



CORONERS COURT OF QUEENSLAND

FINDINGS OF INQUEST

CITATION: Inquest into the death of Yaqin Han

TITLE OF COURT: Coroners Court

JURISDICTION: BRISBANE

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FINDINGS OF: Ainslie Kirkegaard, Coroner

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REPRESENTATION:

Counsel Assisting: Mr A. Luchich

Metro South Hospital & Health Service: Ms S. Robb KC

The Han family: Mr R. Nattrass
instructed by Caxton Legal
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Introduction

1. Yaqin Han was a 69 year old Mandarin speaking woman who died unexpectedly during an exercise stress echocardiogram at the Queen Elizabeth II (QEII) Hospital Cardiology Outpatient Clinic on 14 October 2022. This test involved assessing her cardiac function with ultrasound of her heart, in combination with electrocardiogram (ECG), while inducing increased demand by exercising on a treadmill.
2. Mrs Han had congenital bicuspid aortic valve disease which eventually evolved into the development of aortic stenosis. She had been under clinical care by the QEII Hospital cardiology service following initial referral to the Princess Alexandra Hospital cardiac service in November 2019.
3. As Mrs Han did not speak English, she required an interpreter who spoke Mandarin to be present at her medical consultations.
4. Coronial autopsy determined the cause of Mrs Han's death to be aortic stenosis. Examination of the heart revealed the presence of significant aortic stenosis with associated atherosclerotic calcification of the valve cusps and fusion of two of the cusps.
5. Aortic stenosis is a disease of the aortic valve where there is narrowing that can affect heart function due to increased demands on the heart to pump blood through a narrowed valve. These demands are increased when heart output requirements are higher, such as during physical exertion, which can provoke a fatal cardiac arrhythmia in the presence of aortic stenosis.
6. A QEII Hospital cardiologist ordered that Mrs Han undergo repeat exercise stress echocardiogram because they considered there was ambiguity about the severity of her aortic stenosis and whether she was truly symptomatic of it. This decision was made without the cardiologist seeing or speaking with Mrs Han about her current symptom status. It had been nearly ten months since a cardiologist had last done so. Mrs Han's family believe the test should never have been ordered because she was symptomatic of her aortic stenosis.
7. Independently of the coronial investigation, the circumstances in which Mrs Han died were examined by health service complaint and health professional regulatory processes, and a clinical review commissioned by Metro South Health under Part 6 of the *Hospital and Health Boards Act 2011* (Part 6 review) undertaken by Staff Specialist Interventional Cardiologist, Dr Anthony Camuglia in the latter months of 2022. The outcomes of these processes informed the coronial investigation.
8. The inquest was also informed by independent cardiology opinion provided by Dr Russell Denman, Staff Specialist and Clinical Director of Electrophysiology and Pacing, The Prince Charles Hospital, and Associate Professor Camuglia's response to Dr Denman's opinion.

9. Mrs Han's death is a devastating loss for her family, her church and her community. She is remembered as an intelligent and capable woman who moved to Australia in 2014 to support her daughters and take an active role in caring for her grandsons. In her family's words, she lived with purpose and energy, embracing every day with vitality and a deep commitment to her family and community. She was and always will be the heart of her family. I acknowledge their determined and patient advocacy for her.
10. Without in any way diminishing the family's loss, I also acknowledge that Mrs Han's death was a very distressing outcome for the clinicians involved in her care, particularly those performing the exercise stress echocardiogram and the interpreter assisting communication between them and Mrs Han.
11. In addition to the findings required by s.45(2) of the *Coroners Act 2003*, the inquest examined:
- (a) the appropriateness and adequacy of the medical care and treatment provided to Ms Han, and in particular, with respect to the exercise stress echocardiogram performed on 14 October 2022:
 - (i) was it clinically indicated?
 - (ii) were there were any contraindications to it being carried out?
 - (iii) should there have been a clinical assessment of Ms Han prior to deciding to order and/or proceed with it?
 - (iv) should it have been ceased at any earlier point in time, and if so, when?
 - (b) whether any recommendations can be made arising from the circumstances of Ms Han's death.
12. My role as Coroner is to independently investigate Mrs Han's death to make findings about her identity, the medical cause of her death and when, where, and how she died. The Coroners Act prevents me from determining criminal or civil liability or regulatory consequences in relation to her death.
13. The relevant standard of proof is that of the balance of probabilities, with reference to the *Briginshaw*¹ standard. Accordingly, the more significant the issue for determination, the clearer and more persuasive the evidence must be for me to be sufficiently satisfied on the balance of probabilities that the issue has been proven.
14. I may, where appropriate, comment on matters connected with Mrs Han's death, and make preventative recommendations concerning public health and safety, the administration of justice or ways to prevent deaths from happening in similar circumstances in future.

¹ *Briginshaw v Briginshaw* (138) 60 CLR 336.

15. I thank Counsel Assisting, Counsel for Metro South Health and Counsel for the family for their assistance during the inquest and their helpful submissions, the last of which I received on 28 August 2026.

The broader clinical service delivery context

16. It is important to understand the broader context in which Mrs Han's specialist cardiac care was managed between November 2019 and October 2022.
17. The model of cardiac care delivery by Metro South Health over the course of Mrs Han's engagement with its cardiac services involved the QEII Hospital cardiology team working with the interventional cardiology and cardiothoracic surgery teams at the Princess Alexandra Hospital to provide cardiac services to patients living within the QEII Hospital catchment.
18. Six different cardiologists and multiple cardiology registrars were involved in clinical decision making between Mrs Han's initial referral in November 2019 and the exercise stress echocardiogram performed on 14 October 2022. Mrs Han was also seeing different general practitioners between two medical practices during this period.
19. In the part 6 review, A/Professor Camuglia identified this represented *significant fragmentation* in Mrs Han's cardiac assessment and care which prevented the development of any sustained therapeutic relationship with a single heart specialist. This is demonstrated by the sequence of Mrs Han's clinical surveillance leading up to the decision to refer her for repeat exercise stress echocardiogram.
20. A/Professor Camuglia identified a range of potential causes for this fragmentation including:
- (a) the impact of the COVID-19 pandemic on health service delivery, including lock downs and mask wearing mandates.
 - (b) fragmented primary care with Mrs Han seeing multiple GPs.
 - (c) the Metro South Health model of care which redirected referrals from a tertiary/quintenary heart hospital (Princess Alexandra Hospital) to a smaller centre without capacity to perform advanced cardiac valvular interventions; and
 - (d) seemingly frequent turnover of Senior Medical Officer cardiologist staff at QEII Hospital.
21. Both experts described the unprecedented challenges for clinicians during the COVID-19 pandemic with rolling lock downs disrupting clinic lists and impacting their ability to conduct in-person reviews. A/Professor Camuglia describes it as *absolute chaos* and *a terrible time in the hospitals* which made it very hard to provide a structured system of care for patients requiring regular follow up and investigations. Dr Denman spoke about how although telephone consultations were probably better than nothing in this context, he did not consider this was *good medicine*, particularly when

clinicians were trying to assess whether to do a major intervention. It was an anxiety provoking time for clinicians doing what they could within the limits of pandemic restrictions at any given time to ensure patients did not become lost to follow up.

22. While I accept the COVID-19 pandemic caused significant disruption to the delivery of health care generally, the sequence of Mrs Han's clinical surveillance leading up to March 2022 shows she was in fact able to attend in person clinic review and investigations after the COVID-19 pandemic began in early 2020.

23. The impact of the Metro South Health model of care on Mrs Han's management is discussed at relevant junctures in her clinical journey.

Mrs Han's clinical journey

Triage and on-referral to the QEII Hospital Cardiology Service

24. Mrs Han's GP referred her to the Princess Alexandra Hospital cardiac service because a privately performed resting echocardiogram reported the presence of severe aortic stenosis. Her referral was triaged by cardiologist 1 to an interventional cardiologist Dr S who onforwarded the referral to the QEII Hospital cardiology service.

Mrs Han's first cardiology outpatient clinic review – March 2020

25. Cardiologist 3 reviewed Mrs Han in the QEII Hospital Cardiology Outpatient Clinic on 10 March 2020. They felt the reported measurements on the resting echocardiogram were not consistent with severe aortic stenosis. They arranged further investigations with a repeat resting echocardiogram to reassess this, together with an exercise stress echocardiogram to assess Mrs Han for abnormal blood pressure response or exercise-induced left ventricular dysfunction suggesting significant aortic stenosis.

26. There is no dispute that the exercise stress echocardiogram was clinically indicated because Mrs Han was not reporting any symptoms relatable to severe aortic stenosis at this time that would contraindicate this test, namely one or more of the following:

- (a) fainting (syncope) or near fainting (presyncope) especially with exertion
- (b) chest pain (angina)
- (c) shortness of breath (dyspnoea) especially on exertion and in particular up inclines.

27. Dr Reza Reyaldeem (Cardiologist 4) performed the exercise stress echocardiogram on 1 June 2020, reporting moderate-severe aortic stenosis with appropriate heart rate and blood pressure response. Of relevance he reported peak aortic valve velocity, ~3.9m/sec, mean aortic valve pressure

gradient 33mmHg, aortic valve area ~0.6cm²/m² and DSI (dimensionless severity index) 0.25.

28. In oral evidence, A/Professor Camuglia explained how aortic stenosis is graded with reference to the patient's aortic valve pressure gradient, measured in millimetres of mercury (mmHg). Mild is a grading of 20-30mmHg, moderate is a grading of 30-40mmHg and severe is a grading of over 40mmHg. He explained how these categories are used to determine a cut off at which the risk of having a procedure is less than the risk of ongoing surveillance, but these categories do not correlate with symptom status. He explained how the cardiology community also uses categories of very severe and critical, these being the categories of significant concern to clinicians.

Mrs Han's second cardiology outpatient clinic review – June 2020

29. Mrs Han was then seen in the QEII Hospital Cardiology Outpatient Clinic on 16 June 2020 by a cardiology registrar under the supervision of cardiologist 5. They documented she was not reporting any symptoms to suggest presyncope, she described walking up to 20-30 minutes on most days without getting chest pain or shortness of breath and denied any orthopnoea (discomfort while breathing while lying flat) or paroxysmal nocturnal dyspnoea (sensation of shortness of breath that wakes a patient). On this basis she was apparently asymptomatic of her aortic stenosis.
30. In the absence of any reported symptoms relatable to her moderate-severe aortic stenosis, the management plan was continued surveillance with a repeat resting echocardiogram and clinic review in six months. Having regard to the expert evidence of A/Professor Camuglia and Dr Denman this plan was an entirely appropriate and adequate response to Ms Han's clinical presentation at that time.

Mrs Han's third cardiology outpatient clinic review and referral for coronary angiogram – March 2021

31. Mrs Han did not attend for her scheduled surveillance resting echocardiogram on 18 February 2021, so she was rebooked.
32. Cardiologist 5 performed the repeat resting echocardiogram on 12 March 2021, reporting it demonstrated severe calcific aortic stenosis of functionally bicuspid valve. Of relevance, the proceduralist reported aortic valve velocity, 4.3m/s, mean aortic valve pressure gradient 46.4mmHg, aortic valve area 0.5cm² and DSI 0.18.
33. Mrs Han attended in-person clinic review by a different cardiology registrar under the supervision of cardiologist 5 on 16 March 2021. She is documented as reporting two new symptoms since her last clinic review - one episode of presyncope while walking, which she described being very close to losing consciousness and resolved spontaneously with rest, and worsening shortness of breath on exertion. She did not report exertional

chest pain, orthopnoea, paroxysmal nocturnal dyspnoea or concerns of evolving heart failure.

34. There is no dispute that the combination of reported severe aortic stenosis on repeat resting echocardiogram and the emergence of one symptomatic episode (presyncope on exertion) qualified Mrs Han for consideration of aortic valve replacement at this stage. This led to a discussion with Mrs Han about the need for aortic valve replacement work up, starting with an outpatient coronary angiogram at the Princess Alexandra Hospital. The discussion involved explaining the disease and its natural progression, informing Mrs Han of the risks associated with coronary angiogram and educating her about exertional activities in the context of severe aortic stenosis.
35. The QEII Hospital cardiology team planned see Mrs Han in clinic in six months' time but expected she would be seen at the Princess Alexandra Hospital in the meantime.
36. Mrs Han underwent coronary angiogram performed by interventional cardiologist Dr S at the Princess Alexandra Hospital cardiac catheter laboratory on 11 May 2021.
37. The pre-procedure clinical assessment by Dr S was informed by in-depth conversation via a Registered Nurse who spoke Mandarin (because an interpreter had not been booked as requested). Mrs Han reported *she goes black in her eyes at times, and gets breathless going up hill*, mimicking huffing and puffing when talking about going uphill, such that she was avoiding going up inclines, but had no shortness of breath when walking on level ground. She reported non-specific chest pain which it was noted could not reliably be related to exertion. She also reported having experienced intermittent episodes of light headedness for seven years but no syncope.
38. The angiogram report stated Mrs Han also reported one episode where she was unable to speak or move her legs but did not seek medical attention.
39. Dr S reported the coronary angiogram as showing moderate aortic stenosis with an aortic valve gradient of 38mmHg (adjusted for pressure differential), minor coronary plaque and no significant coronary artery stenosis. There is no report of the aortic valve area.
40. The Mandarin speaking nurse translated these findings for Mrs Han, conveying Dr S's opinion that her symptoms were unlikely due to her heart problems and needed further scans of her head and neck to investigate her symptoms. Mrs Han advised she did not currently have those symptoms and had only experienced one episode of her vision going black in the last year.

41. The management plan was for Mrs Han to continue to be followed up through the QEII Hospital Cardiology Outpatient Clinic with six monthly surveillance. Dr S recommended that Mrs Han's GP consider further investigation of her light headedness and transient speech deficit with MRI/MRA brain and neck vessels.
42. Mrs Han was not reviewed by the cardiothoracic surgery team at the Princess Alexandra Hospital because the angiogram determined her aortic stenosis was not of a grade meaning she was clinically indicated for aortic valve replacement surgery.

Events leading up to the decision for Mrs Han to undergo repeat exercise stress echocardiogram in 2022

43. Mrs Han presented to the QEII Hospital emergency department on 5 June 2021 with sudden onset vomiting, dizziness and associated ataxia. She was managed on the Stroke Pathway and investigated with CT and MRA imaging of the head and neck which showed only minor age related changes in the brain. Her carotid and vertebral arteries were all widely patent. She presented to her GP on 10 June 2021, who noting these results, documented a clinical impression of benign positional vertigo and prescribed stemetil.
44. The QEII Hospital cardiology team were aware of this episode, and on 21 June 2021 requested a clinic review for October 2021. Mrs Han was placed on the waiting list.
45. In the meantime, Mrs Han had ongoing issues with intermittent dizziness, neck pain, tinnitus and nausea which by 20 July 2021 she told her GP had settled with the stemetil. The GP noted she was not keen for further clinical investigations but wished to have physiotherapy.
46. Mrs Han was scheduled for outpatient review by telephone consultation with Dr Diana Valencia (Cardiologist 6) on 1 March 2022. The inquest heard evidence this was in keeping with the cancellation of outpatient clinics as a service response to the COVID-19 pandemic.
47. It was now nearly ten months since she was last assessed by a cardiologist.
48. Dr Valencia confirmed in her oral evidence she would have reviewed Mrs Han's records from both the Princess Alexandra and QEII Hospitals. She agreed those records indicated a change in Mrs Han's symptoms over time from the absence of symptoms potentially associated with her aortic stenosis in June 2020 to the presence of symptoms that could be by March 2021.
49. Dr Valencia tried to contact Mrs Han by telephone multiple times but was unsuccessful. She felt it was very important to speak with Mrs Han, so she contacted Mrs Han's nominated next of kin. Mrs Han's daughter advised her mother was likely not aware of the appointment, so Dr Valencia booked

Mrs Han for a repeat resting echocardiogram and clinic review in three months' time given more than 12 months had passed since this was last done. Dr Valencia says Mrs Han's daughter reassured her she would contact her mother to ensure she attended her appointment and did not make any comments regarding possible new symptom development at that time.

50. Mrs Han presented to her GP in late March 2022 reporting what the GP documented as *vertigo again* for which they prescribed stemetil.
51. In May 2022, Mrs Han was seen by different GPs at two medical practices in Sunnybank reporting intermittent dizziness and light headedness. She was investigated with non-contrast CT imaging on the brain which reported a couple of old lacunar infarcts in the right middle cerebral artery distribution involving the right caudate nucleus but no other brain pathology of concern. She was prescribed stemetil 5mg. She continued to experience dizziness which one of the GPs attributed to likely benign paroxysmal positional vertigo for which she was prescribed a stemetil injection. Mrs Han continued to receive regular physiotherapy for neck tightness, vertigo and headache, which she reported was helping improve her symptoms.
52. Mrs Han underwent repeat resting echocardiogram performed by a cardiac sonographer at the QEII Hospital on 3 June 2022. Although Dr Valencia reported the results, she did not see Mrs Han that day. She reported the echocardiogram demonstrated severe aortic stenosis. Of relevance, Dr Valencia reported velocity 4.8m/s, mean pressure gradient 44mmHg, aortic valve area 0.73cm² and DSI 0.21. She explained how she compared the measurements and pictures with those from the March 2021 resting echocardiogram, noting the numbers were very similar.
53. Mrs Han underwent gastroscopy and endoscopy at the QEII Hospital on 22 August 2022. The anaesthetist's pre-operative assessment that day noted moderate-severe aortic stenosis and documented Mrs Han was starting to get some mild symptoms (dizziness on standing up) but was largely functionally okay with no chest pain or syncope.
54. She was seen by a GP on 8 September 2022 reporting recurrent dizziness. The GP noted the hospital anaesthetist had picked up a heart murmur. On examination, there was a murmur documented as 4/6 diastolic radiating to carotids. The GP queried aortic stenosis and ordered further investigation with echocardiogram. There is no record of this having been performed.
55. For reasons that remain unknown, the scheduled in-person clinic review on 27 September 2022 did not occur as planned by Dr Valencia. It was cancelled on 14 September 2022 and changed to a chart review. In 2022, cancelled in-person clinics were not replaced by telehealth appointments; rather desktop clinical reviews were scheduled in lieu. These administrative decisions were beyond the control of individual clinicians. The chart review for Mrs Han was added to Dr Valencia's clinic list on 20 September 2022.

56. I accept Counsel Assisting's submission there is no reason to conclude Mrs Han would not have attended in-person clinic review on 27 September 2022 had it not been cancelled. She had attended for all previous clinical investigations (but for one which was rescheduled) and in-person clinic reviews including the repeat resting echocardiogram performed by Dr Valencia.
57. Dr Valencia reviewed Mrs Han's chart on 20 September 2022. Her contemporaneous note of the chart review documents the June 2022 resting echocardiogram report of severe aortic stenosis and a plan for Mrs Han to undergo repeat exercise stress echocardiogram and clinic review in three months' time.
58. Dr Valencia says she tried to contact Mrs Han by phone that day but was unsuccessful. She does not have a specific recollection of actually attempting to do so though this is not surprising given the passage of time. At best her evidence was that it would have been her usual practice to do so because she always assumes the patient is waiting to hear about their test results. The fact she did not document this or attempt to contact Mrs Han's next of kin (as she did on 1 March 2022), combined with the fact she was only booked to perform a chart review, and no interpreter was arranged to help her speak with Mrs Han leads me to find it more likely Dr Valencia did not attempt to contact Mrs Han that day.
59. This was a missed opportunity for Dr Valencia to have evaluated information obtained directly from Mrs Han about her current symptoms before ordering she undergo the repeat exercise stress echocardiogram.
60. The then current Queensland Health clinical guideline for exercise stress echocardiograms stated if the patient had *symptomatic severe aortic stenosis*, the test was absolutely contradicted. In practice, this required a two stage clinical assessment of whether the patient had the presence of severe aortic stenosis and if so, whether the patient was symptomatic from that condition. If both were present, then an exercise stress echocardiogram should not be performed.
61. Dr Valencia did not document her clinical reasoning for ordering the repeat exercise stress echocardiogram without reviewing Mrs Han as she had originally planned after the repeat resting echocardiogram. Her evidence is that she ordered the test to assess Mrs Han for objective symptoms because in the context of the May 2021 coronary angiogram finding of moderate aortic stenosis, she assumed Mrs Han's previously reported presyncope and shortness of breath walking up hills were not due to her aortic stenosis. This assumption was in keeping with the documented opinion of interventional cardiologist Dr S.
62. This is reflected in her notation of *Severe AS ?asymptomatic* as the clinical indication for stress echocardiography.

Actions taken in preparation for the repeat exercise stress echocardiogram

63. On 13 October 2022, the cardiac sonographer raised concerns with their line manager about Mrs Han proceeding with the exercise stress echocardiogram. Having been involved in the performance of Mrs Han's repeat resting echocardiogram in June 2022, they were aware of the reported severe aortic stenosis which they understood increased the risks associated with the test.
64. This led to a conversation that day with Dr Reyaldeen who was scheduled to perform the exercise stress cardiogram. He confirmed he was aware of the case in advance because it had been raised with him due to the niche/atypical indication for the test. This led him to speak with Dr Valencia to clarify the indication and rationale for ordering it because he wanted to ensure Mrs Han was suitable for the test.
65. Dr Reyaldeen explained this was not his usual practice because the main reason patients are referred for exercise stress echocardiogram is to investigate whether they have coronary ischaemia. It is less routinely used to investigate severe aortic stenosis.
66. While the fact of clinically reported severe aortic stenosis does not of itself preclude a patient from this test, the test is absolutely contraindicated in patients who have symptomatic severe aortic stenosis. There is no dispute that exercise stress echocardiogram is clinically indicated for patients with clinically reported severe aortic stenosis who appear to be asymptomatic, where there is some doubt about them being truly asymptomatic. For example, a patient who is not reporting symptoms but has reduced their activity greatly to compensate.
67. Dr Denman agreed that if Mrs Han was asymptomatic then an exercise stress echocardiogram could be reasonably be performed given there was some discordance between the invasive (coronary angiogram) and non-invasive (resting echocardiogram) findings. This was in keeping with international guidelines and not a contraindication for stress testing within the relevant Queensland Health clinical guideline.
68. Dr Valencia says she was very clear with Dr Reyaldeen that she had not seen Mrs Han and ordered the test to reassess for any symptoms relatable to the aortic stenosis. She confirmed she did not tell Dr Reyaldeen anything about the previously reported symptoms because she understood them not to be related to the aortic stenosis.
69. Dr Reyaldeen recalls being told there was some discrepancy between the invasive haemodynamics done during the May 2021 coronary angiogram and the more recent resting echocardiogram in June 2022. He understood the question was whether Mrs Han was *truly a severe aortic stenosis* and the test was ordered to assess whether she was *truly asymptomatic*. Dr Reyaldeen accepted Dr Valencia's rationale based on what she told him in

this conversation. He did not independently review Mrs Han's records at this time.

Could Dr Valencia be reasonably satisfied the exercise stress echocardiogram was clinically indicated and there were no contraindications at that time?

70. Without information from Mrs Han about her experience of potentially relatable symptoms since May 2021, Dr Valencia could not be reasonably satisfied Mrs Han was asymptomatic when she ordered the test. It would have been clinically prudent for her to review Mrs Han in person or at least speak with her by phone via an interpreter to obtain information to assess her current symptom status and consider any possible contraindication to the test before she ordered it.

71. Dr Valencia placed significant weight on the May 2021 coronary angiogram finding of moderate stenosis following which the proceduralist (Dr S) considered Mrs Han's symptoms were not related to the aortic stenosis. She told the inquest:

...all the numbers that she had and the echocardiogram hadn't changed over time. We did a stress echo a few years earlier – two years prior – and there was not significant difference and we were convinced that they hadn't changed. There was a possibility of change in symptoms which was not co-related to the findings of the angiogram. And when I repeated the echocardiogram there were not changes in the numbers again on the echocardiogram.

72. In her opinion, moderate aortic stenosis did not cause symptoms. As discussed in paragraph 87(a) below, A/Professor Camuglia clarified this is not the case.

73. Given the relative recency of the coronary angiogram, Dr Valencia felt she needed to provide objective evidence of relatable symptoms before Mrs Han would be considered for surgery. Repeat stress exercise echocardiogram was the least invasive clinical investigation to obtain this evidence.

74. In cross-examination by Counsel for the family, Dr Valencia agreed it would be concerning if a patient whose aortic stenosis was progressing from moderate to severe and was reporting symptoms such as shortness of breath going up inclines, chest pain, fainting, darkness in vision, dizziness, light headiness or what someone may describe as vertigo. She agreed that given the progressive nature of aortic stenosis, it was important to monitor the progression of a patient's symptoms and whether they more frequent, worse or causing the patient to limit their activities.

75. Dr Valencia agreed it was important for clinicians to be very sure about the patient's reported symptoms. She accepted that in circumstances where there was some uncertainty about the relatability of their symptoms to their aortic stenosis, it would probably warrant a conversation with the patient about the risk associated with undertaking an exercise stress

echocardiogram. Dr Valencia told the inquest that once satisfied a patient with reported severe aortic stenosis had symptoms associated with it, she would not bring the patient back to clinic but would refer them for surgery.

76. She accepted that in circumstances where she had not spoken with Mrs Han who had not been reviewed by a cardiologist within the cardiac service for more than 12 months, she could not have been satisfied Mrs Han was asymptomatic of the reported severe aortic stenosis when she ordered the repeat exercise stress echocardiogram. It follows then she could not be satisfied the test was clinically indicated for Mrs Han.
77. The inquest examined possible options available to Dr Valencia at this juncture.
78. She agreed it was possible for her to ask for an appointment to be scheduled to review Mrs Han, whether in clinic or by telephone. A conversation with Mrs Han at this time was an opportunity for a cardiologist to elicit information about any current symptoms and evaluate whether there had been any evolution or change since May 2021 suggesting she may have become symptomatic of her aortic stenosis in the intervening period.
79. Dr Valencia was not aware of the symptoms Mrs Han was reporting to others including GPs during 2022. When they were put to her in cross examination by Counsel for the family, she maintained would still have ordered the repeat stress echocardiogram because she needed to discern if those symptoms – regular dizzy episodes and worsening shortness of breath walking up hills – were related to the aortic stenosis.
80. The evidence indicates that different cardiologists may take different approaches where there is actual or potential ambiguity about whether a patient is truly asymptomatic of their aortic stenosis.
81. While acknowledging there can be other explanations for Mrs Han's previously reported symptoms, Dr Reyaldean says he would not have proceeded with the exercise stress echocardiogram had he been aware of them in the setting of the recently reported severe aortic stenosis on resting echocardiogram.
82. In his opinion, the May 2021 coronary angiogram report of moderate aortic stenosis was a *moot point* because he would have been guided by the combination of the recently reported severe aortic stenosis on resting echocardiogram and the previously reported symptoms. He told the inquest that had he known Mrs Han had not been reviewed by a cardiologist since May 2021, he would *definitely* have suggested not proceeding with the exercise stress echocardiogram and to review Mrs Han in person to evaluate any symptoms.
83. In Dr Denman's opinion, a clinician can only get the indication right if they have recent information about the patient's symptom status. He considered Mrs Han probably had some symptoms that could be considered reliable

to her aortic valve disease, particularly her exertional shortness of breath walking up hills. He suspected Mrs Han would likely have reported symptoms which contraindicated the exercise stress echocardiogram had Dr Valencia spoken with her in September 2022.

84. Dr Denman told the inquest he would not have placed the same reliance on the invasive pressure gradient from the May 2021 coronary angiogram. In his words, *...a pull-back pressure, which is basically what they do – um – is not the thing that we really – you know, when I’m assessing the valve, if the echoes are severe, it’s severe.*

85. Mrs Han’s shortness of breath walking up hills, in the context of serial echocardiograms reporting severe aortic stenosis, meant Dr Denman would not have ordered the exercise stress echocardiogram. He would have referred Mrs Han for cardiothoracic surgical review.

86. The experts agree it was difficult to reliably relate Mrs Han’s reports of longstanding dizziness and light headedness to her aortic stenosis.

87. A/Professor Camuglia’s evidence sheds valuable light on the position in which Dr Valencia found herself at this juncture. In essence:

(a) it was entirely possible that Mrs Han’s previously reported symptoms were due to moderate aortic stenosis. On this point he told the inquest it is so well recognised in the published clinical literature and in the cardiac community that:

...moderate aortic stenosis causes symptoms to the point that that there are clinical trials being done on those patients to treat them while they’ve got moderate aortic stenosis using the newer technologies we use now that seem to have less risk because the risk benefit trade-off may have changed. In particular, females do seem to get symptoms of moderate aortic stenosis – um – more frequently than men..

(b) nonetheless, the echocardiography showed an alternative possible explanation for Mrs Han’s shortness of breath (diastolic dysfunction due to the thickened left ventricle and small cavity).

(c) during the COVID-19 pandemic they were relying a lot more on the tests because seeing patients in clinic was hard back then.

(d) left heart catheterisation is the gold standard for measuring aortic valve pressure gradient. This involves measuring the pressure inside the pumping chamber of the heart and outside in the aorta.

(e) there was ambiguity that Mrs Han actually had severe aortic stenosis because:

(i) the invasive pressure trace from May 2021 showed *nowhere near* severe aortic stenosis

- (ii) although her aortic valve was diseased, it was still opening, the *numbers were not much different* and her heart was not getting weaker; and
- (iii) it would be unusual for the gradient to have gone from 38mmHg to over 50mmHg in 16 months because gradient usually progresses at about 5-10mmHg at most per year. He distinguished 50mmHg as the invasive gradient cut off for a severe grading, not 40mmHg which is regarded as the severe cut on non-invasive echocardiogram.
- (f) it would be very unusual for a patient with an invasive pressure trace of 38mmHg to be put through left heart catheterisation and coronary angiogram within two years without a less invasive test given the associated risks.
- (g) in A/Professor Camuglia's opinion, no matter what Mrs Han may have had to say about her symptoms, *any sensible proceduralist* would want non-invasive exercise stress echocardiogram before proceeding with an invasive procedure within two years. His evidence was that nothing Mrs Han could have said about her symptoms, including a change in frequency, intensity or change in the way she was limiting her function to avoid symptoms, would have made a difference because the most recent resting echocardiogram did not look sufficiently different for him to be satisfied the invasively measured gradient had changed.
- (h) there are risks either way – in relation to the risk that tragically manifested for Mrs Han, he said:

But all of us for the grace of God have had patients with AS, aortic stenosis, much worse than this that went for treadmill tests, and we probably will in future. It's an area of incredible discomfort when you've got someone with clearly severe aortic stenosis and they don't meet the symptom threshold and we're doing our best to apply the evidence and the guidelines we have...but there is a number and the number is one or two per cent and Mrs Han fell into that number...

88. A/Professor Camuglia went so far as to say that had Dr Valencia referred Mrs Han for reconsideration of surgical intervention at that time:

I would've been annoyed, because I would have been, like, "Why can't people take ownership of their patients and work them up properly," because we're so busy. I would've been annoyed, because I would've been thinking, "They can do stress echoes at QEII. We just did a cath on the patient. We've unequivocally shown she doesn't have severe aortic stenosis. She's got diastolic dysfunction. Now you're sending her back, basically, to dump the decision on me," because there's risks in every direction, and they want someone else to take the risk.

89. In this context, I accept that Dr Valencia could not be confident that referral to the Princess Alexandra Hospital cardiac service for reconsideration of surgical intervention without objective symptom assessment would result in

Mrs Han being progressed on the surgery pathway without repeat exercise stress echocardiogram.

90. On the available evidence I cannot be satisfied that changing course with in-person clinic review by Dr Valencia or a different cardiologist at this juncture would have been outcome changing for Mrs Han. This is because having regard to A/Professor Camuglia's evidence, nothing Mrs Han could have said would have persuaded the receiving cardiac service that her symptom status contraindicated exercise stress echocardiogram because there was ambiguity about whether she actually had severe aortic stenosis. Sadly, she did.

Performance of the repeat exercise stress echocardiogram on 14 October 2022

91. A Mandarin speaking interpreter was present to interpret all communication between the clinical team and Mrs Han before and during the exercise stress echocardiogram.
92. Dr Reyaldeen says he asked Mrs Han whether she had been experiencing any chest pain, shortness of breath, light headedness or dizziness and whether she was feeling well to proceed with the test. He recalls she said she had no symptoms and was happy to proceed. His evidence did not go into detail about exactly how he went about eliciting this information from her, for example, whether he expressly asked about the presence of chest pain or shortness of breath when walking up inclines.
93. He told the inquest this was something he wanted to discuss with her before she was up on the treadmill because he understood her have an atypical indication for the stress test. He explained the discussion was less in-depth than a clinic review but more than his usual practice for a routine test of this kind. He said it was to make sure nothing had evolved/changed since prior clinical reviews. He said he also impressed upon her the need to tell them immediately if she developed any of these symptoms during the stress test.
94. Although Dr Reyaldeen's clinical record does not document this discussion, the interpreter's recollection of events, provided to representatives of QEII Hospital on 15 November 2022 and in writing through her employer on 6 December 2022, does not contradict his evidence in this regard. Nor does the evidence of the cardiac scientist and cardiac sonographer present for the test. I accept that the discussion occurred.
95. I am satisfied that short of reviewing Mrs Han's patient record himself, Dr Reyaldeen took reasonable and appropriate steps to clarify the indication for the test and assess Mrs Han's current symptoms and clinical suitability to undertake the test that day. He did not review Mrs Han's patient record because he accepted what his clinical peer had told him. That was not unreasonable. In the context of Mrs Han not reporting any current symptoms and the discordance between the invasive and non-invasive

gradings of her aortic stenosis, I find that the test was clinically indicated as there no clear contraindication to the test proceeding.

96. There is no dispute that the exercise stress cardiogram proceeded as expected to the point when Mrs Han said, via the interpreter, she was experiencing some chest pain, at which point it was ceased immediately.
97. Dr Reyaldeen explained they were asking Mrs Han, via the interpreter, whether she was having any symptoms at regular intervals during the stress test because the purpose of the test was to objectively assess whether her aortic stenosis was symptomatic. He was standing right beside her on the treadmill, with the ECG monitor beside him and watching how she was coping with the stress test. He says up to that point she said absolutely nothing regarding symptoms. Had she done so sooner, he would have stopped the test.
98. Dr Reyaldeen's clinical record documents that Mrs Han exercised without issue until the 5:40 minute mark or so when she described mild chest pain which she said via the interpreter, she *sometimes gets when she walks up a hill*. This is the first time Mrs Han is noted to have reported chest pain while walking uphill. In oral evidence, Dr Reyaldeen confirmed she definitely did not mention this to him prior to the test starting because it would have been a red flag for him. This was confirmed by the cardiac scientist present.
99. The interpreter's written recollection of events indicates while on the treadmill Mrs Han said she was exhausted. The clinician asked if she could go for another minute to which she said she would do her best. She then asked how much longer, to which the clinician said 40 seconds left. Mrs Han then said she had discomfort which on questioning by the clinician she indicated was the same as when she was walking up a hill. The clinician stopped the treadmill immediately. The interpreter recalled Mrs Han grabbed her chest, closed her eyes and used her other hand to hold onto the rail. She did not respond when the clinicians asked her to move down onto the bed.
100. Dr Reyaldeen could see on the ECGs that Mrs Han's heart rate was slowing, so the clinicians lay her down flat. She was unresponsive, without a palpable pulse. Staff immediately activated a Code Blue and Dr Reyaldeen commenced CPR. A Medical Emergency Team attended but despite prolonged emergency resuscitation efforts, there was never any shockable heart rhythm, and after 35-40 minutes of CPR, the clinical consensus was that further resuscitative efforts would be futile, so they were ceased.
101. On the available evidence I am satisfied the emergency response to Mrs Han's acute clinical deterioration was timely and comprehensive, with nothing further that could have been done to revive her.

102. Her sudden unexpected death came as a complete shock to her family who understood she was having a routine clinical investigation. They were understandably distraught by the outcome.

Did the undertaking of the exercise stress echocardiogram cause Mrs Han's death?

103. Yes.

104. The forensic pathologists who performed the coronial autopsy considered it unlikely that Mrs Han's death was entirely unrelated to the exercise stress test which induced increased demand on her heart in the presence of significant aortic stenosis.

105. Their opinion is not disputed. I accept it.

Should Dr Reyaldeen have stopped the test sooner?

106. No.

107. The relevant Queensland Health clinical guideline identified indications for terminating an exercise stress cardiogram (relative indications). Of relevance to Mrs Han's test, these were where there are ST changes such as excessive ST displacement (horizontal or down sloping of >2mm) or mixed access shift and increasing chest pain.

108. Dr Denman identified the ECG first became abnormal with non-specific minor upsloping ST depression around 2:30 minutes into the test due to motion and respiratory muscle artifact but by around 3:34 minutes (early second state of the test) it was unequivocally abnormal with was horizontal ST depression of at least 2mm in multiple leads (inferior and precordial) with associated ST elevation in aVR.

109. A/Professor Camuglia considered the ECG was not clearly abnormal until 5:37 minutes into the test.

110. There is no dispute that ST depression is a non-specific change in the setting of aortic stenosis.

111. Dr Denman agreed the decision to stop an exercise stress test is never based on ECG abnormality alone; rather it depends on the clinical context for which the test is ordered and involves a clinical judgement call balancing how the patient was coping with the level of exercise, whether they are developing symptoms and their blood pressure response, balanced against the risks of continuing the test.

112. Dr Reyaldeen was aware of the earlier ECG abnormalities but allowed the test to continue because Mrs Han was clinically stable and not reporting any symptoms. He stopped it as soon as Mrs Han reported chest pain at around the 5:40 minutes mark.

113. While, with the benefit of hindsight, Dr Denman may have stopped the test earlier as he considered the abnormal ECG changes provided an answer to the question for the test was ordered, he ultimately accepted Dr Reyaldeen's decision to allow Mrs Han to continue the test until the point at which it was ceased was an appropriate judgement call.

Findings required by s. 45

Identity of the deceased – Yaqin Han

How she died – Mrs Han died from a fatal cardiac arrhythmia provoked by undergoing an exercise stress echocardiogram in the presence of significant aortic stenosis.

Place of death – QEII Hospital 360 Troughton Rd COOPERS PLAINS QLD 4108 AUSTRALIA

Date of death– 14/10/2022

Cause of death – 1(a) Aortic stenosis.

Comments and recommendations

114. Princess Alexandra is Metro South Health's heart valve centre of excellence. The evidence suggests Mrs Han was being managed by the QEII Hospital general cardiology service rather than through the specialist heart valve centre because of an administrative health service directive aimed at delivering localised care.

115. A/Professor Camuglia told the inquest he felt Mrs Han *should never have gone to QEII* because its cardiology service was and still is not set up to manage patients with advanced valvular heart disease because:

they don't have a cath lab. They've got a small echo service. They have difficult retaining doctors for any longer than a few months – um – that's partly why they're so frag – fragmented.

He confirmed that in the years since Mrs Han's death, the QEII Hospital cardiology department staffing appears to have stabilised somewhat in the last 12 to 18 months, including with a *fairly senior* cardiologist in the Director role for over a year.

116. A/Professor Camuglia wondered, but could not be certain, whether had Mrs Han been more integrated into the more structured system of care through the Princess Alexandra Hospital's cardiac service, it may have been possible to pick up subtle differences in Mrs Han's symptoms. Fundamentally though, his position is that with the same information

available to Dr Valencia, he and any sensible proceduralist would still have ordered the exercise stress echocardiogram.

117. A/Professor Camuglia considers it would be more appropriate for patients like Mrs Han, who are thought to have significant aortic stenosis, to be managed by the interventional cardiology and cardiothoracic surgery teams at the Princess Alexandra Hospital. He acknowledges the Princess Alexandra Hospital cardiac service is not currently resourced to accommodate keeping these patients serially evaluated at that centre or by the same subspecialty team through outreach clinics
118. Dr Denman agreed the system within which Dr Valencia was having to work at that time was part of the problem. However, he considers there is a role for cardiology services outside the major hubs providing local screening and surveillance to the point of identifying patients needing intervention. Similarly to the other side of the river, The Prince Charles Hospital cardiac service cannot possibly cope with every person who wants to be seen there.
119. Metro South Health has had an opportunity to consider A/Professor Camuglia's views on its model of cardiac care since he delivered the part 6 review in December 2022. Public health services are competing for very finite resources in the current fiscal environment. However, while resourcing limitations may preclude the gold star model in the short to medium term, I consider there is scope for the Health Service to reexamine its model of cardiac care to identify incremental opportunity for its existing centre of heart valve excellence resources to better support local cardiology services managing patients with advanced valvular heart disease.

I close the inquest.



Ainslie Kirkegaard
Coroner
BRISBANE

22 September 2026