Southern District Health Board
(now Te Whatu Ora|Health New Zealand)
Radiologist, Dr B

A Report by the

Health and Disability Commissioner

(Case 20HDC00404)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Contents

Executive summary

1. This report concerns the radiology reporting of a CT scan to investigate a liver mass. The radiologist who reported the scan concluded that the mass was benign (non-cancerous) and recommended a follow-up scan in 12 months' time. The follow-up scan showed cancer, which had spread to other parts of the man's body.

2. The report highlights the importance of following the correct CT protocol (the type of CT examination that will best suit the clinical question and the patient's presentation), and of conducting further investigations when imaging is inadequate. The report also highlights the significance of correct interpretation of scans in order to reach a correct diagnosis or differential diagnosis.

3. The Commissioner found that the radiologist did not provide services with reasonable care and skill, in that he did not correct the incomplete CT protocol when he became aware that the imaging was inadequate and non-compliant with the expected standard for liver imaging; did not take any further action to validate his subsequent diagnosis, either by further imaging or referral for biopsy when he was aware that the imaging was suboptimal; and did not interpret the CT scan results adequately, and subsequently misdiagnosed a malignancy as a benign haemangioma. These significant failings meant that a further scan was not undertaken until 12 months later, which resulted in an unacceptable delay in the diagnosis of cancer. The Commissioner found the radiologist in breach of Right 4(1) of the Code.

4. The Commissioner considered that the failure to read and interpret the CT scan correctly was an individual error that did not indicate broader systems or organisational issues at the district health board (now Te Whatu Ora|Health New Zealand). The Commissioner found that the district health board did not breach the Code but identified a number of areas for improvement.

5. The Commissioner recommended that the radiologist provide a written apology to the man's family. The Commissioner noted that as a result of this case, the radiologist completed a six-month recertification programme with the Medical Council of New Zealand. In light of the changes already made, the Commissioner made no further recommendations in relation to the radiologist's practice and competence.

6. The Commissioner recommended that Te Whatu Ora remind radiologists of the importance of undertaking double readings or getting a second opinion on complex or difficult cases; consider whether any further training could be developed to ensure that radiographers are diligent in reviewing the indications for a CT scan and checking the correctness and appropriateness of the protocol with the supervising radiologist; advise HDC of the implementation of one of the recommendations identified in its Adverse Event Review report; and use an anonymised version of this report as a case study to educate staff.

Names have been removed (except Te Whatu Ora Southern, Southland Hospital and the independent advisor) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

Complaint and investigation

7. The Health and Disability Commissioner (HDC) received a complaint from Mrs A about the services provided to her late husband, Mr A, by Southern District Health Board (SDHB) (now Te Whatu Ora|Health New Zealand Southern[1]) and radiologist Dr B. The following issues were identified for investigation:

- *Whether Southern District Health Board provided Mr A with an appropriate standard of care in January 2018.*
- *Whether Dr B provided Mr A with an appropriate standard of care in January 2018.*

8. The parties directly involved in the investigation were:

Mrs A	Complainant
Southern District Health Board	Provider/DHB
Dr B	Provider/radiologist

9. Further information was received from:

Medical centre	
Dr C	General practitioner (GP)
Dr D	Consultant radiologist

10. Independent advice was obtained from a radiologist, Dr Remy Lim (Appendix A).

11. Mr A died from his illness. I extend my sincere condolences to Mr A's family for their loss.

Information gathered during investigation

Introduction

12. On 20 November 2017, Mr A (in his seventies at the time) underwent an abdominal ultrasound scan[2] at Southland Hospital (SDHB) to investigate pain on the right-hand side of his abdomen.[3] The scan was ordered by Mr A's GP, Dr C, and showed a mass in the left lobe of the liver. It was recommended that Mr A undergo a CT scan on 9 January 2018. Radiologist Dr B[4] reported that the CT scan showed that the mass was not cancerous (that is, it was benign).

[1] On 1 July 2022, the Pae Ora (Healthy Futures) Act 2022 came into force, which disestablished all district health boards. Their functions and liabilities were merged into Te Whatu Ora|Health New Zealand. All references in this report to SDHB now refer to Te Whatu Ora Southern.
[2] A scan combining X-ray images to create cross-sectional images.
[3] Right iliac fossa pain.
[4] Dr B is a vocationally registered radiologist who was employed by SDHB at the time of these events.

13. Subsequently, Mr A underwent a follow-up CT scan on 22 January 2019, and was diagnosed with cancer that had spread to other parts of the body.[5] This report concerns the failure to diagnose the mass as cancer following the CT scan in January 2018.

14. It is of note that Dr B no longer works in Te Whatu Ora Southern or Southland Hospital.

Ultrasound scan — 20 November 2017

15. The findings of the ultrasound scan of 20 November 2017 were reported as follows:

> "Findings: In the left lobe of the liver there is a 29 x 27 x 29 hypoechoic[6] mass with internal blood flow. This is of unknown significance and further investigation is recommended. Referral to the Medical Department of our Hospital might be considered. The remainder of the upper abdomen and the RIF[7] appear unremarkable …"

16. The reporting radiologist recommended further investigation of the mass, and that Mr A be referred to the General Medicine Department. Dr C made a semi-urgent referral to SDHB's General Medicine Department on 13 December 2017 for a follow-up ultrasound scan. The referral stated that Mr A was feeling well and maintaining steady weight, and had normal bowel and bladder function, no shortness of breath, and a good appetite.

17. Mr A's referral was triaged by an internal medicine specialist, who wrote to Dr C on 14 December 2017 stating:

> "This newly detected liver lesion could potentially be malignant, given the blood flow seen within it on ultrasound. It could also be a haemangioma.[8] I agree with you that it requires further investigation. I will organise a contrasted CT[9] of the liver, and send [Mr A] a form for liver function tests, iron studies, an alpha fetoprotein,[10] and viral hepatitis[11] serologies."

18. The internal medicine specialist advised Dr C that he would be forwarding Mr A's referral to the Gastroenterology Department, but that he would be happy to see Mr A instead if that was preferred.

[5] The cancer had metastasised.
[6] Tissue in the body that is more dense or solid than usual. The term is used to describe what is seen on an ultrasound scan.
[7] Right iliac fossa.
[8] Usually a benign tumor.
[9] Computed tomography scan, combining X-ray images to create cross-sectional images.
[10] A test to measure the alpha-fetoprotein in the blood, to monitor liver disease and test for certain types of cancer.
[11] An inflammation of the liver caused by an infection.

CT scan — 9 January 2018

19. Mr A underwent an abdominal and pelvic computed tomography (CT) scan at SDHB, performed by radiologist Dr B.

20. The clinical details on the referral form stated: "Liver lesion in the left lobe with internal blood flow seen on ultrasound. CT scan for further evaluation and characterising the lesion."

21. On the day in question, Dr B was the radiologist who prioritised the day's scans and selected the CT protocol for each patient. Usually, the protocol is determined by another radiologist, but the radiologist was on sabbatical leave at the time, and therefore Dr B was undertaking the task.

22. Dr B told HDC that he assigned the CT scan as a four-phase protocol, which was the standard protocol used for liver imaging.

23. A CT protocol is a set of parameters that specify a specific examination. That is, it specifies the type of CT examination that will best suit the clinical question and patient presentation (including characterisation of any liver lesion). Dr B advised that he gave the protocol to the radiographer verbally but did not document it. In response to the provisional opinion, Dr B advised that the radiographer came to him prior to the scan and asked if he wanted a "single phase (abdomen and pelvis)" protocol. Dr B advised that he told the radiographer that he wanted the standard CT liver protocol (four phase). Dr B said that he did not document the requested protocol, as the standard practice at the time was to document the protocol required only if it was different from the standard protocol.

24. Radiographers are health professionals who take medical images to assist clinicians in diagnosing diseases and injuries, while radiologists are specialist medical doctors trained to interpret medical imaging tests. Dr B told HDC that as the radiologist, he was responsible for assigning the protocol for the scan, and that the radiographer sets the protocol on the CT machine before performing the scan.

25. Dr B said that on 9 January 2018, initially the scan was performed on a portal-venous phase[12] (and later a delay phase,[13] as discussed below), because the incorrect protocol was applied to the machine during the scan. Dr B told HDC that the scan was set incorrectly on the machine (presumably by the performing radiographer, who used a portal-venous phase only). This is only one phase of the four-phase liver protocol. Dr B told HDC:

[12] In this phase, the portal vein (main vessel in the portal venous system that drains blood from the gastrointestinal (GI) tract and spleen to the liver) and hepatic veins (blood vessels that return low-oxygen blood from the liver back to the heart) are completely enhanced. This phase offers the best liver enhancement for the detection of hypovascular liver lesions (abnormal growths on the liver), liver metastases (cancerous tumours that have spread to the liver from another part of the body), and liver abscesses.

[13] In a delay phase, the contrast is still in the arteries and has not enhanced the organs and other soft tissues.

> "My regular and standard liver protocol for CT scans in normal daily work includes non-enhance liver, arterial liver phase, portal venous phase, and a delay phase for all liver cases which is also considered the gold standard."

26. Conversely, Dr B's colleague, Dr D told HDC:

> "[Dr B] prioritised the request form and did not suggest that he wanted anything but a standard CT protocol to the Radiographers so this was what was performed. The Radiographers must have brought the liver lesion to his attention and that was when the delayed scan was also performed. I cannot explain why [Dr B] did not suggest a CT liver protocol given that the request form specified this. I also cannot explain why, given the appearance, the patient was not rescanned with the appropriate protocol."

27. Dr B told HDC that there is no evidential basis for Dr D's comments. He said that Dr D was not involved in the matters about which Dr D has provided information, and so Dr D can be reporting only second hand.

28. SDHB provided HDC with a copy of the internal request form referred to by Dr D above, which states: "Exam requested: CT liver w/contrast." The handwritten radiology comments state: "CT [abdomen, pelvis]." Dr B told HDC that he did not write the comments on the form and clarified that he did not ask the radiographer to undertake only a single phase.

29. Dr D told HDC that the Radiology Department has a standard liver scan protocol that was well established and in place in 2018.

30. SDHB provided HDC with its "CT's Liver Protocol" (outlined below). SDHB said: "Medical imaging technologists [radiographers] use this protocol when an examination is protocoled as requiring it by the supervising radiologist."

Liver	• C- upper • Art upper • PV abdomen/pelvis • Delayed upper – 5 minutes

31. SDHB also told HDC that if anything other than the "routine-portal-venous-abdo" (the standard CT protocol) was required, the radiologist would note which phases were to be scanned, regardless of what the referrer had asked for.

32. Dr B said that the radiographer asked him to review the case while Mr A was still on the machine table. Dr B stated that he reviewed the images at the time of the scan and realised that there was not enough imaging to make a diagnosis with the portal-venous phase alone. He advised that he then asked the radiographer to add a delay phase to the scan with a view to characterising the lesion further.

33. Once the delay phase was complete, Dr B read and reported the scan. The findings of the scan were reported as follows:

> "Single large liver lesion with peripheral enhancement and centripetal fill-in[14] on the delayed phase suggestive of most likely [a] large liver haemangioma. Subsequent ultrasound/CT scan follow-up is recommended in 12 months time."

34. A liver haemangioma is a benign (non-cancerous) tumour in the liver that is made up of clusters of blood-filled cavities. Dr B provided his clinical rationale for why he concluded that the tumour was a benign liver haemangioma:

> "1. It was a single liver lesion with no sign of invasion or other lesion, that had peripheral enhancement and subtle central filling on the delay phase (this could represent a giant liver haemangioma, intrahepatic cholangiocarcinoma or metastatic disease).
>
> 2. The subtle filling in on the delay phase was misleading me to the wrong diagnosis. It was a mistake and very wrong decision to add a delay phase in this type [of] study, the delay phase likely deceived me to [the] wrong diagnosis by thinking of the liver haemangioma.
>
> 3. Normal liver function tests and alpha fetoprotein on blood tests.
>
> 4. No enlarged lymph nodes, no dilated bile ducts proximal to the lesion, no invasion with almost well-defined appearance on axial CT scan. This was more favoured [to] a benign entity. No primary lesion in the stomach, pancreas, large bowel, rectum or elsewhere in the abdomen and pelvis to suggest metastatic lesion."

35. Having diagnosed the lesion as a "giant liver haemangioma with atypical features", Dr B recommended a follow-up scan in 12 months' time, which is typical for a benign lesion. Dr B told HDC:

> "Due to my diagnosis of this lesion as a giant liver hemangioma with atypical features, I therefore recommended follow up of 12 months for this lesion. The recommendation for follow-up [of] a liver haemangioma with no risk of liver malignancy can range from center to center from 6 to 12 months. 12 months is an acceptable follow up period for a benign lesion."

36. However, Dr B appreciates that in hindsight:

> "I should have repeated the CT scan to accord with my standard practice or sought a second opinion, tissue diagnosis or MRI of [the] liver. I regret that I did not do so at the time and I cannot recall or explain why I did not do so."

[14] Portal venous phase.

37. A follow-up letter from SDHB was sent to Dr C from a gastroenterologist on 11 January 2018, stating:

> "The CT abdomen was performed yesterday and shows a 3.8 cm lesion consistent with a haemangioma. This is a benign lesion and requires no treatment … I suggest you arrange an ultrasound in 12 months' time to ensure there has been no interval change. [Mr A] does not need to be seen in the gastroenterology clinic."

CT scan — 22 January 2019

38. On 22 January 2019, as per the one-year follow-up recommendation, Mr A underwent a further liver, abdomen, and pelvis CT scan at SDHB. The clinical details stated: "Haemangioma in left lobe of liver, 1 year follow up."

39. The results of the CT scan showed possible cancer that had started in the liver.[15] The findings were reported on 22 January 2019, and stated:

> "Marked progression of disease in the upper abdomen since the 2018 study. Findings are now consistent with very extensive hepatic infiltration with probable extracapsular spread[16] to involve the gastric fundus,[17] with evidence of portal venous invasion and with significant intra-abdominal lymph node enlargement. These findings may reflect primary hepatic malignancy rather than metastatic disease."

40. Dr B told HDC that after noting the results of the 22 January 2019 scan, he reviewed the 9 January 2018 scan focusing on the portal venous phase only. He stated:

> "I realised that the lesion could represent more than one differential diagnosis with more non-benign entities included in the differential diagnosis and that I should have diagnosed metastatic disease, a primary liver lesion and sclerosing haemangioma."

41. A general medicine consultant from SDHB conveyed this information to Mr A on 25 January 2019.

Diagnosis of liver cancer[18]

42. On 30 January 2019, Mr A underwent a chest CT scan to determine the stage of the cancer.[19] The scan showed lung lesions[20] suspicious of metastases (spread of the cancer). An

[15] Primary hepatic malignancy.
[16] Extension of the tumour outside the lymph node capsule.
[17] The part of the stomach that lies above the cardiac notch (a concave impression moulded into the left lung to accommodate the shape of the heart).
[18] Hepatocellular carcinoma.
[19] A staging chest CT scan.
[20] Areas of abnormal tissue.

ultrasound-guided liver biopsy was conducted on 31 January 2019, and reported a finding of "[m]etast[at]ic adenocarcinoma[21] consistent with large bowel primary[22]".

43. Mr A's management was discussed at the SDHB gastrointestinal multidisciplinary meeting (MDM) on 7 February 2019, where concerns were raised that the original lesion on the scan of January 2018 may have been misread by Dr B.

44. Subsequently, Mr A was diagnosed with bile duct cancer. The clinical notes state: "Adenocarcinoma, favour primary cholangiocarcinoma."

Subsequent events

45. Mr A was referred to the Oncology Department at SDHB for consideration of palliative chemotherapy. Mr A's referral was received by the service on 8 February 2019, and originally he was given an estimated wait time of five weeks for an initial specialist appointment. It is noted that the letter advised that the Ministry of Health|Manatū Hauora National Guidelines indicate an average wait time of four weeks for a "semi-urgent" priority, meaning that the wait time for Mr A to be seen was outside the National Guidelines. The referral letter advised that Mr A's GP would receive a copy, and that his GP was welcome to contact the service if there were concerns in relation to the priority assigned or should Mr A's condition change.

46. SDHB told HDC:

> "The Medical Oncology service letter reflected the fact that demand exceeded capacity to manage patients within the Ministry of Health|Manatū Hauora's guidelines for time and that the service did not wish to mislead patients about the wait time."

47. Subsequently, Mr A was seen by the Oncology Department on 28 February 2019 (within the four-week standard wait time outlined by the Ministry of Health|Manatū Hauora's National Guidelines).

48. Mr A underwent palliative chemotherapy, but, sadly, he died.

Further information

Dr B

49. Dr B told HDC that he accepts that he made an incorrect diagnosis of haemangioma on 9 January 2018. He stated:

> "Firstly, I would like to pass on my condolences to [Mrs A] and her family for their loss and I would like to apologise to [Mr A's] family for this error and all the [difficult] time[s]

[21] A type of cancer that starts in gland tissue.
[22] That is, it was initially thought that the cancer had originated in the bowel. However, this was later changed to a cholangiocarcinoma (a cancer in the tubes that carry bile (digestive fluid) through the liver).

that [Mr A] went through during his treatment, I can only reiterate how sorry I am that this occurred."

SDHB

Policies

50. SDHB told HDC that it had no policies or guidelines in place concerning the diagnostic processes of radiologists, as that is a matter of individual practice. Instead, there are informal agreements between radiologists and their referring colleagues concerning reporting formats for specific examinations.

51. SDHB said that there were also no specific policies relating to misinterpreted imaging or delay in diagnosis, as "this would fall under the auspices of the Clinical Incident Management Policy and its associated documents/policies". SDHB provided HDC with the Clinical Incident Policy, and relevant sections are included in Appendix B.

Adverse Event Review

52. SDHB conducted an Adverse Event Review in February 2019 following Mr A's diagnosis with liver cancer. The events were given a Severity Assessment Code (SAC) score of 2.[23] The summary of events was outlined as follows:

> "The lesion was thought to be benign by [Dr B], the reporting Radiologist and a recommendation for inappropriately long term follow up was made rather than short term follow up or further imaging and consideration of biopsy. After the recommended follow up 12 months later, the Gastroenterology (GI) Multidisciplinary meeting raised concern that the lesion may have been misdiagnosed on original CT and subsequent biopsy initially suggested metas[ta]tic adenocarcinoma consistent with large bowel primary but later established the diagnosis of primary cholangiocarcinoma with metastases."

53. SDHB identified a "[d]elay in diagnosis of malignant liver lesion due to an error judgement by the reporting Radiologist. It is not clear what caused this error as this was noted to be uncharacteristic of this Radiologist." It was also noted that there are inherent risks of diagnostic errors in radiology (noted to be 4% annually worldwide).

54. The report stated:

> "Since the incident was raised, the CT scan of 9 January 2018 has been reviewed by several Radiologists, including [Dr B]. All agree that the differential diagnosis was far too narrow and the timeframe for follow up recommended too long. All agreed other imaging and biopsy should have been recommended."

[23] SAC score of 2 is categorised as: "Major: Permanent major or temporary severe loss of function: not related to the natural course of the illness; differs from the immediate expected outcome of the care management; can be sensory, motor, physiological, psychological or intellectual." This rating requires event reporting to the Health Quality & Safety Commission (HQSC).

55. The family expressed their distress upon learning that Mr A might not be seen for his first specialist appointment within the Ministry of Health|Manatū Hauora recommended wait times and said that this was compounded by his already delayed diagnosis. As part of the Adverse Event Review, SDHB asked the Medical Oncology Service to consider direct contact with patients to explain possible delays, "when waiting times were expected to be greater tha[n] indicated for the given priority status".

56. The Adverse Event Report outlines numerous opportunities for improvement and proposed changes, which are discussed below in the "Changes made" section.

Responses to provisional opinion

57. Mrs A, Dr B and SDHB were given an opportunity to comment on relevant sections of the provisional opinion. Their comments have been incorporated into the report where relevant, and further comments are included below.

Mrs A

58. Mrs A told HDC that although the "information gathered" section of the provisional opinion was "not an easy read", she commended Dr B for the ongoing education he has completed since Mr A's death. Mrs A also told HDC that she was heartened to read that SDHB has improved its documentation. Mrs A concluded: "[Mr A] was amazingly calm when he finally did get diagnosed and took any treatment offered. But unfortunately it was just too late. He is missed very much."

Dr B

59. Dr B told HDC:

> "I would like to begin by taking this opportunity to again express my sincere apologies to … [Mr A's] family for my errors when interpreting … [Mr A's] CT scan. I was deeply saddened to hear of [Mr A's] cancer diagnos[i]s and the impact this has had. I have carefully reviewed your opinions and taken on board the comments you … and Dr Lim have made about my assessment and management of … [Mr A's] care. As previously stated, I have reflected at length on what I could have done differently … and I have amended my practice accordingly …"

60. Dr B also noted several external factors that he considers influenced his errors in this case. Dr B advised that he was covering three modalities (ultrasounds, CT scans and MRI scans), and that CT scans and MRI scans are considered "heavy duties" because of their complexity and the skill that is required. Dr B said that he had a particularly high workload in 2018, and at the time of these events, he was the only radiologist in the department who was reporting on MRI scans (which also increased his workload). Dr B noted that SDHB's investigation into his scans showed that he had reported more scans than other radiologists from January to May 2018. Dr B also said that he was suffering from severe pain at the time while he awaited surgery, and this was affecting his daily work, sleep and performance. Dr B said that despite this, his workload was not reduced.

61. Dr B told HDC that any overload of work or interruption can result in an error in reporting, or the misdiagnosis of a lesion, as when overloaded, you lose the adequate timing that is required for reporting, and the quality of reporting reduces. While Dr B noted the comment in SDHB's Adverse Event Review that the risk of diagnostic errors in radiology is 4% annually worldwide, his view is that this rate increases when additional negative factors are present (as in his circumstances at the time).

62. In summary, Dr B told HDC:

> "I would like to emphasise that I am in no way seeking to distance myself from th[is] error[.] I am trying to explain how [this] occurred. As is noted, my liver cases … were audited and other than these two cases,[24] there were no issues and there have been no issues since. This in itself shows that there were external factors at play as opposed to a lack of knowledge of liver scanning."

SDHB

63. SDHB accepted the findings in the provisional opinion, and largely accepted the proposed recommendations. However, in response to the recommendation in the provisional opinion that it consider whether any guidelines could be developed to encourage radiologists to consider double reading of complex or difficult cases, it advised:

> "We have considered this recommendation and do not think that formal processes or guidelines are required, based on the clinical opinion from the medical director and clinical director of radiology. They note that as part of best practice and professionalism, the expectation is that radiologists consult and undertake double reading of, or seek a second opinion on, complex or difficult cases."

Opinion: Introduction

64. When Mr A had a CT scan on 9 January 2018 at SDHB Radiology, the incorrect scan protocol was used. As a result, Dr B missed suspicious findings on the CT scan and did not initiate further imaging or diagnostic testing. This led to a delayed diagnosis of cancer for Mr A. Dr B has accepted that in this case he made an incorrect finding of a benign lesion.

65. I note that Mr A's care was also being managed by his GP, Dr C. I have not identified any concerns with the care provided by Dr C.

[24] See: 20HDC00693.

Opinion: Dr B — breach

66. At the time of events, Dr B was a vocationally registered radiologist working at Southland Hospital.

67. In order to assist my assessment of whether Dr B provided services of a reasonable standard, I obtained independent advice from radiologist Dr Remy Lim.

Protocol assignment for 9 January 2018 CT scan

68. Mr A's abdominal and pelvic CT scan of 9 January 2018 was undertaken for the purpose of further categorising the liver lesion seen on the ultrasound scan of 20 November 2017. Dr Lim advised that for the purpose of categorising a liver lesion previously detected on ultrasound:

> "[A] multiphase liver protocol would usually be performed and this should have included:
>
> 1. Unenhanced imaging of the liver
> 2. Arterial phase imaging of the liver
> 3. Portal venous phase imaging of the liver and remainder of the abdomen/pelvis
> 4. Delayed imaging of the liver
>
> These temporally separated phases of acquisition are critical when evaluating the different enhancement characteristics of a liver lesion. Different liver lesions have specific characteristics on these various phases, thus allowing for optimal characterisation and identification of a liver lesion."

69. Dr Lim told HDC: "For reasons unclear to me, no unenhanced scan or arterial phase scan of the liver were acquired." That is, only two of the four phases were performed.

70. It is clear that the internal CT request form specified that the examination to be performed was a CT liver with contrast. However, the handwritten comments on the form state: "CT [abdomen, pelvis]." Dr B told HDC that he did not write those comments.

71. Dr B told HDC that he assigned the CT scan as a four-phase protocol. He said that the radiographer came to him prior to the scan and asked if he wanted a "single phase (abdomen and pelvis)" scan. Dr B advised that he told the radiographer that he wanted the standard (four-phase) CT liver protocol. Dr B said that he did not document the requested protocol, as the standard practice at the time was to document the protocol required only if it was different from the standard protocol.

72. Dr B's evidence in this respect is in part contradicted by Dr D, who claims that Dr B did not suggest to the radiographer that he wanted anything but a standard CT protocol. The evidential basis for this statement is not available to me, so I have accorded it little weight. However, SDHB told HDC that standard practice at the time was for the radiologist to

document the protocol required if different from the "routine-portal-venous-abdo" phase. This was not done by Dr B.

73. Subsequently, the scan was performed only on one phase — the portal-venous phase. Dr B stated that when he reviewed the images, he requested that a delay phase be added, as there was not enough imaging to categorise the lesion with the portal-venous phase alone.

74. Ultimately, on the evidence available to me, I am unable to make a finding on whether or not Dr B verbally requested that the radiographer perform the CT liver protocol. The handwritten comments on the internal request form suggest that there was a change in plan to use a single phase (abdomen and pelvis) as opposed to the CT liver protocol, but I cannot identify whether this change in plan was instigated by Dr B or the radiographer. I also note the discrepancy between Dr B's explanation of why he did not document that he required a CT liver (four-phase) protocol, and Dr D's/SDHB's assertion that if anything other than the standard CT protocol (single phase — portal-venous-abdo) was required, it was to be documented by the radiologist. It appears that in this case, Dr B considered the "standard" to be a CT liver (four-phase) protocol, whereas SDHB and Dr D have told HDC that the "standard" was a portal-venous-abdo (single-phase) protocol.

75. In any event, any possible shortcomings in what was, or was not, conveyed by Dr B to the radiographer were superseded by Dr B's subsequent decision not to apply the full CT liver protocol once he became aware that the imaging was inadequate (conveyed to him by the radiographer after the initial portal-venous phase). Dr B elected to add just one further phase from the liver protocol (delayed imaging).

76. As identified above, Dr Lim considers the four phases of the CT liver protocol "critical" to evaluating and categorising a liver lesion. His view is that Dr B's assigned protocol for the CT scan of 9 January 2018 (only two phases) represents a significant departure from the standard of care. Dr Lim advised that this shortcoming "contributed significantly to the erroneous diagnosis of a haemangioma by [Dr B]". I accept Dr Lim's advice.

77. I find that Dr B's failure to use the full CT liver protocol was a significant error.

Interpretation of 9 January 2018 CT scan

78. Dr B read and verified the findings of the CT scan. He reported:

> "Single large liver lesion with peripheral enhancement and centripetal fill-in on delayed phase suggestive of most likely large liver haemangioma. Subsequent ultrasound/CT scan follow-up is recommended in 12 months time."

79. Dr Lim advised:

> "Whilst there is mild peripheral enhancement of the liver lesion on the portal venous phase, this is not in a discontinuous, nodular pattern, which would point towards diagnosis of a typical benign liver haemangioma … The centripetal filling in of the lesion

> on the delayed phase imaging is a subjective observation and one that I was not able to fully convince myself of."

80. Dr Lim considers that Dr B's observation of the findings on the CT scan represent a moderate departure from accepted practice.

81. While acknowledging Dr B's explanation that the delayed phase imaging misled his interpretation, I accept Dr Lim's advice (which is largely consistent with the expert advice obtained through ACC and DHB review processes) and conclude that Dr B's interpretation was incorrect and a departure from the expected standard of care.

Diagnosis of haemangioma following CT scan of 9 January 2018

82. Following the interpretation of the CT scan, Dr B reported his finding as "most likely [a] large liver haemangioma".

83. Dr Lim advised HDC:

> "Due to the absence of an arterial phase acquisition and presence of the typical enhancing characteristics of a haemangioma, the diagnosis of haemangioma for the appearance of the liver lesion on [Mr A's] scan offered by [Dr B] represents a significant departure from standard of care."

84. Once again I agree with and accept Dr Lim's advice, and note that Dr B similarly accepts Dr Lim's opinion. It must also be noted that although Dr B assigned an incorrect protocol for the CT scan and therefore achieved less than desirable imaging, Dr Lim's blind reading of the 9 January 2018 scan identified the following:

> "Although the lesion is incompletely characterised on this examination (no unenhanced and arterial phase imaging) [the] appearance is suspicious for malignancy."

85. I note further that "blind" readings by three radiologists as part of ACC's review processes all declared the images to be suggestive of malignancy, as did reviewers for SDHB — with concern expressed in the DHB's adverse event report that the differential diagnosis in Dr B's report was too narrow.

86. Therefore, I consider that Dr B's diagnosis of haemangioma represents a further significant failure by Dr B to provide an appropriate standard of care to Mr A.

Recommendation for follow-up

87. Following Dr B's interpretation of the CT scan, and his subsequent diagnosis of haemangioma, he made a recommendation for ultrasound/CT scan follow-up in 12 months' time.

88. At the outset, it is important to note that Dr B's recommendation for follow-up scanning in 12 months' time was made as a result of an incorrect diagnosis of a benign haemangioma.

89. Dr B told HDC:

> "Due to my diagnosis of this lesion as a giant liver hemangioma with atypical features, I therefore recommended follow up of 12 months for this lesion. The recommendation for follow-up [of] a liver haemangioma with no risk of liver malignancy can range from center to center from 6 to 12 months. 12 months is an acceptable follow up period for a benign lesion."

90. However, Dr B also stated: "In hindsight, my diagnosis was incorrect, and I should have repeated the CT scan to accord with my standard practice or sought a second opinion, tissue diagnosis or MRI of liver."

91. Dr Lim advised:

> "As the liver lesion has been incompletely characterised, this recommendation and the proposed time interval for repeat imaging represents a moderate departure from standard of care."

92. I agree with Dr Lim's advice.

93. On the evidence before me, it is clear that Dr B recognised that he had suboptimal imaging of the lesion at the time of the scan, leading him to add a delay phase, which was not in accordance with his usual practice or what was an expected protocol for liver imaging. Because the incorrect protocol was used for the CT scan, the imaging was incomplete.

94. Consequently, while I acknowledge Dr B's comments that a 12-month follow-up period is appropriate for a benign lesion, it is my view that Dr B should have taken further steps to ensure that he had optimal imaging, and validate his diagnosis, before proceeding to make follow-up recommendations. Dr B should have recommended a follow-up scan or sought a second opinion, or recommended consideration of a biopsy, to ensure that adequate clinical information was available to support a diagnosis. His decision to recommend follow-up in 12 months' time, without taking these further steps, contributed to the delay in diagnosis of Mr A's cancer.

Conclusion

95. Dr B had a responsibility to provide services to Mr A with reasonable care and skill. In my opinion, he did not do this.

96. I acknowledge Dr Lim's comment that "a single isolated error in interpretation as in this case … is not necessarily a reflection on the general competence of [Dr B's] practice".

97. However, I do not characterise this as a single isolated error in interpretation. In this respect I conclude that there were several errors of concern. Foremost, Dr B did not correct the incomplete CT protocol when he became aware that the imaging was inadequate and non-compliant with the expected standard of liver imaging (or indeed his usual practice). The sub-optimal imaging (as recognised by Dr B) did not result in him taking any further action

to validate his subsequent diagnosis either by further imaging or referral for biopsy. Dr B also failed to interpret the CT scan results adequately, and subsequently misdiagnosed Mr A's malignancy as a benign haemangioma.

98. In response to the provisional opinion, Dr B put forward several mitigating factors. In particular, he asserted that at the time, his workload was high due to understaffing and under-resourcing at SDHB, and that he was suffering from severe pain. Dr B also highlighted the known risk of error in radiology reporting, and that in light of the above factors, the risk of error in this case was increased.

99. I acknowledge that radiology reporting has a known risk of human error because of its complexity, and that working conditions and other factors (like those described above) may increase this risk. However, this Office has stated previously that just because it is widely accepted that errors of perception occur in a small but persistent number of radiology interpretations, this is not determinative in assessing whether the standard of care has been met in a particular case. The standard of care applicable is the care and skill that an ordinarily careful radiologist would exercise under similar circumstances.[25] As I have discussed in detail above, it is my view that Dr B made several serious errors, and these errors were not limited to perception errors. The accumulation of these errors does not support that Dr B exercised the care and skill of an ordinarily careful radiologist in providing services to Mr A. I am not satisfied that Dr B met the accepted standard, or that the factors raised by Dr B mitigate his errors such that a breach is not warranted.

100. Ultimately, Dr B's significant failings meant that Mr A did not receive a further scan until 12 months later, resulting in an unacceptable delay in the diagnosis of his cancer. Accordingly, I find that Dr B failed to provide services to Mr A with reasonable care and skill and breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code).[26]

Opinion: SDHB — adverse comment

Policies and guidelines

101. SDHB told HDC that it had no policies or guidelines in place concerning the diagnostic processes of radiologists, as that is a matter of individual practice. SDHB stated: "There are informal agreements between radiologists and their referring colleagues concerning the reporting formats for specific examinations."

[25] Opinions 15HDC00685; 17HDC00415; 19HDC002399; 20HDC00972.
[26] Right 4(1) states: "Every consumer has the right to have services provided with reasonable care and skill."

102. SDHB also told HDC that there were no specific policies relating to misinterpreted imaging or delay in diagnosis, as "this would fall under the auspices of the Clinical Incident Management Policy[27] and its associated documents/policies".

103. My advisor, Dr Lim, told HDC that usually it would be the responsibility of the individual radiologist to "self-police" their errors. He said that it is not unusual for radiology departments not to have defined policies or protocols for misinterpreted imaging. However, he stated:

> "If a case of misinterpreted imaging is deemed to be clinically significant, there is the expectation that the case would be submitted and discussed at a 'REAL' (Radiology Event and Learning) or QA [quality assurance] meeting, without identification of the reporting radiologist for all to learn from. The objective is for a similar error to be minimised in the future and if there is identification of systemic issues that led to the error, for that to be discussed and steps implemented to prevent recurrence of the error."

104. Dr Lim considers that the failure to discuss this case at a REAL or QA meeting represents a mild departure from accepted standards.

105. I acknowledge that Mr A's case was discussed at a multidisciplinary meeting on 7 February 2019. However, I have inferred that this case was not discussed at the kind of radiology meeting identified by Dr Lim (for quality assurance purposes). Given the seriousness and clinical significance of the misinterpreted imaging, it would have been appropriate to do so.

Other comments

Double-checking by radiographers

106. Dr Lim advised HDC that radiologists are required to identify requests that need more specialised multiphase protocols from the outset, which is the usual practice when referrals are assessed by radiologists. Dr Lim recommended the following:

> "As a secondary check, [radiographers] need to be diligent in reviewing the indication for the CT scan about to be performed and check the correctness and appropriateness of CT scan protocol with the supervising radiologist before commencing [the] scan."

107. In response to Dr Lim's comments, Dr D told HDC:

> "This is a common occurrence in the department. We [radiologists] are often questioned regarding special protocols needed for certain indications if it has not already been suggested on the request form so again, I cannot explain why this did not happen on this day."

108. Dr Lim considers that the failure by the radiographer to question the protocol on this occasion represents a mild departure from accepted standards. While acknowledging this

[27] Relevant sections are included as Appendix B.

advice, I note that I have been unable to make a finding as to what protocol Dr B requested or who documented the change in protocol on the request form. In any event, I note that Dr B told HDC that prior to the scan, the radiographer checked whether Dr B wanted the "standard" protocol (single phase) and Dr B advised that he wanted the CT liver protocol (four phase). I also note that there is evidence to suggest that the radiographer did return to Dr B during the scanning to ask him to review the imaging. This suggests that the radiographer did raise concerns about the quality of the imaging and showed critical thinking at least part way through the scanning, calling into question the protocol. Accordingly, I am not critical of the radiographer in this case.

Protocol standards

109. SDHB told HDC that the Radiology Department has a standard liver protocol ("CT Liver Protocol") that was well established and in place in the department in 2018. SDHB supplied HDC with the protocol.

110. SDHB told HDC that usually the protocol is assigned by one of the other radiologists, but this radiologist was on sabbatical at the time, and therefore Dr B was undertaking the task.

111. Dr Lim advised HDC:

> "[I]t is quite a common practice in larger radiology departments for one or two radiologists to be responsible for vetting, approving and protocoling [the] majority of departmental scan referrals. These are then booked, scanned and reported by a team of radiologists rostered on the day of [the] scan. Therefore, the scan may or may not be reported by the protocolling radiologist. In some smaller departments, I am aware referral forms may be protocoled on the day by the radiologist rostered for that modality who would also subsequently report the scans performed."

112. Dr Lim does not consider the protocol system at SDHB to be a departure from accepted or widely practised standards. I accept Dr Lim's advice and consider that on this occasion it was acceptable that Dr B was performing both the protocol assignment and the reading of the scan.

Wait time for specialist appointment

113. Mrs A told HDC that the proposed wait time given to Mr A following his already delayed diagnosis, and the fact that the proposed wait time fell outside the Ministry of Health|Manatū Hauora National Guidelines, was of concern to Mr A and his family.

114. SDHB told HDC that the referral letter reflected the fact that demand for the Oncology Service exceeded capacity, and it did not wish to mislead patients about their wait time. SDHB met with Mr A's family to apologise for the delays as stated in the letter, and SDHB recommended in its Adverse Event Review that the service consider direct contact with patients when wait times are expected to be greater than indicated for the given priority status.

115. SDHB also told HDC:

> "The Oncology team consider phoning patients with delays for radiation oncology but, as outlined in the letter, they rely on the GP and patients contacting them for updated information or escalating issues. A follow-up phone-call and co-ordination may occur between the Clinical Nurse Specialist and the GP following an inquiry. Patients being booked within two weeks are phoned to make appointments."

116. I acknowledge that following these events, the SDHB Oncology Service updated its letter to patients regarding a first specialist appointment. The revised letter provides more detail about why the proposed wait time falls outside the Ministry of Health|Manatū Hauora guidelines, and an apology for the delay.

117. During this investigation I completed a Commissioner Initiated Inquiry into delays for non-surgical cancer patients accessing first specialist appointments (Case 22HDC01310). That inquiry identified the psychological harm (in addition to physical and financial harm) for people diagnosed with cancer on waiting lists outside expected timeframes. One of the recommendations was for Te Whatu Ora Southern to consider establishing a system that provides a single point of contact for patients on the waiting list for such appointments, which could include (among other things) keeping patients updated and informed about wait times, and providing patients with available supports and advice. I will be following up on this, and the other recommendations in that report.

118. As it happens, Mr A received his initial specialist appointment within three weeks of referral, which was within the Ministry of Health|Manatū Hauora National Guidelines. Consequently, I have not considered the time Mr A was required to wait for his specialist appointment as part of my investigation into the standard of care provided by SDHB. However, I acknowledge that the proposed delay in Mr A being assessed in the context of his already delayed diagnosis would have been distressing for Mr A and his family.

119. As a healthcare provider, Te Whatu Ora Southern is responsible for providing services in accordance with the Code. In this case, notwithstanding the contextual work environment factors that Dr B has recently asserted, I consider that the failure to read and interpret Mr A's CT scan correctly on 9 January 2018 were errors that are attributable to him. However, I have identified a number of areas for improvement for Te Whatu Ora Southern, which are outlined in the recommendations section below.

Changes made

Dr B

120. Dr B told HDC: "I am committed to participating in continuing education activities in order to maintain and develop my expertise — including expanding my basic and advanced Radiology skills."

121. As a result of these events, Dr B attended the following courses and workshops:

- The ARGANZ Advanced Workshop — Liver imaging, Rectal MRI and MR Enterography in 2019.
- The ARGANZ Meeting (liver lecture) in 2019.
- A British MRI course (liver and body MRI lectures) in 2019.

122. Dr B told HDC that he has taken away the following important learnings as a result of the above courses:

- To diagnose a liver lesion on a CT scan, the gold standard protocol should be followed (four phases to protocol).
- MRI liver and tissue diagnosis is important for undistinguished lesions on CT scan and ultrasound.
- Difficult liver lesions with atypical features should be discussed in MDMs and referred for a second opinion.
- Cholangiocarcinoma is a difficult tumour and can mimic other lesions like hepatocellular carcinoma (HCC), metastatic disease, or even sclerosing giant haemangioma.
- Cholangiocarcinoma is an easy tumour to miss, and missing cholangiocarcinoma is not uncommon among the radiology practice, especially the small lesions.
- Mass-forming intrahepatic cholangiocarcinoma tends to present as a larger mass as it rarely causes symptoms early in its course.

123. Dr B told HDC that he has also undertaken the following:

- Applied the most updated protocols and guidelines to meet the Royal Australian and New Zealand College of Radiologists (RANZCR) and the Medical Council of New Zealand (MCNZ) guidelines and recommendations regarding liver imaging protocols and liver lesion work-up.
- Discussed this case within the Radiology Department to gain more learnings for himself and the department.
- He attends the clinical meeting and MDM meetings with other departments regularly.
- He attends regular teaching meetings within the Radiology Department to discuss challenging cases and missed diagnoses.

- He has changed his practice and reporting system, especially in regard to liver lesions, and is doing "everything possible to improve [his] skills and knowledge in radiology".
- He has published several radiology articles in collaboration with other departments, which has ensured that he continues to gain experience and develop his skills and practice.

124. Dr B underwent a six-month recertification programme with MCNZ to ensure that he is maintaining the required standard of competence. This programme included a review of the current literature relating to liver imaging protocols, and a retrospective audit to review all the liver scans reported by Dr B in the last two years. Dr B provided HDC with a detailed outline of his learnings from the programme, and advised HDC that since undertaking the programme, no other liver mistakes or significant failures have been identified in any of his reports.

SDHB

125. SDHB told HDC that it conducted an internal investigation into these events (its Adverse Event Review), which identified the following recommendations:

- Once an occurrence of error delaying diagnosis has occurred, the affected patient is fast tracked through the system to further investigation and treatment.
- The Oncology Service to review its acknowledgement of referral letters and consider direct contact with a patient who may experience delays.
- For Dr B (as the reporting radiologist) to undergo additional training in liver study interpretation.

126. SDHB told HDC that the recommendations outlined above were all completed by mid-2019.

127. As discussed above, the SDHB Oncology Service provided HDC with a copy of its updated letter to patients regarding an initial specialist appointment, and noted that the Oncology Service noticed an improvement in feedback following implementation of the revised letter.

128. SDHB told HDC that in December 2020, a new Radiology Information System (RIS) was introduced, and referrals are now assigned a protocol electronically during the approval process. The new process replaced the paper-based radiology request forms.

129. SDHB also told HDC that as a result of these events, it was agreed that the Radiology/Surgery meetings would be minuted, and there would be more stringent documentation of recommendations for follow-up.

130. SDHB also told HDC that it was considering wider sampling and double reads across the district, and investigation of methods implemented by other districts. SDHB advised that any sampling and double reads taken would be in addition to the current review and audit meetings held.

131. SDHB undertook a retrospective audit of Dr B's liver imaging, and advised HDC that the results of the review were "in line with expectations" in that "no significant non-conformities" were identified.

Recommendations

132. I recommend that Dr B provide a written apology to Mr A's family for the failings identified in this report. The apology is to be provided to HDC within three weeks of the date of this report, for forwarding to Mr A's family.

133. I note that as a result of this case, Dr B completed a six-month recertification programme with MCNZ, and he provided details of his learnings to HDC. In light of the changes already made, I am satisfied that Dr B has undertaken sufficient reflection on this case and taken adequate steps to improve the standard of his practice in this regard.

134. I note also that in relation to a second case that occurred after Mr A's, I have made several other recommendations directed at improving Dr B's knowledge and skills (Case 20HDC00693).

135. I therefore make no further recommendations in relation to Dr B's practice and competence.

136. I recommend that Te Whatu Ora Southern:

a) Remind radiology staff of the importance of seeking double reads or a second opinion on complex or difficult cases.

b) Consider whether any further training should be developed to ensure that radiographers are diligent in reviewing the indications for a CT scan and checking the correctness and appropriateness of the protocol with the supervising radiologist.

c) Provide evidence of the implementation of the recommendation identified in its Adverse Event Review report in relation to fast tracking patients through the system to further investigation and treatment where an occurrence of error delaying diagnosis has occurred.

d) Use an anonymised version of this report as a case study to educate staff on the learnings from this case.

137. Te Whatu Ora Southern is to report back to HDC on the progress of recommendations a) to d) within six months of the date of this report.

Follow-up actions

Referral to Director of Proceedings

138. Dr B 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.

139. My independent advisor identified two significant departures in the standard of care provided to Mr A by Dr B. As I have noted in this report, it is my view that Dr B is individually responsible for the poor standard of care Mr A received, as opposed to the care having resulted from wider systems issues at SDHB.

140. I have also considered Dr B's responsibility for a separate radiology misread at SDHB within a three-month period (see Case 20HDC00693). His incorrect diagnoses of benign haemangiomas in both cases resulted in devastating outcomes for the consumers involved.

141. In making this decision, I have had regard to Dr B's submissions. Dr B accepted the errors he made in both cases but submitted that referral to the Director of Proceedings is unnecessary as he has been held accountable by the subsequent audits performed for his readings, the recertification programme imposed by the Medical Council of New Zealand, and the subsequent changes he made to his practice. Dr B also submitted that the systemic workplace issues at SDHB contributed to the errors, and that referring him to the Director of Proceedings would cause a potential chilling effect on the care provided by other radiologists.

142. Dr B continues to work in the private and public sectors. While I acknowledge that Dr B has made several changes to his practice and has undergone review by MCNZ, there is a public interest in accountability for his serious individual failures and major shortcomings of care. I believe it is appropriate to refer Dr B to the Director of Proceedings to consider whether further action is necessary to hold Dr B to account for his serious breaches of the Code.

Publication

143. A copy of this report with details identifying the parties removed, except Te Whatu Ora Southern, Southland Hospital, and the advisor on this case, will be sent to the Medical Council of New Zealand and the Royal Australian and New Zealand College of Radiologists, and they will be advised of Dr B's name.

144. A copy of this report with details identifying the parties removed, except Te Whatu Ora Southern, Southland Hospital, and the advisor on this case, will be sent to Te Tāhū Hauora|Health Quality & Safety Commission, Te Aho o Te Kahu|Cancer Control Agency, and the Ministry of Health|Manatū Hauora and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Appendix A: Independent clinical advice to Commissioner

The following blind reading of the 9 January 2018 CT scan was obtained from radiologist Dr Remy Lim:

"**Indication:** Left lobe of liver lesion with internal blood flow seen on US. CT to further characterise. ?Malignancy vs haemangioma

Technique: Portal venous and delayed phase imaging of the abdomen and pelvis following 90mls of Visipaque 270. No unenhanced or arterial phase imaging available for review.

Findings:
Hepatobiliary: No unenhanced or arterial phase acquisition is available. A centrally hypoenhancing lesion with irregular outline within posterior segment 2 measures 3 x 2.5 cm. There is mild peripheral enhancement without nodularity. The lesion remains hypodense on delayed imaging without significant filling in or contrast retention. No other focal or suspicious hepatic lesions. No biliary obstruction. Gallbladder is thin walled without radio-opaque gallstones.

Spleen/Pancreas/adrenal glands: Spleen and pancreas are unremarkable. No dilatation of main pancreatic duct. Mild nodularity of the left adrenal gland. Right adrenal gland is unremarkable.

Renal tract: No solid renal lesions or hydronephrosis. Tiny cortical cyst in lower pole of the left kidney.

Abdominopelvic nodes: No retroperitoneal or pelvic adenopathy.

GI/peritoneum: No gross masses in the bowel. No peritoneal nodules or ascites.

Pelvic organs: Moderate prostate enlargement.

Bones/soft tissue: No suspicious osseous lesions.

Other: Subpleural emphysema in the lung bases. Calcified granuloma in the left lung base.

IMPRESSION: Single hypoenhancing lesion within posterior segment 2. Although the lesion is incompletely characterised on this examination (no unenhanced and arterial phase imaging) but appearance is suspicious for malignancy. The differential considerations include primary malignancy (eg. HCC or cholangiocarcinoma — arterial phase correlation would be useful) vs metastatic disease (less likely given single lesion, correlate with history of prior malignancy). Completion CT chest (arterial phase liver could be acquired at the same time) is recommended. MRI of the liver would also be useful to exclude other smaller lesions not resolved on CT. The segment 2 lesion may be amenable to percutaneous biopsy (review of relative visibility and accessibility on US is required). Non specific mild nodularity of left adrenal gland."

The following expert advice was obtained from Dr Lim:

"I, Dr Remy Lim, have been asked to provide an opinion to the Commissioner on case number 20HDC00404. I have read and agree to follow the Commissioner's Guidelines for Independent Advisors, and I am not aware of any conflicts of interest.

I am a diagnostic radiologist trained in Auckland and Hamilton. I received my diagnostic radiology fellowship from RANZCR in 2009. My subspecialty interest lies in body and oncology imaging, PET/CT and genitourinary imaging.

I have reviewed the following items for the purpose of this report:

1. CT request form for [Mr A's] scan on 9 January 2018
2. CT scan images performed on [Mr A] on 9 January 2018
3. CT report generated by [Dr B] on [Mr A's] scan on 9 January 2018

The chronological summary of events as below:

1. [Mr A] presented for an ultrasound November 2017 for investigation of right iliac fossa pain.
2. A liver lesion was detected on ultrasound (images for this ultrasound have not been reviewed) and a recommendation for CT to investigate the nature of the liver lesion was made.
3. [Mr A] presented for a CT scan on 9 January 2018 for characterisation of the liver lesion.
4. The lesion was deemed as a benign lesion (liver haemangioma) by the reporting radiologist ([Dr B]) and follow up imaging in 12 months was recommended.
5. The follow up imaging in 2019 reported progression of liver disease and metastatic disease (images for this CT scan have not been reviewed).

I have been asked to specifically comment on the following:

1. The standard of the radiology report on 9 January 2018 and whether the finding/ conclusions and recommendations were reasonable;

The clinical indication for [Mr A's] CT scan was for a liver lesion detected on ultrasound of 20 November 2017. The ultrasound report recommended further characterisation of the liver lesion with CT, which is standard of care.

On 9 January 2018, a CT scan of the abdomen and pelvis acquired in portal venous phase and a subsequent delayed scan imaging were carried out.

For reasons unclear to me, no unenhanced scan or arterial phase scan of the liver were acquired.

Notwithstanding the absence of unenhanced and arterial phase acquisitions on [Mr A's] scan, [Dr B] observed peripheral nodular enhancement of the liver lesion with centripetal filling in on delayed phase imaging.

Whilst there is mild peripheral enhancement of the liver lesion on the portal venous phase, this is not in a discontinuous, nodular pattern, which would point towards a diagnosis of a typical benign liver haemangioma.

This specific pattern of enhancement for haemangioma of the liver would usually be better visualised and more conspicuous on the arterial phase imaging of the liver (not performed on this occasion), rather than the portal venous phase as performed on [Mr A] (ref: https://radiopaedia.org/articles/hepatic-haemangioma-3).

The centripetal filling in of the lesion on the delayed phase imaging is a subjective observation and one that I was not able to fully convince myself of.

*The observation of the findings on the CT scan performed on 9 January 2018 is therefore a **moderate** departure from accepted practice.*

[Dr B] suggested the diagnosis to 'most likely' represent a benign haemangioma.

*Due to the absence of an arterial phase acquisition and presence of the typical enhancing characteristics of a haemangioma, the diagnosis of haemangioma for the appearance of the liver lesion on [Mr A's] scan offered by [Dr B] represents a **significant** departure from standard of care.*

As [Dr B] had offered a benign entity for the lesion, a recommendation for repeat imaging in 12 months was also advised.

*As the liver lesion has been incompletely characterised, this recommendation and the proposed time interval for repeat imaging represents a **moderate** departure from standard of care.*

Recommendations:

1. [Dr B] to undergo further training to familiarise himself with liver CT interpretation and patterns of enhancement for various liver lesions.

2. [Dr B] to undergo further training to familiarise himself with what constitutes an optimal characterisation of a liver lesion on CT.

3. [Dr B] is made aware that, in the absence of what would usually constitute an optimal characterisation protocol of a liver lesion on CT, a shorter follow up interval with optimal liver characterisation protocol or a follow up with a different modality such as liver MRI should be recommended.

4. Collegial and peer support be made available to [Dr B] so that he has the opportunity to discuss cases he may be unsure of.

5. Ensure online resources or access to educational journal articles are easily accessible.

2. Any other matters in this case that you consider warrant comment.

The primary purpose of the CT scan performed on 9 January 2018 was to characterise a liver lesion detected on ultrasound. However, the CT scan was performed only in 'portal venous' phase and 'delayed' phase. For standard characterisation of a liver lesion, a multiphase liver protocol would usually be performed and this should have included:

1. Unenhanced imaging of the liver
2. Arterial phase imaging of the liver
3. Portal venous phase imaging of the liver and remainder of the abdomen/ pelvis
4. Delayed imaging of the liver

These temporally separated phases of acquisition are critical when evaluating the different enhancement characteristics of a liver lesion.

Different liver lesions have specific characteristics on these various phases, thus allowing for optimal characterisation and identification of a liver lesion.

[Mr A's] CT scan as protocoled and performed on 9 January 2018 therefore represents a ***significant*** *departure from standard of care for characterisation of liver lesion using CT scanner. In my opinion, this shortcoming contributed significantly to the erroneous diagnosis of a haemangioma by [Dr B].*

Recommendations:

1. For liver lesion characterisation using CT, a departmental protocol is established to incorporate the phases as described above. These protocols are relatively standard throughout radiology departments in New Zealand.

2. Radiologists to identify CT requests requiring more specialised multiple phase protocols from the outset. This is the usual practice when referrals are protocoled by radiologists.

3. As a secondary check, CT medical imaging technologists (MIT) need to be diligent in reviewing the indication for the CT scan about to be performed and check the correctness and appropriateness of CT scan protocol with the supervising radiologist before commencing scan.

[Addendum dated 8 September 2021: Dr Lim confirmed that MITs not checking the protocoling before commencing the scan is a mild departure from accepted standards.]"

The following further expert advice was received from Dr Lim on 15 May 2021:

> "I have reviewed the responses provided by SDHB and [Dr B]. My commentary regarding the case and subsequent recommendations remain the same.
>
> I am heartened to know many of the recommendations have been implemented or are already in place.
>
> It is also important to note that a single isolated error in interpretation as in this case that I reviewed, is not necessarily a reflection on the general competence of [Dr B's] practice. General competence should only be a concern if this is a recurring pattern."

The following further expert advice was received from Dr Lim on 8 September 2021, to clarify his previous advice:

> "Yes it is quite a common practice in larger radiology departments for one or two radiologists to be responsible for vetting, approving and protocolling [the] majority of departmental scan referrals. These are then booked, scanned and reported by a team of radiologists rostered on the day of [the] scan. Therefore, the scan may or may not be reported by the protocolling radiologist. In some smaller departments, I am aware [that] referral forms may be protocoled on the day by the radiologist rostered for that modality who would also subsequently report the scans performed. Yes I believe so, it is sometimes preferable for the protocolling radiologist to also be reporting the scan, but this is not always possible nor desirable for larger departments. There is no departure here.
>
> Yes it would usually be up [to] the individual radiologist to 'self police' their errors. More frequently errors or misinterpretations are subsequently identified by one of the following scenarios:
>
> 1. Follow up imaging and the pathology has progressed and more conspicuous on follow up imaging;
> 2. Review by another radiologist at clinical meetings or multidisciplinary meetings;
> 3. Clinician seeking second opinion from another radiologist due to clinical inconsistency with radiology report.
>
> It's not unusual either for radiology departments to not have defined policies or protocols for misinterpreted imaging.
>
> If a case of misinterpreted imaging is deemed to be clinically significant, there is the expectation that the case would be submitted and discussed at a 'REAL' (Radiology Event and Learning) or QA meeting, without identification of the reporting radiologist for all to learn from. The objective is for similar errors to be minimised in the future and if there is identification of systemic issues that led to the error, for that to be discussed

and steps implemented to prevent recurrence of the error. [I consider this to be a] mild [departure].

No it would not be standard practice for scans reported by a fully qualified radiologist to have their scans double read or double checked. If they are unsure, radiologists are encouraged to obtain a second opinion. Only certain radiological studies are routinely double read, eg. Mammogram or PET/CT scans. Not a departure as above.

[Dr Lim was asked whether it was standard practice to have CT scan paper-based request forms hand graded by the supervising radiologist. He advised:] yes, provided the supervising radiologist's writing is legible. [This is] Not a departure."

Appendix B: SDHB Clinical Incident Policy

The Clinical Incident Policy states:

> "Investigation
>
> All clinical incidents reported must be followed up by some form of investigation. The investigation with focus on identifying the systems issues related to the incident rather than apportioning blame. The following levels of investigation are required:
>
> …
>
> SAC2 Incidents
>
> Formal investigation using RCA/comprehensive, concise, check, review on single aggregated.
>
> A lead investigator is appointed by the DLT where the incident occurred. The team will not include the health professional(s) involved in the incident and must not be led by the leader of the service involved.
>
> Recommendations
>
> Recommendations must be recorded in the incident record in Safety1st. SAC1 and SAC2 incident recommendations wi[ll] be monitored for implementation and progress reports will be required each month by the clinical risk management coordinator."