

**A Decision by the  
Deputy Health and Disability Commissioner  
(Cases 22HDC01223 & 23HDC00906)**

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## **Introduction**

1. This report is the opinion of Rose Wall, Deputy Health and Disability Commissioner, and is made in accordance with the power delegated to her by the Commissioner.
2. The report discusses the care provided to two separate consumers, Mrs A and Mrs B, during their pregnancies. The cases highlight the importance of health professionals adhering to clinical guidelines and maintaining the required standard of clinical practice to mitigate the risk of error.
3. On 18 May 2022 Mrs A submitted a complaint to this Office advising that through multiple ultrasound scans radiologist Dr D failed to identify the signs of congenital pulmonary

airway malformation<sup>1</sup> (CPAM). The multiple scans were performed by sonographer Mr C. In Mrs A's 36-week scan to check her baby's growth, a different radiologist identified CPAM. Mrs A was referred urgently to the Maternal Fetal Medicine (MFM) Clinic, where a specialist advised her that if the CPAM had been identified when it was first noticeable on the ultrasound scans at 20 weeks, the subsequent interventions would likely have been less invasive and more healthy lung tissue could have been saved. Following an unsuccessful attempt to drain the fluid from the cystic thoracic masses in utero, Baby A was born via Caesarean section, after which he required multiple surgeries, including the complete removal of his right lung.

4. On 6 April 2023, Mr and Mrs B submitted a complaint to this Office advising that through multiple ultrasound scans of their twin pregnancy, Mr C and Dr D failed to identify signs of renal agenesis.<sup>2</sup> At 31+2 weeks' gestation Mrs B went into pre-term labour, following which Twin 1 was diagnosed with renal agenesis through multiple tests, scans, and blood samples. In their complaint, Mrs and Mr B advised that there was evidence of total renal agenesis from the 20-week scan onwards. Sadly, Twin 1 passed away three days after birth.

5. This Office identified that the same combination of sonographer and radiologist working at the radiology service were performing and reporting on the ultrasound scans in question and, therefore, the following issues were identified for simultaneous investigation:

- *Whether Mr C, Dr D and the radiology service provided Mrs A with an appropriate standard of care in 2021 and 2022.*
- *Whether Mr C, Dr D and the radiology service provided Mrs B with an appropriate standard of care in 2022 and 2023.*

6. The parties directly involved in the investigation were:

Mrs A	Consumer/complainant
Mrs B	Consumer/complainant
Mr C	Individual provider/sonographer
Dr D	Individual provider/radiologist
Radiology service	Group provider

7. The following people are also referred to in the report:

Dr E	Radiologist
Dr F	Consultant obstetrician

8. Due to the concerns about Dr D's and Mr C's competence, the Deputy Commissioner made a referral to the Medical Council of New Zealand (MCNZ) and the Medical Radiation

<sup>1</sup> A mass of abnormal fetal lung tissue that forms during pregnancy, which can be life-threatening as it can dominate the fetal lung space.

<sup>2</sup> A condition in which a newborn is missing one or both kidneys.

Technologists Board (MRT Board) pursuant to section 59(4) of the Health and Disability Commissioner Act 1994.

9. As part of the investigation, a radiologist, Dr Rachael McEwing, was asked to undertake a blind review of the imaging and referrals for each case and to report on each scan as she would in her role as a radiologist (see Appendix A). Dr McEwing had no knowledge of the outcome of either case.
10. The role of a sonographer is to acquire the appropriate images and biometry, to complete a worksheet detailing patient information and biometry, and then to record normal and abnormal findings. This information is sent to the radiologist, and the radiologist has ultimate responsibility for reporting the images and data accurately.
11. The role of a radiologist for routine obstetric scans is to ensure that appropriate data and images are obtained, and then to report on the images and data accurately.
12. The requirements of obstetric ultrasound scans are specified in the New Zealand Obstetric Ultrasound Guidelines (the Guidelines),<sup>3</sup> and include image and measurement requirements for each individual scan. As the baby grows, the complexity and specifics of measurements and images increases.
13. Whilst Dr McEwing is not a peer of Mr C, because the radiologist's role includes ensuring that appropriate images are obtained, I consider that it is within her scope to make statements on Mr C's images.

### Case 1 — background

14. Mrs A became pregnant in 2021 and had a dating scan.<sup>4</sup> The dating scan was performed by sonographer Mr C and reported on by radiologist Dr D. Dr D reported a single live embryo with a gestational age of 9+5 weeks. Mrs A's uterus was reported as retroverted.<sup>5</sup> The gestational sac<sup>6</sup> was reported as normal with no pelvic abnormality noted.
15. At 12+5 weeks' gestation, Mrs A had her second ultrasound scan — the nuchal translucency (NT) scan.<sup>7</sup> The NT scan was also performed by Mr C and reported on by Dr D. The findings in the report identified this scan as acoustically challenging,<sup>8</sup> but Dr D reported no fetal abnormality, with no abnormality seen in the maternal pelvis, and he

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<sup>3</sup> <https://www.tewhatauora.govt.nz/publications/new-zealand-obstetric-ultrasound-guidelines/>

<sup>4</sup> A dating scan is performed around week 8 of pregnancy but can be done as early as 5 weeks. It is used to confirm due dates, assess the viability of the pregnancy, check the number of embryos, provide maternal reassurance, and to rule out ectopic pregnancy.

<sup>5</sup> A common condition that describes how the uterus sits within the pelvis during pregnancy.

<sup>6</sup> A fluid-filled structure surrounding an embryo during the first few weeks of development.

<sup>7</sup> The nuchal translucency scan is performed between 10+6 and 14+1 weeks' gestation and measures the space between the baby's neck and nuchal fold to screen for Down Syndrome and other chromosomal anomalies. This scan can also assess early anatomy and detect multiple pregnancies.

<sup>8</sup> Difficult to read due to the resistance an ultrasound beam encounters as it passes through tissue.

concluded that the fetal size was consistent with the previously identified estimated date of delivery (EDD).

16. At 19+5 weeks' gestation, Mrs A had her third ultrasound scan — the anatomy scan.<sup>9</sup> The anatomy scan was also performed by Mr C and reported on by Dr D. Dr D reported that the measurements obtained during the anatomy scan were normal, but that due to the position of the fetus, not all required measurements could be obtained, and therefore a follow-up anatomy ultrasound scan was scheduled.
17. The follow-up scan to obtain the remainder of the measurements was performed when Mrs A was 21+5 weeks' gestation. The follow-up anatomy scan was also performed by Mr C and reported on by Dr D.
18. Dr D reported the anatomy scan as complete from the additional images obtained at this follow-up appointment. Specifically, no abnormality was found or reported on in the aortic arch (AA) or descending aorta (DA), the placenta was noted to be posterior and clear, the liquor volume was reported as normal, and no pelvic abnormality was found.
19. Mrs A had a routine growth scan<sup>10</sup> performed by a sonographer and reported on by radiologist Dr E at the radiology service. At this time Mrs A was 36+2 weeks' gestation. Dr E identified multiple cystic lesions in each hemithorax,<sup>11</sup> with the largest measuring 30 x 32 x 46mm. The baby's heart was displaced and compressed by the cystic lesions, making it difficult to assess.
20. Dr E made a prompt referral to the MFM unit at the public hospital for assessment and notified Mrs A's ultrasound referrer and lead maternity carer (LMC) of the cystic lesions identified in the most recent ultrasound.
21. Mrs A's clinical records held by Health New Zealand | Te Whatu Ora (Health NZ) document that Mrs A was assessed by the MFM Clinic urgently due to the cystic lesions, which were suggestive of severe CPAM.
22. Immediately after the assessment, Mrs A was admitted to the maternity ward under obstetric consultant Dr F. CPAM was confirmed through an additional ultrasound scan during this admission. An attempt was made to drain the fluid from the cystic thoracic masses, which were considered macrocysts<sup>12</sup> due to their size. However, the fluid reaccumulated quickly. Mrs A's clinical records document:

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<sup>9</sup> The anatomy scan is performed around 20 weeks' gestation to assess whether the anatomy is developing as expected. The scan assesses growth and development and checks the placenta and body structure.

<sup>10</sup> The growth scan is usually performed at 28 weeks' gestation. It checks the baby's growth by measuring the head, abdomen, and thigh bone and assesses the amount of amniotic fluid surrounding the baby, and the position of the placenta.

<sup>11</sup> One side of the chest.

<sup>12</sup> An unusually large cyst.

'...: Large macrocystic CPAM — invading entire right lung field. Admit overnight, steroids x 2, NICU<sup>13</sup> aware, Review ..., fetal drainage done in utero ....

...: Seen by [Dr F] ... & the fetal lung cysts had reaccumulated overnight. CPAM dominates the R lung.'

23. Mrs A was discharged with an appointment for a further ultrasound scan and follow-up at the MFM clinic with Dr F.
24. The ultrasound scan confirmed that the fluid had reaccumulated and was dominating the fetal right lung. The CPAM macrocysts were documented as abnormally sized at 77 x 75 x 34mm. Prior to the drainage, the cysts had been measured at 55 x 26 x 36mm.
25. A decision was made to proceed to elective Caesarean section.
26. A referral for an anaesthetist explained the situation as:

'Late referral and diagnosis of fetal CPAM at 36 weeks. Has had x 1 drainage of fetal lungs which reaccumulated in a day. NICU are aware and have seen [Mr and Mrs A]. Plan is for EL CS ... at 39 weeks.'
27. Mrs A attended hospital for the scheduled Caesarean section.
28. Baby A's birth records describe him as being born in good condition and requiring positive end-expiratory pressure (PEEP) for initial resuscitation followed by continuous positive airway pressure (CPAP)<sup>14</sup> respiratory support.
29. Immediately following his birth, Baby A was transferred to NICU for observation and management, and he remained in hospital for five weeks.
30. On the day of Baby A's birth, an X-ray showed a large solid cystic lesion in the chest area. The lesion was invading the diaphragm space and causing an abnormal placement.
31. On day two post-birth, a computerised tomography (CT)<sup>15</sup> scan was undertaken to investigate the CPAM further. The scan showed several very large air- and fluid-filled cysts centred in the right middle lobe of the lung, causing significant distortion and herniation across the midline into the left hemithorax (the left side of the chest).

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<sup>13</sup> Neonatal Intensive Care Unit.

<sup>14</sup> Delivers normal air to a newborn child's airway at a set pressure, which keeps the airway open and prevents airway obstruction.

<sup>15</sup> A CT scan combines a series of X-ray images taken from different angles around the body and uses computer processing to create cross-sectional images (slices) of the bones, blood vessels, and soft tissues inside the body. CT scan images provide more detailed information than plain X-rays.

32. Baby A underwent a right thoracotomy<sup>16</sup> and resection of the lower, middle, and partial upper lobes. Postoperatively Baby A was intubated and required management of a pneumothorax<sup>17</sup> with chest drains.
33. Baby A experienced acute respiratory deterioration and required a pneumonectomy.<sup>18</sup> Baby A remained in NICU postoperatively and was able to breathe on his own after a few days.
34. Baby A was discharged home with Mr and Mrs A with advice on how to proceed and whom to contact if there were any problems, including respiratory problems. Regular follow-up was scheduled for neonatal/paediatric assessment and support.
35. In her complaint, Mrs A advised that the radiology service had confirmed with her LMC that the cysts were visible from the 20-week anatomy scan. Mrs A also advised that Dr F had told them that had the cysts been identified in the earlier scans, other drainage options would have been available to them. The NICU clinical lead advised Mrs A prior to Baby A's birth that he had only a 40% survival rate due to the size of the cysts.
36. Mrs A explained that she understood that the four earlier ultrasound scans were missed opportunities to identify the CPAM, and that had it been identified earlier, the interventions would likely have been less invasive and more healthy lung tissue could have been saved.

### **Case 1 — radiology service response**

37. In its response to this Office, the radiology service advised that following receipt of Mrs A's complaint, Mr C and Dr D met to discuss her complaint and the misdiagnosis.
38. The minutes from this meeting were provided and record that Dr D and Mr C reviewed all Mrs A's images and noted that the cystic mass was present on image 30 in the anatomy scan. The follow-up anatomy scan did not show the cystic mass, but it was obvious in the growth scan.
39. The meeting minutes record that both Mr C and Dr D conceded that not identifying the CPAM in the earlier scans was an error in observation. They determined that they would both need to be extra careful when reviewing images and would need to focus not only on the area of interest, but also on whether any abnormality could be seen in the outer areas, in this case in the lungs.
40. The radiology service's response to Mrs A's complaint also advised:

'[Dr D] and [Mr C] reflected on their individual performance and acknowledged they both made an error in missing the fetal abnormality in the anatomy scan ...'

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<sup>16</sup> A surgical procedure in which a cut is made between the ribs to access the lungs or other organs in the chest.

<sup>17</sup> A collection of air outside the lung but within the lung cavity.

<sup>18</sup> Surgery to remove a lung.

41. The radiology service's response included a statement from Dr D and Mr C and an apology for the misdiagnosis of CPAM for Baby A.
42. The radiology service concluded its response with an apology from the organisation for the misdiagnosis of CPAM.

## Case 2 — background

43. Mrs B became pregnant in 2022 and had a routine dating scan. The dating scan was performed by sonographer Mr C and reported on by radiologist Dr D.
44. The dating scan showed a dichorionic diamniotic<sup>19</sup> twin pregnancy. The uterus was reported as anteverted<sup>20</sup> with the positions of the gestational sacs normal and no pelvic abnormality found.
45. Mrs B had her second ultrasound at 12 weeks' gestation. This scan (the NT scan) was also performed by Mr C and reported on by Dr D. The scan showed that the fetal size was consistent with the previously identified EDD and confirmed the multiple pregnancy with no abnormalities identified in the maternal pelvis.
46. Mrs B had her third ultrasound scan at 20+1 weeks' gestation. This scan (the anatomy scan) was also performed by Mr C and reported on by Dr D. The scan confirmed the multiple pregnancy and EDD. Visualisation of each twin was recorded as good. The anatomy ultrasound report recorded measurements and observations of each twin's head, face, spine and skin line, chest, heart, abdomen, stomach, kidney, bladder wall, limbs, and cord as normal and concluded: 'No anatomic abnormality is detected.'
47. Mrs B had her first growth scan at 24+1 weeks' gestation. The scan was also performed by Mr C and reported on by Dr D. The scan concluded that no abnormality was detected, with Twin 1 on the 48<sup>th</sup> centile for growth and Twin 2 on the 71<sup>st</sup> centile for growth (between the 25<sup>th</sup> and 75<sup>th</sup> centile is considered normal range). The anatomy was reported as 'not repeated, but no abnormality was observed'.
48. Mrs B had a second growth scan at 28+1 weeks' gestation, which again confirmed the EDD. This scan was performed by Mr C and reported on by Dr D. Both Twin 1 and Twin 2 were reported as transverse<sup>21</sup> with the head to the maternal left. Twin 1 was reported as being on the 14<sup>th</sup> centile and Twin 2 was on the 58<sup>th</sup> centile for growth. However, there was no mention of Twin 1 being significantly below normal range, indicating that he might be a 'stuck twin'<sup>22</sup>. The anatomy was reported as 'not repeated, but no abnormality was observed'.

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<sup>19</sup> A dichorionic diamniotic twin pregnancy is a twin pregnancy in which each fetus has its own placenta and amniotic sac.

<sup>20</sup> Sloping forwards (an anteverted uterus is considered normal).

<sup>21</sup> When the baby/babies lie across the womb.

<sup>22</sup> The 'stuck twin' phenomenon in MCDA pregnancies is characterised by marked disparity in both fluid volume and fetal size between the twin gestations.



49. Three weeks later, Mrs B's LMC recorded in the clinical records that at 1.43pm she received a telephone call from Mrs B, who was attending a pre-organised obstetric clinic for anaesthetist assessment and was experiencing contractions every 5 minutes lasting 30–40 seconds.
50. At 3.36pm the LMC recorded meeting Mrs B at the delivery suite and commencing cardiotocography<sup>23</sup> (CTG) while Mrs B continued to experience contractions every 4–5 minutes lasting 30–40 seconds and becoming more painful. The LMC had trouble obtaining both babies' heart rates, and the Associate Clinical Manager (ACM) attended and located these. The ACM discussed Mrs B with the Delivery Suite Manager.
51. At 4.52pm, after assessment by an obstetrics and gynaecology registrar, Mrs B was moved to the delivery suite.
52. Mrs B and her twins continued to be monitored until their delivery via Caesarean section. Twin 1 was born at 8.22pm and Twin 2 was born at 8.24pm.
53. The maternity discharge papers for Mrs B record:
- '[W]ell pregnancy until presentation for delivery. At birth (via c section) Twin 1 — taken to NICU for resuscitation and admission. Twin 2 — delayed cord clamping then admitted to NICU.'
54. On assessment after birth, Twin 1 was found to have an 'antenatally undetected absence of kidney and bladder' and, sadly, he passed away on day three of life.
55. In her complaint, Mrs B advised that the scans and analysis were not completed with reasonable care or skill, as there was evidence of total renal agenesis in the anatomy scan at 20 weeks' gestation. Mrs B felt that if it had been picked up earlier, medical testing on Twin 1 could have been reduced after his birth and potentially could have reduced the trauma Mr and Mrs B experienced.

## Case 2 — Radiology service response

56. In its response to Mrs B's complaint, the radiology service provided a copy of minutes from a meeting between Mr C and Dr D when they met to discuss Mrs B's complaint and misdiagnosis.
57. The minutes documented that Mr C and Dr D had reviewed the anatomy and all subsequent growth scans.
58. Documentation of their discussion of the review of the scans was minimal, but they agreed that the anatomy scan was difficult because of the fetal position, and that Dr D thought Twin 2's liquor pocket was Twin 1's, and that the lack of movement by Twin 1 was not noted in the scan.

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<sup>23</sup> Monitoring of the fetal heartbeat and uterine contractions during pregnancy and labour.



59. The remainder of the minutes document the conversation about Mr C's workload, a decision to take him off anatomy and twin growth scans, and that an arrangement had been made for Mr C to have additional training with the MFM unit at the hospital.
60. The radiology service's response included a statement from Mr C in which he explained that in image 10 and 19 of the anatomy scan he had mistaken a small cystic area on the pelvis to be the bladder and renal arteries of each twin, and therefore he did not recall the patient for an additional scan, thinking he had seen the required anatomy.
61. Mr C concluded by advising: 'I deeply regret my errors and the effect this had on [Mrs B] and her family. I again offer my sincerest apology.'
62. Dr D also provided a statement in response to Mrs B's complaint, advising that Mr C had incorrectly labelled Twin 1's kidney and recorded in the preliminary report that visualisation had been good, giving Dr D the (false) reassurance that the kidneys had been well visualised. Dr D advised that therefore, there was no indication to contradict or override Mr C's findings.
63. Dr D also explained that Twin 2's liquor pocket was mistaken as Twin 1's and incorrectly labelled as such, and therefore it was not recognised that the reduced liquor for Twin 1 would have indicated a stuck twin, along with the discrepancies in growth size between each fetus.
64. Dr D advised that he sincerely regrets not picking up the renal agenesis diagnosis in his review and report, and he extended an apology to Mrs B and her family for the stress they have gone through.

### **Cases 1 & 2 — other information**

65. In its response to this Office, the radiology service provided relevant sections of its procedural guidelines. This included details of the required images and measurements when a sonographer undertakes an anatomy scan at the radiology service.
66. The radiology service also provided a copy of the template sonographers are required to complete when performing an anatomy scan, which includes spaces to input the required measurement.
67. In Dr D's response to Mrs B's complaint, he advised that the procedural guidelines set by the radiology service had been followed by both himself and Mr C in terms of required images and measurements.
68. Following receipt of both Mrs A's and Mrs B's complaints, the radiology service arranged for radiologist Dr E, who is a director of the radiology service, to undertake an audit of 100 anatomy scans performed by Mr C and reported on by Dr D to ensure that no further misdiagnosis or abnormalities had been missed. Following the audit, Dr E stated: 'I have found no misdiagnoses or cases of overlooked abnormality.'

69. The radiology service also facilitated a meeting for Dr D and Mr C to discuss each complaint to determine how the issues had arisen and what learnings could be taken from each case.

### **Responses to provisional opinion**

70. Mrs A was provided with an opportunity to respond to the introduction and background sections of the provisional decision in relation to her complaint and acknowledged receipt of the report but provided no comment.
71. Mrs B was provided with an opportunity to respond to the introduction and background sections of the provisional decision in relation to her complaint and acknowledged receipt of the report, required clarification on some parts of the process, which was responded to, and gave no comment on the content of the provisional opinion.
72. Mr C was provided with an opportunity to respond to the provisional opinion as it related to him and his practice. Mr C acknowledged receipt of the provisional opinion, accepted the findings, including the recommendations, and provided an apology letter for Mrs A and Mrs B, which will be enclosed with their copy of this opinion.
73. Dr D was provided with an opportunity to respond to the provisional opinion as it related to him and his practice. Dr D acknowledged receipt of the provisional opinion, accepted the findings, including the recommendations, and provided an apology letter for Mrs A and Mrs B, which will be enclosed with their copy of this opinion.
74. The radiology service was provided with an opportunity to respond to the provisional opinion. The service acknowledged the provisional opinion and accepted the decision.

### **Case 1 opinion: Introduction**

75. Mrs A had five ultrasound scans throughout her pregnancy. The first four were performed by sonographer Mr C and reported on by radiologist Dr D.
76. Overall, all reports completed by Dr D with images obtained by Mr C were reported as normal, with no concern about the baby's development noted, and no recommendation for obstetric or MFM review made.
77. A different sonographer and radiologist performed a growth ultrasound scan at 36+2 weeks' gestation. They identified cystic lesions within the baby's lung, which later were identified as CPAM.
78. An immediate referral to the MFM service was made and an attempt to drain the cysts undertaken, but the fluid reaccumulated quickly.
79. Baby A was born via Caesarean section.

80. Baby A spent five weeks in NICU and underwent two surgeries, including a right pneumonectomy.
81. In Dr McEwing's blind review of the dating ultrasound scan performed at 9+5 weeks, she noted that cardiac activity had not been documented. The Guidelines include cardiac activity in the list of minimal reporting requirements for all obstetric dating ultrasound scans. Dr McEwing also advised that the left ovary had been labelled, but it was not definitely visible on the image.
82. In the blind review of Mrs A's NT scan performed at 12+5 weeks, Dr McEwing advised that the scan itself was incorrectly labelled as 'NUCHAL [Mr C's first name]', the fetal heart was not imaged despite being reported on, and the NT measurement was technically suboptimal as there was inadequate magnification.
83. Dr McEwing provided a list of recommended fetal anatomy to be assessed during the NT scan from the Guidelines and advised that none of these structures had been imaged adequately on Mrs A's NT scan.
84. As per the Guidelines, the anatomy scan assesses fetal biometry and anatomy, screens for structural abnormality, and establishes the placental location. Within the Guidelines there is an extensive list of the required measurements to be taken during the anatomy scan.
85. In Dr McEwing's blind review of Mr C's images during the first anatomy scan she summarised:

'Views of the brain, face, abdomen, heart and extremities are very limited and non-diagnostic. No colour Doppler views have been obtained of the fetal heart.

The lower margin of the placenta cannot be ascertained on these images and low lying placenta/placenta previa cannot be excluded.

The recommendation for standard imaging within the national guideline do[es] not appear to have been adhered to.

There is an abnormal elongated fluid structure suspicious for bowel in the fetal thorax. The right hemi-diaphragm has not been imaged. Appearances are highly concerning for congenital diaphragmatic hernia (CDH).

The presence of associated choroid plexus cysts raises the possibility of a chromosomal abnormality in this fetus.

Head and abdominal measurements are above the 90<sup>th</sup> centile.

Ideally, tertiary or fetal medicine referral should have been advised and follow up scan to complete anatomy should have been arranged.'

86. Dr McEwing included in her summary of the follow-up anatomy scan that although the study was labelled 'Fetal Echo<sup>24</sup>', none of the basic cardiac anatomy had been imaged as per the Guidelines.
87. Dr McEwing's review of Mrs A's ultrasound scans performed by Mr C and Dr D summarised that the images in all scans, excluding the dating scan, were suboptimal and did not adhere to the Guidelines. In addition, the fetal heart was not assessed adequately in any of these ultrasound scans, some of the recommended anatomy was not imaged as per the Guidelines, and the lower margin of the placenta was not imaged.
88. Dr McEwing concluded:
- 'Appearances are in keeping with a significant structural abnormality most in keeping with a right congenital diaphragmatic hernia. Although the third trimester imaging has not clearly shown a connection between the fluid filled structures in the fetal thorax in keeping with bowel, appearances at the anatomy scan were highly suggestive of bowel. The heart is significantly displaced. The differential diagnosis includes a pulmonary cystic abnormality such as CPAM (congenital pulmonary airway malformation). Fetal Medicine or Tertiary referral would have been appropriate at the time of the anatomy scan when these findings were present.'

### **Case 1 opinion: Mr C — breach**

89. The Australasian Society for Ultrasound in Medicine (ASUM) guidelines state that sometimes it may not be possible for sonographers to obtain adequate images, and in that event, the fact that the assessment is limited must be recorded.
90. The radiology service explained in its response that its sonographers type in a preliminary report, which the radiologist then reads and authorises. Therefore, it would be the responsibility of Mr C, as the sonographer, to flag with Dr D any difficulties faced resulting in suboptimal images when performing the ultrasound scans.
91. Dr McEwing's independent advice is accepted for Mr C because of her knowledge, as a radiologist, of the requirements of a sonographer in terms of the standard of images obtained.
92. I accept Dr McEwing's blind review of Mrs A's pregnancy scans as described above — three out of the four scans performed by Mr C had suboptimal images, did not adhere to the current Guidelines, and on numerous occasions had incorrect labelling. The extent of Mr C's departure from the Guidelines is particularly evident in the NT scan, for which Dr McEwing advised that 'none of the required structures in the NT scan had been adequately imaged in adherence with the Guidelines'.

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<sup>24</sup> A fetal echocardiogram (also called a fetal echo) uses sound waves to create pictures of an unborn baby's heart.

93. Dr McEwing's blind review highlights that the scope and standard of imaging performed by Mr C in three of the four ultrasound scans he performed on Mrs A did not adhere to national guidelines. In my opinion, this represents a significant departure in the standard of care. I therefore find that Mr C did not provide services to Mrs A with reasonable care and skill and breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code).

### **Case 1 opinion: Dr D — breach**

94. Radiologists practising in New Zealand have a requirement to adhere to the Royal Australian and New Zealand College of Radiologists (RANZCR) standards of practice, which under sections 5.5.1 and 17.3.5 stipulate the responsibilities of the reporting radiologist. The standards state:

'A single named clinical radiologist is to be responsible for the supervision, interpretation and reporting of the entire study.

The responsibility for the conduct of the study and the production of the report lies with the clinical radiologist.'

95. I accept Dr McEwing's advice that the images obtained throughout Mrs A's ultrasound scans were suboptimal and labelled incorrectly. As per the RANZCR standard of practice, Dr D held overall responsibility for the reporting of each ultrasound scan and was required to provide the sonographer with feedback if their images were not of the expected quality or if the sonographer did not provide images as required in the Guidelines.
96. In Mrs A's case, Dr McEwing first identified and reported on the abnormalities suggestive of CPAM in the first anatomy scan.
97. In the follow-up anatomy scan, Dr McEwing again reported further on the abnormalities.
98. Dr McEwing concluded in the blind review that MFM or tertiary referral would have been appropriate at the time of the first anatomy scan at 19 weeks and 5 days' gestation.
99. Mr C and Dr D reviewed Mrs A's scan and acknowledged that the cystic mass was first present in the first anatomy scan.
100. It is extremely concerning that Dr D signed off reports for Mrs A without having seen all the required images as set out in the Guidelines, and accepted images from Mr C that on multiple occasions were suboptimal or were labelled incorrectly. In my opinion, this represents a significant departure in the standard of care provided by Dr D.
101. In considering Dr McEwing's blind review and noting the above, I find that Dr D failed to recognise the cystic mass, failed to recommend MFM for tertiary referral at the time of the anatomy scan, and signed off on reports with suboptimal images and incorrect labelling, and without viewing all the required images as set out in the Guidelines. Therefore, I find

that Dr D failed to provide Mrs A services with reasonable care and skill, in breach of Right 4(1) of the Code.

## Case 2 opinion: Introduction

102. Mrs B had five ultrasound scans throughout her twin pregnancy, all of which were performed by sonographer Mr C and reported on by radiologist Dr D.
103. Overall, all reports completed by Dr D with images obtained by Mr C were reported as normal, and specifically reported no abnormality having been seen.
104. Mrs B delivered her twins via Caesarean section, after which Twin 1 was found to have renal agenesis and, sadly, he passed away three days later.
105. Throughout the blind review of Mrs B's ultrasound scans, Dr McEwing made note of the time taken on each ultrasound scan based on the timestamps on the images.
106. Dr McEwing's blind review of the dating ultrasound scan reported the dichorionic, diamniotic twin pregnancy and summarised that technically the images were adequate, but the cardiac activity had not been documented on the images, which, as advised earlier, is a requirement of the Guidelines.
107. In the blind review of Mrs B's NT scan, Dr McEwing reported that the images of the NT measurement were suboptimal as they were not magnified appropriately or positioned correctly. Dr McEwing advised that the fetal anatomy imaging for both twins was incomplete, and she provided a list of images and measurements that the Guidelines recommended be taken.
108. Throughout Dr McEwing's reporting of the anatomy scan, she advised that the images were suboptimal, and in the summary, she advised that there was suboptimal visualisation of the brain, extremities, kidneys, and heart in both twins and neither bladder was imaged. Dr McEwing considered that therefore, the Guidelines had not been followed for Mrs B's anatomy scan.
109. In the first growth scan, Dr McEwing describes the assessment as being limited and again suboptimal, noting that the kidneys had not been imaged on either twin. The bladder had been labelled as present for both twins, but it is not demonstrated clearly for either.
110. Dr McEwing's blind review of Mrs B's ultrasound scans summarised that as per the Guidelines, the assessment of fetal anatomy was incomplete for each gestation. In particular, she noted that the heart had not been assessed appropriately in either twin. Dr McEwing also advised that the imaging of all scans was of shorter duration than she would expect, particularly for a twin pregnancy. Dr McEwing's conclusion included the following:

'The bladder for [Twin 1] has not been shown on any scans despite being labelled as present.

The kidneys for [Twin 1] appeared echogenic on the anatomy scan and have not been imaged in subsequent scans.

A renal anomaly for [Twin 1] is not excluded.

Amniotic fluid assessment for [Twin 1] on the 28-week growth scan is not clear (obscured by the fetus) and may not reflect a pocket of fluid.

Obstetric review should have been recommended at 28 weeks for small gestational age [Twin 1].’

111. In its response to Mrs B’s complaint, the radiology service advised:

‘Following the complaint, [Dr D] and [Mr C] immediately conducted a review meeting and went through [Mrs B’s] scans together, reviewing all of the images and reports in detail. From this meeting, [Dr D] and [Mr C] reflected on their individual performance and acknowledged that they made an error in missing the renal agenesis diagnosis in one of the twins in the anatomy scan ... and missed the “stuck twin” in the two following grow[th] scans ...’

## Case 2 opinion: Mr C — breach

112. I accept that in the blind review of Mrs B’s ultrasound scans, Dr McEwing identified numerous incidents where images taken by Mr C were suboptimal and did not adhere to the Guidelines and were labelled incorrectly. Specifically, Dr McEwing noted that the NT measurements were inaccurate and Twin 1’s kidneys were echogenic in the anatomy scan and not visualised in any further ultrasound scans, and the bladder of Twin 1 was not shown on any scan despite being labelled as present.
113. I appreciate that Dr D and Mr C met to discuss both incidents after the complaint for each was received. I acknowledge that discussions around Mr C’s workload occurred and decisions were made, namely to remove Mr C from anatomy and twin growth scans for the foreseeable future, to undertake additional training/upskilling, and to consider reducing his workload.
114. Given that there is no evidence to suggest that Mr C was aware that his images were suboptimal and he did not advise Dr D of any issues faced whilst performing Mrs A’s and Mrs B’s ultrasound scans, I have significant concerns about Mr C’s skills as a sonographer, and I will follow up on my referral to the MRT Board with a copy of this report and will suggest that a competence review is undertaken.
115. Guided by the review undertaken by Dr McEwing, in my opinion there was a significant departure in the standard of care Mr C provided to Mrs B. I find that Mr C did not provide services to Mrs B with reasonable care and skill and breached Right 4(1) of the Code, because the images obtained throughout her pregnancy ultrasound scans were suboptimal and were labelled incorrectly.



**Case 2 opinion: Dr D — breach**

116. Mrs B had five ultrasound scans throughout her pregnancy, all of which were performed by Mr C and reported on by Dr D.
117. In the blind review of the anatomy scan, Dr McEwing reported an unusual presence and noted that the kidneys for Twin 1 appeared echogenic but had not been well assessed, and Twin 1's bladder was not seen.
118. Dr McEwing concluded that a renal anomaly for Twin 1 could not be excluded, and that obstetric review should have been recommended at 28 weeks' gestation for Twin 1, who was small for gestational age.
119. Dr D and Mr C reviewed Mrs B's anatomy and subsequent growth scans and recorded that Mr C advised that the anatomy scan was difficult, but he thought he saw the fetal kidneys. Dr D acknowledged the difficulties in the anatomy scan and that there was a lack of movement for Twin 1 that was not recognised during the growth scan.
120. It concerns me that Dr D signed off reports for Mrs B without having seen all the required images or anatomy as set out in the Guidelines. In my opinion this represents a significant departure in the standard of care Dr D provided.
121. I find that Dr D did not provide services to Mrs B with reasonable care and skill and breached Right 4(1) of the Code for failing to recognise the renal anomaly for Twin 1, failing to recommend obstetric review for Twin 1's small for gestational age, and for signing off on reports without having noted suboptimal images or seeing all required images as set out in the Guidelines.

**Cases 1 & 2 opinion: Radiology service — other comment**

122. As a healthcare provider, the radiology service is responsible for providing services in accordance with the Code.

**Standard of care**

123. I acknowledge that the radiology service had in place procedural guidelines and a template for the anatomy scan that included spaces to input the required measurements. It is concerning that Dr D considered that the procedural guidelines had been followed in terms of required images and measurements. While images may have been obtained and measurements input, as Dr McEwing has found, many of the images were suboptimal and the anatomy was not visualised adequately.
124. It was appropriate that the radiology service had in place guidelines for the images required to be obtained and a sonographer worksheet to be completed, but the responsibility then passed to Dr D and Mr C, as registered health professionals in their respective fields, to adhere to the guidelines of their professional regulatory bodies and obtain and assess the images appropriately, and for Dr D to report on them appropriately.

125. I consider that Dr D's misdiagnoses and Mr C's suboptimal images and incorrect labelling of scans and images were independent clinical errors and do not indicate broader systems or organisational issues at the radiology service. Accordingly, I consider that the radiology service did not breach the Code directly.

### **Concluding remarks**

126. In conclusion, the findings from this investigation highlight failings in the standard of care provided to separate consumers by the same two health professionals. This report emphasises the importance of a scheduled maternity ultrasound scan as a principal opportunity to identify fetal developmental issues in utero. The common element in both cases was the failure of the sonographer and radiologist to maintain their respective standard of clinical practice during the performance of multiple ultrasound scans. In each case, this resulted in missed opportunities to diagnose medical issues with the developing fetus at the earliest opportunity. Understandably, this delay in diagnosis had a profound and lasting impact on the consumers concerned and their wider whānau/family.

### **Audit**

127. It was appropriate that following these events, the radiology service arranged an audit to consider the scans conducted and reported on by Mr C and Dr D. The audit was completed by Dr E, who is a director of the radiology service. I acknowledge that Dr E did not find any further missed abnormalities from a sample of 100 other cases conducted together. However, in my view, it would have been more appropriate for an audit of this nature to be undertaken independently by a party external to the radiology service. Therefore, I have recommended that a further audit be undertaken (see below).

### **Changes made since events**

128. Following these incidents, Dr D, Mr C, and the radiology service implemented several changes, as outlined below.

#### **Dr D**

##### *Ongoing education*

129. Dr D:

- Attended an online refresher course on obstetric ultrasound requirements in New Zealand.
- Attended an RANZCR Annual Scientific meeting and the obstetric ultrasound lectures relevant to both misdiagnoses.
- Attended all the lectures and presentations at an International Fetal & Women's Imaging conference.
- Attended a Wāhi Rua NZ Maternal Fetal Medicine Network Update Day and Fellows Day.

130. Dr D advised that following reflection of the incident and current workload pressure, he retired from the hospital components of his work and now is employed only in clinic work.
131. In response to the provisional opinion, Dr D advised that he is practising under a voluntary undertaking with the Medical Council of New Zealand, where all his obstetric anatomy scans are reviewed by a supervisor.

### **Mr C**

#### *Ongoing education*

132. Mr C:
- Attended eight webinars and reviewed four papers on multiple subjects, including in relation to obstetric ultrasound, early anatomy, and outcomes of antenatally diagnosed congenital cystic adenomatoid malformation (CCAM).<sup>25</sup>
  - Ceased performing anatomy and twin growth ultrasound scans.
  - Is no longer employed by the radiology service.

#### **Radiology service**

133. As a result of this complaint, the radiology service initiated morbidity/mortality meetings in which radiologists and sonographers discuss complex cases or cases with suboptimal outcomes.
134. Following receipt of the second complaint, Dr E, a radiologist at the radiology service, conducted an audit of 100 obstetric cases performed by Mr C and Dr D and found no further misdiagnoses.

### **Recommendations**

135. I recommend that Dr D use this report as a basis for a case study presentation to his peers focusing particularly on the breaches of the Code identified, including details of the misdiagnoses. Evidence confirming the content of the presentation is to be provided to HDC within six months of the date of this report.
136. I recommend that Mr C:
- a) Enter into a mentoring relationship with a senior colleague for at least one year, to review images from a collection of scans regularly to ensure that the images obtained through scans performed adhere to the requirements as per the current Guidelines, with confirmation to HDC that mentoring has occurred, and that Mr C's images are in accordance with the current Guidelines.
  - b) Review the Guidelines against images taken for Mrs A and Mrs B and reflect on the departures from the Guidelines. Mr C should provide this Office with a reflection based on this review within six weeks of the date of this report.

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<sup>25</sup> CCAM is a benign lung lesion that appears before birth as a cyst or mass in the chest.

137. I recommend that the radiology service:
- a) Undertake a new audit by an external party, to consider whether any other diagnoses were missed, as well as to consider whether the images obtained were sufficient and labelled appropriately and provide the outcome within six months of the date of this report.
  - b) Review the current procedural guidelines and reporting templates to ensure that they are in line with the New Zealand Obstetric Ultrasound Guidelines and provide an update within six months of the date of this report.
138. Considering the issues identified in these cases, I recommend that the Medical Council consider whether a review of Dr D's competence is warranted.
139. Considering the issues identified in these cases, I recommend that the Medical Radiation Technologists Board consider whether a review of Mr C's competence is warranted.

### **Follow-up actions**

140. A copy of this report with details identifying the parties removed, except the advisor on this case, will be sent to the Medical Council of New Zealand, and it will be advised of Dr D's name.
141. A copy of this report with details identifying the parties removed, except the advisor on this case, will be sent to the Medical Radiation Technologists Board, and it will be advised of Mr C's name.
142. A copy of this report with details identifying the parties removed, except the advisor on this case, will be sent to the Royal Australian and New Zealand College of Radiologists and placed on the Health and Disability Commissioner website, [www.hdc.org.nz](http://www.hdc.org.nz), for educational purposes.
143. Dr D and Mr C will be referred to the Director of Proceedings in accordance with section 45(2)(f) of the Health and Disability Commissioner Act 1994 for the purpose of deciding whether any proceedings should be taken.

## Appendix A: Independent clinical advice to Commissioner

The following blind review and independent advice was obtained from radiologist Dr Rachael McEwing:

'REVIEW — ULTRASOUND PREGNANCY — CASE 1

1. DATING SCAN [date]

**CLINICAL DETAILS:**

Dating prior to NT, CVS or amniocentesis.

Unsure of dates ? 7/40 wks.

**SCAN INTERPRETATION:**

Transabdominal scan.

Limited assessment (7 images)

Anteverted uterus.

Images show an intrauterine gestation sac containing an embryo, which appears to be single.

Crown-rump-length (CRL) — best measurement is 28 mm, corresponding to a gestational age (GA) of 9 weeks 4 days, +/- 4 days.

Cardiac activity has not been documented.

Right ovary: contains a small cystic corpus luteum

Left ovary: has been labelled but the ovary is not definitely visible on the image.

Estimated date of delivery (EDD) by averaged measurements is [date].

**SUMMARY:**

Limited, but technically adequate dating scan.

The technically best measurement of CRL has not been used (average used) but this is not significantly discrepant from the average.

2. NUCHAL SCAN, 12 WEEKS 5 DAYS

**CLINICAL DETAILS:**

Nuchal translucency assessment (between 12 weeks to 13.6 weeks) code: NT

**SCAN INTERPRETATION:**

Limited transabdominal scan (12 images). Labelled NUCHAL [Mr C's first name] (presumably sonographer's name).

Images taken showing placenta, fetal skull and choroid plexi, cardiac activity, part of one limb (unsure which, probably a humerus), probably mid abdomen (uncertain

plane and not labelled, no structures such as stomach visualised), legs (partially imaged), Cardiac activity is present, heart rate 154 bpm. The heart has not been imaged.

Biparietal diameter (BPD): 23 mm (suboptimal image)

CRL: 73 mm, corresponding to GA of 13 weeks 3 days (> 95th centile) — technically suboptimal measurement

Nuchal translucency (NT): 2.59 mm technically suboptimal (inadequate magnification, first 2 images not in midline, posterior brain structures have not be well resolved).

Very limited assessment of fetal anatomy (see above).

Recommendations from the New Zealand Obstetric Ultrasound Guidelines (2019) at the 12 week scan:

Assessment of fetal anatomy is the major component of the 12+ week scan. The following routine fetal anatomy should be assessed as a minimum at the time of the NT scan.

- Skull and brain
- Stomach
- Bladder
- Spine
- Four limbs (document two arms, two legs, two hands and two feet)
- Cord insertion
- Three-vessel cord
- Four-chamber (4Ch) heart (if possible).

Other structures that may be examined, if possible, include:

- Situs
- Diaphragm
- posterior fossa
- kidneys
- orbits/lenses
- three-vessel view/cardiac outflow tracts
- facial triangle.

<https://www.tewhātuora.govt.nz/publications/new-zealand-obstetric-ultrasound-guidelines/>

#### **SUMMARY:**

Technically suboptimal measurement of CRL and NT.

None of the recommended structures to be assessed as per the New Zealand Obstetric Ultrasound Guidelines have been adequately imaged on this scan.

### 3. ANATOMY SCAN 19 WEEKS 5 DAYS

#### **CLINICAL DETAILS:**

Anatomy scan Code: AN

#### **SCAN INTERPRETATION:**

45 images, showing:

1. Midline sagittal lower segment (placental location not visible)
2. Placenta (not clear which plane image was acquired in, if sagittal plane the placenta would be fundal, if transverse plane, right wrap)
3. BPD: 51 mm > 98th centile measured in incorrect plane
4. Head circumference (HC): 183 mm, 94th centile — measured in incorrect plane
5. Abdominal circumference (AC): 159 mm, 93rd centile technically adequate measurement. The stomach is visualised.
6. Femur length (FL): 31 mm, 44th centile technically adequate measurement
7. Choroid plexus showing small bilateral choroid plexus cysts (labelled CPCs)
8. Choroid plexus showing near-side choroid plexus cyst
9. Choroid plexus showing far side choroid plexus cyst
10. Cerebral ventricle, measuring appropriately 7.99mm (within normal limits). CPC evident in far side ventricle.
11. Cerebellum measured (not labelled) — 19.2 mm consistent with GA. Cisterna magna measured 4 mm, within normal limits. Nuchal fold would normally be measured on this view also (not well visualised but looks thickened on this limited view).
12. Limited view of fetal face, showing one orbit (not labelled)
13. Limited view ? Of fetal nose and lip (not labelled). Part of the fetal thorax has been visualised, showing ribs, partially imaged heart, and a probable fluid structure on the near side of the thorax.
14. Coronal view showing small part of cervical spine
15. Coronal view of lower spine and sacrum
16. Sagittal view of lower spine and sacrum
17. Sagittal view of lower spine and sacrum showing skinline appears normal
18. Sagittal view of mid and upper spine grossly normal
19. Limited coronal views of both kidneys (labelled k) — not well seen (labels partially obscuring the kidneys)
20. Coronal view of renal arteries
21. Limited view (partially obscured by labels) of bladder and stomach within the fetal abdomen in oblique coronal plane
22. Image of left side of diaphragm (labelled diaphragm) — this side of the diaphragm appears grossly intact (right side not imaged). Abnormal fluid structure partially included in the thorax
23. Cord insertion labelled, appears normal



24. Cord insertion and 2 umbilical arteries (labelled 3V cord) — appears normal
25. Placenta labelled pl insertion showing insertion of cord into placenta looks normal
26. Heart suboptimal apex down view labelled 4 Chamber Heart non-diagnostic image. No colour Doppler. Heterogeneous appearances of right thorax, with bright (echogenic) tissue visualised not typical for normal lung. Fetal bowel can have these appearances.
27. Heart — suboptimal apex down view labelled 4 Chamber Heart grossly normal but limited. No colour Doppler. Heterogeneous echogenic tissue with adjacent fluid evident on right thorax. Intrathoracic bowel is not excluded.
28. Heart suboptimal apex down view without colour Doppler. Heterogeneous echogenic tissue with adjacent fluid evident on right thorax. Intrathoracic bowel is not excluded.
29. Limited view of heart labelled IVS (interventricular septum). No colour Doppler.
30. Image labelled RVOT (right ventricular outflow tract), without colour. There is an elongated fluid-filled structure in the thorax on this view which is an abnormal finding and is highly suspicious for intrathoracic bowel.
31. Image labelled 3VV (three-vessel view) — suboptimal, not in correct plane. No colour Doppler. I cannot tell whether this is normal or not. Partially included anechoic (fluid) structure on this view suspicious for intrathoracic bowel at the level of the mediastinum.
32. Image labelled Arrow showing cardiac outflow tracts, suboptimal, no colour Doppler. Grossly normal three-vessel view. Small fluid collection visualised anterior to the outflow tracts.
33. Image labelled LVOT suboptimal plane, no colour Doppler. Non-diagnostic image. Fluid structure visualised within the fetal lung anterior to the heart.
34. Not labelled. ? Showing profile. Very suboptimal, non-diagnostic image. Chin not visualised.
35. Not labelled. I cannot interpret this image possibly profile but non-diagnostic.
36. Labelled leg shows tibia and fibula of near side leg. Foot partially included. Talipes (clubfoot) or abnormal positioning cannot be excluded.
37. Labelled leg one of the lower leg bones (tibia) only of far-side leg.
38. Labelled foot plantar view of one foot grossly normal
39. Labelled foot both feet partially imaged suboptimal visualisation
40. Labelled Lt arm radius and ulna partially imaged
41. Labelled Rt arm one lower arm bone partially imaged
42. Labelled hand transverse image through the fingers non-diagnostic
43. Labelled hand limited view showing 4 fingers partially imaged in longitudinal plane
44. Labelled hand both hands partially included on the image, cannot tell which fingers belong to which hand, non-diagnostic
45. Labelled hand 4 fingers partially imaged of one hand
46. Screen shot of fetal biometry.

## NEW ZEALAND OBSTETRIC ULTRASOUND GUIDELINES FOR FETAL ANATOMY ASSESSMENT:

At a minimum, the following need to be assessed.

Extended views, if achievable, are in italics and marked with \*. Note: Failure to visualise these is not an isolated reason to recall for further imaging if the remaining anatomy is well visualised and normal.

### Head

- Nuchal fold measurement (measure in the plane of the cavum septum pellucidum (CSP), normal is  $\approx$ 6 mm)
- Cerebral ventricles (measure lateral ventricle at atrium, normal  $\approx$ 10 mm)
- Choroid plexus
- CSP and falx
- Cerebellum/vermis
- Cisterna magna (normal  $\approx$ 10 mm)
- Calvarium
- Sagittal corpus collosum\*
- Sagittal vermis\*.

### Face

- Orbits + lenses
- Nose/lips (coronal)
- Profile showing nasal bone and mandible
- Alveolar ridge\*
- Uvula/soft palate\*.

### Abdomen

- Stomach (situs)
- Kidneys in two planes (transverse and longitudinal/coronal images (measure AP pelvis if renal dilatation is suspected)
- Bladder
- Diaphragm (right and left sides, and document organs in relation to the diaphragm)
- Anterior abdominal wall and cord insertion
- Bowel.

### Heart

- Situs, cardiac axis, position and size
- 4Ch heart and transverse view of the interventricular septum
- Outflow tracts: left/right ventricular outflow tract (LVOT and RVOT respectively)
- Three vessel and trachea (3VT) view/arrow view
- Assess fetal heart rate and rhythm (Note: Document M-mode if there is an abnormality of the heart rate or rhythm.)

- An axial sweep cine from stomach to outflow tracts is extremely helpful for offline review and when referring a suspected anomaly.

Include both colour and non-colour imaging on all heart views.

The following extended cardiac views should be considered in case of suspected anomaly, if the operator is experienced in cardiac assessment.

- Ductal arch and aortic arch\*
- Superior/inferior vena cava\* (SVC/IVC respectively)
- Pulmonary veins\*
- Foramen ovate\*
- Pulmonary arteries\*
- Thymus\*
- Atrioventricular (AV) valves\*
- Ductus venosus\*
- Abdominal aorta and IVC\* (for determination of situs).

If cardiac anomaly is suspected, prompt referral for fetal echocardiography is required.

#### Spine

Assess in three planes (sagittal, coronal and transverse, including skin line and sacrum). Two planes may be acceptable in suboptimal fetal position, but visualisation must be excellent.

#### Umbilical cord

- Cord insertion: both fetal and placental
- Three-vessel cord.

#### Extremities

- Document all long bones
- Arms (upper arm and forearm)
- Hands observed open/parallel digits
- Fingers counted
- Legs (upper leg and lower leg)
- Feet/ankles.

#### **SUMMARY:**

Views of the brain, face, abdomen, heart and extremities are very limited and non-diagnostic. No colour Doppler views have been obtained of the fetal heart.

The lower margin of the placenta cannot be ascertained on these images and low lying placenta/placenta previa cannot be excluded.

The recommendations for standard imaging within the national guidelines do not appear to have been adhered to.

There is an abnormal elongated fluid structure suspicious for bowel in the fetal thorax. The right hemi-diaphragm has not been imaged. Appearances are highly concerning for a congenital diaphragmatic hernia (CDH).

The presence of associated choroid plexus cysts raises the possibility of a chromosomal abnormality in this fetus.

Head and abdominal measurements are above the 90th centile.

Ideally, tertiary or Fetal Medicine referral should have been advised, and a follow up scan to complete anatomy should have been arranged.

#### 4. 21 weeks 5 days

I cannot see a referral form for this examination, presumably this reflects a follow up scan for completion of fetal anatomy arranged by the sonographer.

Images annotated Fetal Echo [Mr C's first name] (presumably [this] is the sonographer)

#### **IMAGE INTERPRETATION:**

1. midline sagittal view of lower uterus/placenta not clearly shown on this image
2. labelled placenta lower margin not visible on this image and plane of image is not labelled so I cannot ascertain if the placenta is right sided or fundal
3. BPD measured 57 mm (> 98th centile) not assessed in the correct plane (cerebral ventricle included on the image)
4. HC incorrect plane as above 207 mm, > 98th centile
5. AC measured either in incorrect plane (should be at level of portal sinus and stomach but stomach not seen on this view), or stomach is not present within the fetal abdomen. Measures 187 mm, 93rd centile.
6. Femur length measured blurry image likely due to fetal movement, so the endpoints for appropriate measurement are not clear. Measures 37 mm, 63rd centile
7. Labelled aortic arch greyscale, sagittal, spine up — this structure is poorly/incompletely visualised
8. Aortic arch with colour Doppler, sagittal, spine up, appears normal
9. Ductal arch greyscale spine down, not well magnified, grossly normal
10. Ductal arch with colour Doppler sagittal, spine down, poorly magnified grossly normal
11. Ductal arch with colour Doppler sagittal, spine down, grossly normal
12. Not labelled sagittal view of ductal arch and descending aorta with colour Doppler grossly normal
13. not labelled coronal fetal nose and upper lip appears normal. On the left of the image there is part of a cross section of the fetus which may be the thorax

showing fluid structures if thoracic this is abnormal (suggestive of intrathoracic stomach or bowel). This has not been imaged further.

14. Screen shot showing fetal biometry.

#### **SUMMARY:**

This study has been labelled as Fetal Echo but none of the basic cardiac anatomy has not been imaged as per the New Zealand guidelines, see below.\*

Sagittal views of the ductal and aortic arches only have been imaged and appear grossly normal. The diaphragm has not been imaged.

The lower margin of the placenta again cannot be ascertained.

#### **\* STANDARD CARDIAC VIEWS:**

- Situs, cardiac axis, position and size
- 4Ch heart and transverse view of the interventricular septum
- Outflow tracts: left/right ventricular outflow tract (LVOT and RVOT respectively)
- Three vessel and trachea (3VT) view/arrow view
- Assess fetal heart rate and rhythm (Note: Document M-mode if there is an abnormality of the heart rate or rhythm.)
- An axial sweep cine from stomach to outflow tracts is extremely helpful for offline review and when referring a suspected anomaly.

Include both colour and non-colour imaging on all heart views

#### **5. GROWTH SCAN, 36 WEEKS 2 DAYS**

##### **CLINICAL DETAILS:**

? LGA. SFH not equal to dates. Growth, liquor and Dopplers please.

1. Midline sagittal showing fetal head (cephalic presentation). Lower margin of placenta not clearly shown (possibly anterior and not low).
2. BPD measured 93 mm, 79th centile.
3. HC measured 330 mm, 83rd centile under-measured
4. M-mode of fetal heart — rate 126 bpm. Image shows a large abnormal fluid structure adjacent to the heart.
5. Labelled chest sagittal image — shows two large abnormal fluid structures in the fetal chest, in keeping with intrathoracic stomach or bowel
6. Labelled chest transverse image with heart partially included, showing two large fluid structures in the thorax. Heart appears displaced.
7. Labelled chest transverse image, slightly different plane to above, partially imaging two fluid structures in the fetal chest
8. Labelled Chest 3VV same image as above.
9. Labelled Chest HRT Left similar image to 6. Heart displaced, presumably to the left as per the label.

10. Labelled Chest HRT Left oblique transverse plane, heart on far-side of thorax, presumably left-sided as per the label. One rounded fluid structure anteriorly. The rest of the image is obscured by shadowing.
11. Labelled Chest HRT Left oblique transverse view — similar to 10 but less shadowing. Probably further elongated fluid structure in the chest.
12. Hand-drawn AC measurement (technically not optimal) stomach appears to be in the abdomen. AC measures 359 mm, 96th centile.
13. AC measured using ellipse tool slightly under-measured, 348 mm, 88th centile.
14. not labelled appears to be transverse fetal chest with heart displaced and intra-thoracic fluid structure, in keeping with bowel.
15. not labelled — sagittal chest. Shows heart displaced anteriorly and intra-thoracic fluid structure, in keeping with bowel. Diaphragm not seen.
16. not labelled sagittal chest. Heart displaced anteriorly. Large fluid structures suggestive of loop/s of probable bowel in the thorax. Liver edge evident. No obvious right diaphragm.
17. not labelled sagittal chest. Partially obscured by shadowing. Findings as per 16.
18. not labelled sagittal chest and upper abdomen. Fluid structures in fetal chest. Diaphragm not seen.
19. Femur length 70 mm, 52nd centile.
20. Labelled bladder, part of one kidney in plane (not standard view), grossly normal
21. Labelled kidneys transverse plane, partially obscured by + annotated over each, presumed bladder partially included
22. not labelled. Pocket (presumably deepest) of amniotic fluid measured, 47.8 mm, normal.
23. Labelled placenta posterior, lower margin not shown
24. Labelled placenta as above
25. Placenta as above
26. Placenta as above
27. Doppler appears to be umbilical no amniotic fluid evident in the image. PI = 1.16. No graph provided, upper limits of normal range.
28. Doppler appears to be umbilical no amniotic fluid evident in the image. PI = 1.14. No graph provided, upper limits of normal range.
29. Screenshot of biometry, EFW 3322g (+/- 485g), 61st centile.
30. Transverse view of chest, labelled CHEST. Heart (labelled HRT) displaced anteriorly and to the left. Two large cystic thoracic structures, measuring 31 and 30 mm in transverse dimension. It is not clear if they join as this has not been imaged, and there are no cine clips.
31. Sagittal chest, labelled CHEST. Fluid-filled intrathoracic structure, elongated appearance measured at 32.7 x 46.6 mm. There is a smaller fluid-filled structure posterior to this which has not been measured.

NEW ZEALAND NATIONAL GUIDELINES recommend that the following are imaged for the first scan in the third trimester:

- cerebral ventricle/choroid plexus measure if abnormal
- 4Ch heart, including IVS (+ colour)
- 3VT/arrow view (+ colour)
- both kidneys (measure AP pelvis in trans if dilated)
- bladder
- stomach
- lips/nose.

**SUMMARY:**

1. Large intra-thoracic fluid filled structures displacing the fetal heart anteriorly and to the left. It is unclear from the imaging whether these are joined, which would suggest that they represent bowel. If separate cystic structures, they might reflect lung cysts. The right diaphragm has not been imaged.
2. Some of the recommended anatomy as per the national guidelines has not been imaged (cerebral ventricle, 4 chamber heart, 3VT/arrow view of cardiac outflow tracts).
3. The lower margin of the placenta has not been clearly demonstrated.

**CONCLUSIONS:**

1. Imaging from the nuchal translucency, anatomy, presumed follow up anatomy and growth scans are all suboptimal, and do not conform to standard imaging and recommendations from the national guidelines (New Zealand Obstetric Ultrasound Guidelines, 2019).
2. The fetal heart has not been adequately assessed on any of these scans.
3. The lower margin of the placenta has not been imaged and a low lying placenta/placenta previa cannot be excluded.
4. Appearances are in keeping with a significant structural abnormality most in keeping with a right congenital diaphragmatic hernia. Although the third trimester imaging has not clearly shown a connection between the fluid filled structures in the fetal thorax in keeping with bowel, appearances at the anatomy scan were highly suggestive of bowel. The heart is significantly displaced. The differential diagnosis includes a pulmonary cystic abnormality such as a CPAM (congenital pulmonary airway malformation).  
Fetal Medicine or tertiary referral would have been appropriate at the time of the anatomy scan when these findings were evident.
5. The presence of choroid plexus cysts at the anatomy scan raises the possibility of chromosomal abnormality.

Dr Rachael McEwing FRANZCR, Radiologist  
Pacific Radiology



**REVIEW — ULTRASOUND PREGNANCY — CASE 2****1. Dating scan****CLINICAL DETAILS:**

Nuchal scan LMP [date]

Dated: ... (from GP).

Nuchal translucency Assessment (between 12 wks to 13.6 wks) Code NT

Dated: ... (from LMC).

**SCAN INTERPRETATION:**

9 images.

Scan duration: 8 minutes from image timestamps.

Anteverted uterus, containing an early dichorionic diamniotic twin pregnancy.

Twin A (labelled Fetus A inf): Crown-rump length (CRL) = 24 mm, corresponding to 9 weeks 1 day (+/- 4 days).

Yolk sac labelled.

Placenta developing anteriorly.

Twin B (labelled Fetus B sup): Crown-rump length (CRL) = 23 mm, corresponding to 9 weeks 0 days (+/- 4 days).

Yolk sac labelled.

Placenta developing posteriorly.

Both ovaries labelled but not clearly seen on the images.

EDD (using CRL for largest twin, A) = [EDD].

Cardiac activity has not been documented.

**SUMMARY:**

Technically adequate images showing a dichorionic, diamniotic twin pregnancy of around 9 weeks 1 day

(+/- 4 days), too early for nuchal translucency assessment.

Cardiac activity has not been documented on the images.

**2. Nuchal translucency scan, 12 weeks 0 days****CLINICAL DETAILS:**

Nuchal translucency Assessment (between 12 wks to 13.6 wks) Code NT

First scan completed [date] with dates thinking that woman was 12 weeks but twin pregnancy

discovered and new gestation of 9.1.

Dated: ... (from LMC).

**SCAN INTERPRETATION:**

25 images.

Scan duration 10 minutes from image timestamps.

Images show a twin pregnancy with twin **A** lower twin, and twin **B** upper twin. Thick intertwin membrane and lambda sign are in keeping with dichorionic, diamniotic twin pregnancy.

Fetus **A** (labelled inf):

Four images of nuchal translucency measuring between 1.3 and 1.6 mm \X2013\ all technically suboptimal, not magnified appropriately, not midline sagittal. I cannot be sure that the measurement reflects the **NT** accurately as the amnion has not been shown separate to the NT.

One measurement of crown-rump length (CRL)\X2013\possibly slightly over-measured as the caliper is outside the fetal head.

CRL measured as 60 mm, consistent with a gestational age (GA) of 12 weeks 2 days (+/- 7 days).

Limited imaging showing limbs (unclear if these are upper or lower limbs), choroid plexus (skull incompletely seen), technically suboptimal BPD measurement not in appropriate plane), cardiac activity (heart rate 154 bpm), legs.

Placenta labeled (poorly seen on the single image), appears to be located anteriorly.

Fetus **B** (labelled sup):

Three images of nuchal translucency measuring between 1.4 and 1.5 mm\X2013\all technically suboptimal, not magnified appropriately, not quite midline sagittal. The first image shows the amnion separately.

CRL measured as 57 mm, 12 weeks 0 days\X2013\slightly suboptimal image as the upper head where the caliper is placed is not well seen.

Limited views obtained of upper spine, limbs, choroid plexuses, technically suboptimal BPD with incorrect caliper placement and suboptimal plane for measurement.

The placenta is developing posteriorly.

Fetal heart rate measured on M-mode imaging, 151 bpm.

Fetal anatomy imaging for both twins is incomplete. CRL and NT measurements for both twins are suboptimal.

See below, recommendations from the New Zealand Obstetric Ultrasound Guidelines (2019) at the 12 week scan:

Assessment of fetal anatomy is the major component of the 12+ week scan. The following routine fetal anatomy should be assessed as a minimum at the time of the NT scan.

- Skull and brain
- Stomach
- Bladder

- Spine
- Four limbs (document two arms, two legs, two hands and two feet)
- Cord insertion
- Three-vessel cord
- Four-chamber (4Ch) heart (if possible).

Other structures that may be examined, if possible, include:

- situs
- diaphragm
- posterior fossa
- kidneys
- orbits/lenses
- three-vessel view/cardiac outflow tracts
- facial triangle.

<https://www.tewhatauora.govt.nz/publications/new-zealand-obstetric-ultrasound-guidelines/>

### 3. Anatomy scan, 20 weeks 1 day

#### **CLINICAL DETAILS:**

Referral form not available.

#### **SCAN INTERPRETATION:**

81 images

Scan duration: 34 minutes from image timestamps.

#### **Fetus A 1X20131 labelled left**

Placenta anterior\X2013\lower margin not demonstrated

BPD (suboptimal plane for measurement): 46 mm

HC (suboptimal plane for measurement): 170 mm

AC (slightly suboptimal plane): 158 mm\X2013\there are some anechoic branching structures Posterior to the portal sinus on this image, incompletely assessed and uncertain aetiology FL: 32 mm

Fetal anatomy imaged:

Lateral cerebral ventricle

Cerebellum (nuchal fold not measured which normally would be in this plane)

One orbit and lens

Top lip/mouth coronal (nose incompletely imaged)

Profile\X2013\suboptimal (flexed position, chin not seen well)

Spine\X2013\coronal upper cervical and sacrum, poor sagittal view (skinline not seen)

Kidneys labelled\X2013\poorly visualised, appear echogenic (bright)

Stomach

Diaphragm kX2013\partially imaged, semi-coronal plane  
Abdominal cord insertion  
2 umbilical arteries\X2013\bladder not shown on this image  
Placental cord insertion\X2013\grossly normal\X2013\fetus close to it so difficult visualisation  
Colour Doppler abdominal image V2013\not labelled\X2013\presumably showing 2 renal arteries

#### Cardiac views

- 4Ch labelled\X2013\suboptimal assessment as apex is down, greyscale only
- IVS grossly normal\X2013\greyscale only
- RVOT\X2013\greyscale only
- arrow view\X2013\greyscale only
- 3VV greyscale only

Left leg V2013\femur, tibia and fibula, foot (sole)

Right arm\X2013\humerus, one forearm bone

Left arm\X2013\one forearm bone, part of hand

#### **Fetus B 1X20131 labelled right**

Placenta\X2013\posterior\X2013\lower margin not clear

BPD: 44 mm 5th centile

HC: 171 mm

AC: 153 mm

FL 32 mm

#### Fetal anatomy imaged:

Lateral ventricle

Cerebellum and cisternal magna.

Nuchal fold not measured.

One orbit and lens

Lips (nose incompletely imaged)\X2013\coronal

Profile

Upper cervical spine\X2013\coronal

Sacrum\X2013\coronal

Lower spine and skinline

Kidneys\X2013\label obscures one of the kidneys

Renal arteries

Bladder

Diaphragm\X2013\incomplete

Abdominal cord insertion

2 umbilical arteries

Placental cord insertion\X2013\difficult to interpret this image\X2013\possibly marginal cord insertion

Cardiac:

- 4 Ch\X2013\suboptimal apex down plane, greyscale only
  - IVS 9(2013\greyscale only
  - RVOT\X2013\greyscale only
  - 3VV 9(2013\greyscale only
  - arrow\X2013\suboptimal, can't see all the structures, greyscale only
  - LVOT 9(2013\greyscale only
- Legs\X2013\right tibia and fibula; left one lower leg bone  
Feet\X2013\one incompletely imaged  
Hands\X2013\partially imaged.

Biometry pages:

Twin A\X2013\EFW 59th centile

Twin B\X2013\EFW 46th centile

Assessment of fetal anatomy is limited, not complying with the national guidelines.

NEW ZEALAND OBSTETRIC ULTRASOUND GUIDELINES FOR FETAL ANATOMY ASSESSMENT:

At a minimum, the following need to be assessed.

Extended views, if achievable, are in italics and marked with \*. Note: Failure to visualise these is not an isolated reason to recall for further imaging if the remaining anatomy is well visualised and normal.

Head:

- Nuchal fold measurement (measure in the plane of the cavum septum pellucidum (CSP), normal is \X2264\6\XA0\mm)
- Cerebral ventricles (measure lateral ventricle at atrium, normal 9(2264\10\XA0\mm)
- Choroid plexus
- CSP and falx
- Cerebellum/vermis
- Cisterna magna (normal \X2264\109(A0\mnn)
- Calvarium
- Sagittal corpus collosum\*
- \*Sagittal vermis\*.

Face

- Orbits + lenses
- Nose/lips (coronal)
- Profile showing nasal bone and mandible

- Alveolar ridge
- Uvula/soft palate

#### Abdomen

- Stomach (situs)
- Kidneys in two planes (transverse and longitudinal/coronal images (measure AP pelvis if Renal dilatation is suspected)
- Bladder
- Diaphragm (right and left sides, and document organs in relation to the diaphragm)
- Anterior abdominal wall and cord insertion
- Bowel.

#### Heart

- Situs, cardiac axis, position and size
- 4Ch heart and transverse view of the interventricular septum
- Outflow tracts: left/right ventricular outflow tract (LVOT and RVOT respectively)
- Three vessel and trachea (3VT) view/arrow view
- Assess fetal heart rate and rhythm (Note: Document M-mode if there is an abnormality of the heart rate or rhythm.)
- An axial sweep cine from stomach to outflow tracts is extremely helpful for offline review and when referring a suspected anomaly.

Include both colour and non-colour imaging on all heart views.

The following extended cardiac views should be considered in case of suspected anomaly, if the operator is experienced in cardiac assessment.

- Ductal arch and aortic arch\*
- Superior/inferior vena cava\* (SVC/IVC respectively)
- Pulmonary veins\*
- Foramen ovale\*
- Pulmonary arteries\*
- Thymus\*
- Atrioventricular (AV) valves\*
- Ductus venosus\*
- Abdominal aorta and IVC\* (for determination of situs).

If cardiac anomaly is suspected, prompt referral for fetal echocardiography is required.

#### Spine

Assess in three planes (sagittal, coronal and transverse, including skin line and sacrum). Two planes may be acceptable in suboptimal fetal position, but visualisation must be excellent.

### Umbilical cord

- Cord insertion: both fetal and placental  
\XB7\Three-vessel cord.

### Extremities

- Document all long bones
- Arms (upper arm and forearm)
- Hands observed open/parallel digits
- Fingers counted
- Legs (upper leg and lower leg)
- Feet/ankles.

### **SUMMARY:**

Suboptimal visualisation of the brain, extremities, kidneys and heart in both twins. The kidneys for twin A appear echogenic in the single limited view provided. The bladder has not been imaged. Cardiac assessment is inadequate for both twins, with the heart apex down to both twins and no colour Doppler views obtained in either twin.

The lower margin of the placenta cannot be ascertained on these images.

The national guidelines do not appear to have been followed.

There is an unusual appearance on the AC view for twin A with possible anechoic branching structures visualised, which have not been further imaged. The kidneys for twin A appear echogenic but have not been well assessed. There is no image of the bladder for twin A.

### 4. Growth scan, 24 weeks 1 day

#### **CLINICAL DETAILS:**

DCDA twins  
Growth 24+  
Dated ...

#### **SCAN INTERPRETATION:**

24 images  
Scan duration 20 minutes from image timestamps.

#### **Fetus A 1X131 labelled left**

Placenta anterior, appears clear of the cervix

BPD: 54 mm, < 2%

HC: 208 mm, 9%

AC (suboptimal measurement \X13\ partially obscured): 202, 48%

**FL:** 41 mm, < 2%



Amniotic fluid pocket 5.5 cm  
Umbilical artery Doppler PI = 1.0, normal range

**Anatomy:**

Stomach \X13\incompletely imaged, appears small  
Bladder \X13\labelled but not clearly seen on the image  
3VV \X13\greyscale only  
4Ch \X13\apex down, greyscale only

**Fetus B 1)(13\ labelled right**

BPD V13\incorrect plane: 57 mm, 12%  
HC \X13\incorrect plane: 217 mm, 32%  
AC: 208 mm, 71%  
FL: 43 mm, 12%

Amniotic fluid pocket\X13\7.9 cm (slightly increased)  
Umbilical artery Doppler PI = 1.29, within normal limits  
Placenta\X13\only small part imaged. Appears posterofundal.  
Cord insertion\X13\marginal/velamentous

**Anatomy:**

Bladder labelled V13\not definitely imaged  
Stomach\X13\incompletely imaged  
Heart\X13\apex down, greyscale only

**Biometry page:**

Twin A EFW 32nd centile  
Twin B EFW 64th centile

Assessment of fetal anatomy is incomplete and does not adhere to the national guidelines.

NEW ZEALAND NATIONAL GUIDELINES recommend that the following are imaged for the first scan in the third trimester:

- cerebral ventricle/choroid plexus\X13\measure if abnormal
- 4Ch heart, including IVS (+ colour)
- 3VT/arrow view (+ colour)
- both kidneys (measure AP pelvis in trans if dilated)
- bladder
- stomach
- lips/nose.

**Summary:**

Twin A is smaller than twin B, with BPD and FL < 2nd centile.

Fetal anatomy assessment is very limited and is suboptimal. The kidneys have not been imaged on either twins. The bladder has been labelled as present on both twins, but is not clearly demonstrated for either twin.

Amniotic fluid appears to be slightly increased for twin B on the single image provided.

#### 5. Growth scan, 28 weeks 1 day

##### **CLINICAL DETAILS:**

DCDA twins

Growth 28+

Dated ... (? Error in date)

##### **SCAN INTERPRETATION:**

25 images

Scan duration 19 minutes (from image timestamps)

##### **Fetus A 1X131 labelled left**

BPD (measured in incorrect plane): 66 mm, < 2%

HC (measured in incorrect plane): 238 mm, < 2%

AC (suboptimal measurement as the abdominal wall is not well shown): 231 mm, 14%

FL: 49mm, <2%

Placenta\X13\anterior\X13\lower margin not shown

Amniotic fluid pocket\X13\poorly seen as shadowing from fetal parts\X13\not clear if this actually reflects the amniotic fluid or not. Measured as 3.88 cm.

Umbilical artery Doppler: PI = 1.22, probably just below the 95th centile

Anatomy:

Bladder labelled\X13\not clearly demonstrated

Stomach

4Ch\X13\greyscale only

##### **Fetus B — labelled right**

BPD — slightly suboptimal image: 69 mm, 4 %

HC — slightly suboptimal image: 259 mm, 32%

AC\X13 suboptimal plane\X13\stomach not included: 247 mm, 58%

FL: 52 mm, 15%

Amniotic fluid\X13\pocket measured at 6.08 cm

Umbilical artery Doppler PI = 1.51, 1.27 and 1.11 (first 2 measurements are abnormal, above the 95th centile, third measurement is within normal limits)

Anatomy:

Bladder

Stomach

Kidneys (transverse)

4Ch\X13\apex down, greyscale only  
3v\X13\greyscale only

Biometry report page:

Twin A: EFW 7th centile

Twin B: EFW 46th centile

Twin A is globally smaller than twin B, with head and femur measurements below the 2nd centile.

EFW for twin A is 7th centile.

**Summary:**

Assessment of fetal anatomy is incomplete at all gestations (see national recommendations above). Twin A is small for gestational age. Obstetric review and further serial growth surveillance should have been recommended at this stage.

**CONCLUSION:**

Assessment of fetal anatomy at every scan in this dichorionic twin pregnancy is incomplete.

In particular, the hearts have not been appropriately assessed in either twin and cardiac anomaly is not excluded.

Colour Doppler has not been used on any of the cardiac imaging. The hearts for both twins were apex down for most scans.

The bladder for twin A has not been shown on any scans despite being labelled as present.

The kidneys for twin A appeared echogenic on the anatomy scan, and have not been imaged on subsequent scans.

A renal anomaly for twin A is not excluded.

Amniotic fluid assessment for twin A on the 28 week growth scan is not clear (obscured by the fetus) and may not reflect a pocket of fluid.

The imaging at all scans is of shorter duration than I would expect, particularly for a twin pregnancy.

I would have expected that a follow up anatomy scan was performed to complete fetal anatomy inadequately assessed at 20 weeks.

Obstetric review should have been recommended at 28 weeks for small for gestational age twin A.

Dr Rachael McEwing FRANZCR, Radiologist  
Pacific Radiology'