical intervention.

Further Review by Dr Natalie MacCormick of the CFMU and response from Director of Cardiology

111. Following receipt of the Director of Cardiology's appraisal of the circumstances leading up to Mr Neitsch's death Dr MacCormick agreed that Mr Neitsch had documented severe peripheral artery disease and that this was important to the clinical outcome.
112. Dr MacCormick opined that the three vessel coronary disease, aortic stenosis and left ventricular dysfunction were also significant cardiac co-morbidities that contributed to his poor outcome. She said that patients undergoing an elective coronary angiogram for coronary artery assessment prior to valvular surgery have the benefit of time. They do not present in extremis necessitating an emergency procedure. Therefore, there is time for the performance of the procedure to ensure they have taken at least a focused history, done an adequate focused examination and reviewed all of the relevant documentation and investigation results.
113. She indicated that these things may have been done in haste. This is ultimately the responsibility of the registrar and their consultant involved, but may also reflect: poor documentation with an inadequate referral, departmental resource limitations (time pressure for rapid case turn over), or cultural attitudes within the department.
114. Dr MacCormick considered that it seemed clear that Mr Neitsch had difficult vascular access. This was recognised by the Interventional Cardiology Fellow who assessed his radial access as poor. Femoral access also proved to be difficult with a failed attempt on the right side. The last remaining option was to access the left side, which resulted in the serious complications to the left femoral artery and haemodynamic collapse. Dr MacCormick agreed with the

Vascular Consultant that there was a high chance of complication by perforation occurring no matter what the experience was of the operator.

115. She opined that it is likely that if the Interventional Fellow was aware of the previous vascular surgery and the changes to the left ilio-femoral anatomy, they would have avoided this site.
116. Dr MacCormick also noted that the Director of Cardiology was generally critical of all the doctors involved for not assuming responsibility for the safe conduct of Mr Neitsch's assessment and investigation. She agreed that there were multiple systemic failures that contributed to the poor transfer of clinical information, and this contributed to the serious complications during the procedure.
117. Dr MacCormick remained concerned regarding the management of this complicated cardiology patient when he developed post-procedure chest pain with acute ECG changes on the ward later that night. There was a significant time delay of approximately 9 hours before Mr Neitsch was medically reviewed, by which time he was in severe cardiogenic shock. Dr MacCormick expected in this situation, a complex post-procedure patient (who had required a Code Blue and CPR during angiography) would be reviewed by a doctor immediately or at least within an hour if he developed chest pain. Nursing staff would be expected to insist upon immediate medical review.
118. Further review was requested from the PAH regarding the response to Mr Neitsch when he developed chest pain with acute ECG changes on the ward at about 20:00 following the procedure. Those concerns specifically related to the significant time delay of approximately 9 hours before Mr Neitsch was medically reviewed. By this time he was in severe cardiogenic shock.
119. The Director of Cardiology responded noting that there were significant ECG changes indicative of diffuse infero-lateral myocardial ischemia. The CCU nursing protocol delineates the nursing actions required in the management of chest pain for patients in coronary care. The purpose of this procedure is to ensure that the CCU/ Cardiology Ward 3E Registered Nurse will accurately assess and promptly manage the treatment of the patient with pain or discomfort due to myocardial ischemia. It aims to minimise myocardial ischaemia, damage and potential for life threatening arrhythmias by decreasing myocardial oxygen demand and enhancing supply. It sets out the procedure for nursing assessment, management of ischaemic chest pain drug therapy, monitoring of the patient and the documentation of the effects of narcotics. In particular, if there are any changes in the ECG the nurse in charge of the shift and the doctor are to be notified immediately.
120. The ECG from the time of admission to CCU earlier in the day could not be located in the chart. It appeared either this admission ECG was not performed (a protocol violation) or it has been lost. If not performed the registered nurse at 8pm would not have had a prior ECG to 'compare' the 8pm ECG with, perhaps lessening the importance of the ECG changes evident. In the end of shift summary however the registered nurse had documented 'significant ECG

changes' with 'chest burning but no pain' and was possibly falsely reassured by the patient's response to Fentanyl.

121. The Director of Cardiology stated Mr Neitsch should have been reviewed by the medical officer (and expected a medical ward call resident, not the registrar to be notified) at that time, and certainly within 15 to 30 minutes given the significant ECG changes recognised.
122. The cardiology nursing protocol for the management of chest pain in coronary care does include an escalation pathway to the cardiology registrar. It appears that this protocol was not followed as the cardiology registrar on call was not contacted until the early hours the following morning, after the patient became hypotensive.
123. The Director of Cardiology questioned whether the in-house medical registrar on the evening shift was contacted regarding this patient, as there is no documentation. The usual protocol in coronary care is for the nursing staff to contact the on-site resident for less serious clinical issues, but to immediately notify the cardiology registrar on call (who may be off site) for more serious events. It appears that when notified at 4am, the cardiology registrar enlisted the assistance of the registrar who had commenced at 01:00 on 22 May. The registrar then immediately assessed the patient for hemodynamic collapse.
124. In the Director of Cardiology's opinion, the nursing and medical response to the episode of chest burning with significant ECG changes at 20:44 on 21 May 2015 was inadequate. A number of issues throughout Mr Neitsch's management were identified and the impacts that followed:
125. The original consultant cardiologist initially assessed this patient in outpatients at Logan Hospital. His response to a patient with 'moderately severe aortic stenosis - aortic valve area 0.75cm²' with an ejection fraction of 43%, was to commence Bior 2.5mg daily.
126. The patient's reduced left ventricular function, moderately severe aortic stenosis and severe 3 vessel coronary artery disease was further challenged by the hemodynamic collapse and hypotension induced by haemorrhage from the perforated left iliac in the cathlab. Given the severe coronary artery disease, this would have caused myocardial ischemia.
127. Mr Neitsch's blood pressure at the time of arrival in the cath lab (pre - procedure) was 139/81, but on return to CCU post procedure it was 59/41. He was adequately transfused and resuscitated from hypovolemic shock during the afternoon of 21 May, but was noted by the cardiology resident at 17:30 to have a blood pressure of 96/59 with evidence of heart failure, with JVP elevation and pulmonary crackles (fluid overload).
128. By 17.30 on 21 May 2015, Mr Neitsch was already showing signs of significant LV dysfunction and in retrospect should have had a repeat transthoracic echo and immediate surgical consultation at that time.

129. Given the critical nature of his coronary artery disease, the added impact of moderately severe aortic valve stenosis with LV dysfunction, the only intervention which could possibly have saved his life was emergency cardiac surgery in the evening of 21 May 2015.
130. The Director of Cardiology said that it is understandable, however that the clinicians caring for him at that time, did not regard him as an appropriate candidate for emergency cardiac surgery.
131. Unfortunately he was not actually seen by the cardiac surgeons until the following morning, by which time he was in severe cardiogenic shock and was an even less appropriate cardiac surgical candidate.
132. In conclusion, the Director of Cardiology said that while the nursing and medical response to Mr Neitsch's physiology at and following the 20:00 burning chest discomfort on 21 May 2015 with significant ECG changes was inadequate, he was of the opinion that Mr Neitsch's outcome was predetermined from the late afternoon on that day heralded by evidence of heart failure fluid overload, hypotension and LV dysfunction by 17:30.

Subsequent review by PAH concerning delay in medical review

133. On 16 of August 2016, the PAH advised that they had conducted a multidisciplinary review of this matter and the deficiencies raised by Dr MacCormick.
134. The following salient points from a review of the medical record were noted:
 - Mr Neitsch underwent an elective angiogram on the 21 May 2015;
 - He suffered a dissection and perforation of the left external iliac artery during this procedure requiring fluid resuscitation and surgical intervention in the form of a stent;
 - Mr Neitsch required blood transfusions (x3) between 13:00 – 17:40 hours following the procedure;
 - Mr Neitsch did complain of burning chest pain in the evening of the 21 May 2015;
 - An ECG was undertaken at 20:44 which was reported as abnormal. The registered nurse recorded in the medical record that this was reported to a medical officer on call and a telephone order for Fentanyl was obtained;
 - The Fentanyl was administered at 20:00 by a registered nurse;
 - A second nurse signed for the Fentanyl in the Schedule 8 Register;
 - The incoming registered nurse took over care of Mr Neitsch at or around 21:30;
 - A blood pressure at 22:30 of 100/60 and at 01:00 of 160/94. Gastrogel was administered at 02:30 as noted in the medication chart. This is also recorded in the Cardiology Observation Chart noting "burning throat";
 - The Registered Nurse recorded a blood pressure at 03:30 of 75/50. This should have triggered a Rapid Response Team call as noted in the Cardiology Observation Chart. This did not occur;

- The registered nurse performed an ECG at 03:28 which again revealed an abnormal ECG;
 - The registered nurse subsequently recorded blood pressure results at 03:45 of 85/50 and at 04:00 of 75/50;
 - At 04:00 the registered nurse recorded in the progress notes the patient's blood pressure dropped to 75/50. The registered nurse notified a Resident Medical Officer for review and undertook an ECG;
 - The registrar subsequently reviewed Mr Neitsch and ordered ongoing fluid and provision, further metaraminol and intravenous fluid bolus. The registrar discussed the case with the on call cardiology registrar who subsequently attended and reviewed Mr Neitsch at approximately 05:30.
135. The PAH advised that they had been unable to identify the doctor who prescribed the Fentanyl and the telephone order as recorded in the medication chart has not been signed by prescribing doctor. It was not clear from the medical record why the incoming nurse did not follow up on a medical review following hand over of the patient at 21:30.
136. The PAH reviewed what was happening on the ward on the evening of 21 May 2015. On the late shift, there were only two senior staff, two junior staff, a pooling RN from 3E (the Cardiology Ward) and two permanent nurse pool staff who did not work regularly in the unit. This was due to sick leave. Of those staff, two did not get an allocated break and four had to be paid overtime. This suggests an exceptionally busy shift. The night duty was also affected by illness with two senior staff off on sick leave, one senior staff member, one new graduate RN, one pool RN from 3E and the agency staff member who looked after Mr Neitsch. Two of these staff also had no break over the 10 hour shift.
137. Normally the unit is staffed with best rostering practice guidelines but it was considered that these shifts reflect what happens when numerous sick leave occurs.
138. The PAH identified communication as a contributing factor in this matter given the possibility the handover process may have been less than optimal. A medical review was not followed up on over the night shift.
139. They advised that a Clinical Handover- Nursing Audit Report was undertaken in April 2015 using a random sampling selection of 10 handovers per unit. Ward 3E & CCU achieved very good results comparatively across the hospital, particularly in terms of:
- Patient/carer participation being encouraged;
 - The diagnosis being discussed;
 - Immediate concerns being discussed;
 - Relevant bedside documentation being discussed;
 - Patient observations being discussed; and
 - Planning for upcoming shifts and discussion of expected dates of discharge if relevant.

140. The PAH acknowledged that staff in CCU failed to detect that Mr Neitsch was deteriorating despite the processes in place at the relevant time to detect a deteriorating patient.

The PAH deteriorating patient system

141. The PAH advised that they have a comprehensive system to identify a deteriorating patient. The Rapid Response (RRT) team consists of a Medical Registrar, and ICU registrar and an ICU nurse. It operates on a 24/7 basis. In addition, PAH has an ICU outreach nursing service which provides follow up on all RRT calls, within 24 hours

142. Education is undertaken at the teams and at the RRT level:

- The deteriorating patient agenda is covered at medical and nursing orientation;
- PAH and Metro South Hospital and health Service undertake widespread communication training, through the CAPS program, and particularly in escalation skills and culture;
- Widespread training of staff on the deteriorating patient agenda was undertaken through the hospital at the introduction of the RRT in 2010. In addition, update training occurs through the ICU Nursing Outreach team;
- Training of the RRT is undertaken via the separate professional and craft group processes, according to the various roles of the staff in the RRT. Crucially, PAH ensures that all members of the RRT have undertaken Advanced Life Support training upon commencement on the RRT.

Performance monitoring of the PAH deteriorating patient system

143. The performance of the RRT is monitored by the PAH Resuscitation Committee, which reports to the PAH Safety and Quality Committee. The Director of ICU chairs this Committee. Performance is also monitored via the MS Clinical Governance Scorecard, which is reported to the Metro South Hospital and Health Service Board and is also published in the Internet. PAH have also recently developed a Digital Dashboard to track performance in a more detailed and real time basis.

144. Issues are also found, managed and feedback provided via the Clinical Incident Management System.

145. The introduction of the Electronic Medical Record at PAH has reportedly also enhanced the system by bringing decision support alerts for staff to the fore. Evaluation of the RRT is continuing and evolving, including via external review.

146. The PAH acknowledged that despite their performance in respect of the deteriorating patient system being among the best in Australia, there remains

a minority of cases where they acknowledge they should have identified and/or escalated concerns and called the Rapid Response Team.

147. The PAH advised that they were committed to ongoing education and training to improve patient outcomes and prevent delays in appropriate escalation of care.
148. The Cardiology Department currently has a dedicated Nurse Educator who develops and implements a full education programme for its nursing staff. In addition to ensuring each nurse undertakes their relevant annual cardiac speciality competency; the programme includes regular participation in the Deteriorating Patient Programme.
149. The PAH expressed that they and their staff are deeply saddened by the death of Mr Neitsch and would like to extend their condolences to Mr Neitsch's family.

Conclusions

150. There is always a risk of vascular perforation in any coronary angiogram, particularly in a patient such as Mr Neitsch who had peripheral vascular disease. The extensive peripheral vascular disease also made vascular access challenging. There was insufficient information about Mr Neitsch provided by the initiating consultant who assessed the patient at the Logan Hospital and arranged the angiogram to be performed at the PAH. This was in preparation for a proposed aortic valve replacement procedure.
151. The original consultant cardiologist was not the doctor who performed the procedure on 21 May 2013. Another consultant cardiologist and Interventional Fellow performed the procedure. Some missing information was obtained from the Logan Hospital. Other information relevant to vascular access which was available on the PAH record system was not accessed or reviewed.
152. Femoral vascular access was difficult and an artery was inadvertently perforated. Further procedures confirming the complication and the extent of vascular disease were performed before Mr Neitsch was transferred to the Coronary Care Unit. He required multiple blood transfusions. His condition deteriorated overnight but this was not recognised in a timely manner or reviewed by the appropriate medical staff. This condition was subsequently assessed as being beyond surgical remedy and he was cared for palliatively until the time of his death.
153. The hospital has thoroughly clinically investigated and reviewed the events that occurred from the time that Mr Neitsch was transferred to the CCU until he deteriorated and died on the 29th of May 2015. The hospital has co-operated with the coronial investigation of the circumstances leading to Mr Neitsch's death, particularly as led by the Director of Cardiology. The Director of Cardiology considered there had been a failure to take overall care and responsibility for Mr Neitsch's management during his admission. It was noted there were as many as 14 doctors involved from the point of first referral.

154. The treating clinicians have acknowledged that there were things that they could have done differently and have made improvements to their practice which may prevent similar deaths from occurring in the future.
155. The autopsy has clearly identified the cause of death.
156. In all these circumstances my view is that it is not in the public interest that an inquest should be convened. Publication of the findings on the coronial website will be considered depending on the views of the family.

Findings in accordance with section 45

- a) The identity of the deceased was Mr Horst Neitsch.

Mr Neitsch was a 77 year old man who had a history of severe aortic valve stenosis (narrowing) with left ventricular dysfunction, hypertension, high cholesterol, fatty liver disease and peripheral vascular disease. He had previously undergone a right femoral popliteal bypass for his peripheral vascular disease at the PAH on the 3 December 2014. Mr Neitsch was assessed at Logan Hospital for a likely aortic valve replacement to be performed at the PAH. Preliminary specialist respiratory review was also proceeding but results were not accessible at the PAH when he was admitted on 21 May 2015 for an elective coronary angiogram. The receiving consultant has acknowledged he did receive and review the clinic letter before proceeding with Mr Neitsch's procedure. This procedure was planned to assess coronary artery disease prior to an aortic valve replacement due to his severe aortic stenosis. There was insufficient background information transferred from the Logan Hospital records to the PAH regarding the severity of Mr Neitsch's pre-existing peripheral vascular disease and pulmonary assessment.

The procedure for coronary angiography was difficult from the outset due to problems with vascular access. An assessment of Mr Neitsch's radial arteries (via an Allens test and also by oxygen waveform) revealed neither left nor right radial arteries were suitable for a radial approach. Therefore he Specialist Cardiologist decided upon femoral access. He was aware from Mr Neitsch's PAH records that he had a right ileofemoral endarterectomy six months previously, but the angiographic images from the recent vascular surgery at the PAH, were not accessed or reviewed in the process of reaching the decision about the site of vascular access. Femoral access was decided upon.

The palpable pulses were weaker in the left and initially access was attempted via the right femoral artery. (Once placement of the needle at the chosen vascular site is confirmed a wire, known as a "J-wire", is passed through the needle into the artery. The wire is inserted into the artery, then, the needle is withdrawn and a sheath is inserted over the wire.)

Due to Mr Neitsch's extensive peripheral vascular disease, vascular access was difficult and a lot of "grittiness" was encountered.

Despite adjustment of the needle, re-introduction under fluoroscopy and insertion higher up the artery, grittiness still continued to be encountered and the wire would not pass.

Further consultation occurred between the two doctors involved in the procedure and access via the left femoral artery was attempted. Grittiness was again encountered and so passage was performed under fluoroscopy. After the wire had passed short distance into the artery, there was further resistance and the wire would not pass into the iliac artery. It was suspected that a fleck of calcium was obstructing the passage as Mr Neitsch's arteries were very calcified.

A femoral arteriogram was then performed by injecting dye into the artery to assess opacification. Radiographic imaging revealed that there was extravasation of the dye out of the artery indicating a perforation of the iliac artery had occurred.

The vascular surgeons were immediately called to assist. The Vascular Consultant assessed Mr Neitsch's condition as sufficiently stable not to warrant open surgery. This would have placed more strain on his heart. He therefore proceeded to perform femoral angiography to diagnose the problem.

The Angiogram showed there was extensive arterial wall disease with a large marble shaped deposit bulging into the lumen of the artery a few centimetres above the arterial entry point. The sheath had perforated the artery wall at the base of this round protruding plaque.

A guide wire was placed past the coralline plaque and a 4cm covered stent was expanded 2cm above and below the perforation to effectively seal it off.

The coronary angiogram confirmed severe triple vessel coronary disease.

Mr Neitsch's was transferred to the Coronary Care Unit (CCU).

Mr Neitsch was hypotensive on arrival to the CCU with persistent bleeding from the groin site. It was difficult to stop the bleeding necessitating a transfusion with red blood cells upon arrival three more between 13:00 and 17:40 hours following the procedure.

An ECG at 20:44 was abnormal. The medical record indicated a report to a medical officer on call and a telephone order for Fentanyl was obtained though it is unclear from whom.

The Fentanyl was administered at 20:00 the next registered nurse commenced around 21:30.

Blood pressure at 22:30 was 100/60 and at 0100 hours was 160/94. Gastrogel was administered at 02:30 due to "burning throat".

Blood pressure at 0330 was 75/50. This should have triggered a Rapid Response Team call.

An ECG at 03:28 was again abnormal.

Blood pressure results at 0345 was 85/50 and at 04:00 was 75/50.

At 04:00 a Resident Medical Officer was notified and review and ECG was performed

Further metaraminol and intravenous fluid bolus was ordered by the registrar. The on call cardiology registrar subsequently attended and reviewed Mr Neitsch at approximately 05:30

Mr Neitsch continued to be hypotensive requiring ongoing blood transfusions. He developed left sided neurological signs suggestive of a stroke. By 08:30, it was apparent that he was in cardiogenic shock and he required increasing inotrope therapy to support his blood pressure.

Mr Neitsch was assessed and found to be unsuitable for emergency coronary bypass graft and aortic valve replacement. A palliative approach was agreed upon with his family.

- b) Mr Neitsch died on 29 May 2013.
- c) He died at the Princess Alexandra Hospital in Woolloongabba in Queensland.
- d) Mr Neitsch died due to:
 - 1(a) stroke;
 - 1(b) cardiogenic shock (7 days);
 - 1(c) severe aortic stenosis with three vessel coronary artery disease (unknown longstanding);Coronary angiogram on 21 May 2015.

Christine Clements
Brisbane Coroner
4 November 2016