

Radiologist, Dr B
Hawke's Bay District Health Board
(now Te Whatu Ora Te Matau a Māui Hawke's Bay)

A Report by the
Deputy Health and Disability Commissioner

(Case 20HDC00972)

Contents

Executive summary	1
Complaint and investigation	2
Information gathered during investigation	2
Opinion: Preliminary matters	9
Opinion: Dr B	10
Opinion: HBDHB — breach	12
Changes made since events	13
Recommendations.....	14
Follow-up actions	15
Appendix A: Independent clinical advice to Commissioner	16
Appendix B: HBDHB Adverse Event Review	25

Executive summary

1. This report concerns the care provided by a radiologist and the Hawke's Bay District Health Board (HBDHB) (now Te Whatu Ora Te Matau a Māui Hawke's Bay)¹ to a woman between November 2016 and February 2020. On 4 November 2016, the woman underwent an abdominal CT scan that included images of her lung bases. A lesion was visible in the right lower lung, but this was not reported, and further investigation was not requested. The lesion was not convincingly perceptible in X-ray images taken in 2016, 2017, and 2018, but was identified in a CT scan of the abdomen and pelvis in February 2020. Subsequently, the woman was diagnosed with lung cancer.

Findings

2. The Deputy Commissioner considered that the lung lesion was visible on the CT scan in November 2016, and should have been reported. As such, the radiologist was found in breach of Right 4(1) of the Code for failing to provide services with reasonable care and skill.
3. The Deputy Commissioner accepted that the standard of the radiologist's reporting of the 24 January 2018 X-ray was reasonable in the circumstances.
4. The Deputy Commissioner noted that HBDHB's response to increasing radiology workloads was insufficient to maintain standards in the face of increasing demands on the service. As such, she found HBDHB in breach of Right 4(1) of the Code.

Recommendations

5. The Deputy Commissioner recommended that HBDHB and the radiologist provide a written apology to the woman and her family, and that the radiologist implement a "checklist" structured reporting style and familiarise himself with the various radiological manifestations of lung cancer. The Deputy Commissioner also recommended that HBDHB ensure that staff are aware of the formal processes available for clinicians to raise concerns about their working environment and the process whereby these concerns are acknowledged and addressed by the organisation; undertake an updated audit of 30 randomly selected abdominal CT scans to confirm improvement in reporting of lung bases; and consider improvements to the reporting process to prevent similar errors occurring in future.

¹ On 1 July 2022, the Pae Ora (Healthy Futures) Act 2022 came into force, which disestablished all 20 district health boards. Their functions and liabilities were merged into Te Whatu Ora — Health New Zealand. All references to HBDHB in this report now refer to Te Whatu Ora Te Matau a Māui Hawke's Bay.

Complaint and investigation

6. The Health and Disability Commissioner (HDC) received a complaint from Mr A about the radiology services provided to his wife, Mrs A, by Dr B and Hawke's Bay District Health Board (HBDHB). The following issues were identified for investigation:
- *Whether Dr B provided Mrs A with an appropriate standard of care in November 2016 and January 2018.*
 - *Whether Hawke's Bay District Health Board provided Mrs A with an appropriate standard of care in November 2016 and January 2018.*
7. This report is the opinion of Deputy Commissioner Vanessa Caldwell, and is made in accordance with the power delegated to her by the Commissioner.
8. The parties directly involved in the investigation were:
- | | |
|-------|----------------------|
| Mrs A | Consumer |
| Mr A | Complainant |
| Dr B | Provider/radiologist |
| HBDHB | Provider |
9. Also mentioned in this report:
- | | |
|------|-----------------------|
| Dr C | Radiologist |
| Dr D | Radiologist |
| Dr E | ACC Radiology advisor |
10. Further information was received from the Accident Compensation Corporation (ACC).
11. Independent expert advice was obtained from a radiologist, Dr Helen Moore (Appendix A).

Information gathered during investigation

Introduction

12. This report discusses the care provided to Mrs A (aged in her sixties at the time of events) prior to her diagnosis of primary lung cancer in 2020. In particular, the complaint concerns the reporting of a CTVC² scan of her abdomen on 4 November 2016, and an X-ray of the abdomen taken on 24 January 2018.

² Computerised tomography virtual colonoscopy (CTVC) or CT colonography is a radiological examination of the colon/large intestine.

CTVC — 4 November 2016

13. On 11 October 2016, Mrs A's GP referred her to HBDHB Radiology for a screening colonoscopy due to a strong family history of bowel cancer. A colonoscopy undertaken at HBDHB on 4 November 2016 found that Mrs A had diverticulosis, and a polyp in the sigmoid colon³ was resected and retrieved. However, the colonoscopy was not completed because of difficulties with progress through the colon secondary to diverticulosis⁴ and likely pelvic adhesions.
14. As such, a CT virtual colonoscopy (CTVC)⁵ was requested for later that day. The request noted: “? Evidence of significant colonic lesions.” The CTVC was completed in the afternoon of 4 November 2016 and was reported by consultant radiologist Dr B.⁶ Dr B commented on the bowel in the CT scan as follows:
- “Satisfactory distension of the large bowel is achieved. There is slight thickening of the wall of the sigmoid colon with multiple diverticuli. No evidence of any significant colonic masses or large polyps can be seen.”
15. No other structures or pathology were noted in the report by Dr B.⁷
16. A CTVC image review was undertaken by HBDHB following Mrs A's cancer diagnosis in 2020. The second radiologist's review noted that the scan in 2016 showed a “14x12 mm slightly irregular minimally spiculated⁸ nodule” visible on the right lower lung that “should be considered highly suspicious for cancer”.
17. With regard to the CTVC of 4 November 2016, Dr B noted that this was an urgent (additional) case that was undertaken between booked cases that day. The medical history and request from the specialist was to look for colonic lesions, and the natural focus of the procedure was the colon. Dr B told HDC that his standard practice for CT colonography is to spend some time reviewing the colon thoroughly as the main organ in question, and then look for extra-colonic lesions within the abdomen and bases of the lungs. He noted that deep concentration is required when navigating through all colonic segments to ensure that no lesions are missed.

³ The contracted and crooked part of the colon immediately above the rectum; the sigmoid colon is also called the pelvic colon, or sigmoid flexure.

⁴ A disorder characterised by abnormal pouches or sacs (diverticula) that push outwards through weak spots in the wall of the intestine.

⁵ Patients must undertake two days of bowel preparation prior to a conventional (optical) colonoscopy or CT virtual colonoscopy (CTVC). When a conventional colonoscopy cannot be completed, usually a CT (virtual colonoscopy) will be undertaken urgently on the same day to avoid the patient having to undergo further colonic preparation.

⁶ Dr B is no longer practising in New Zealand.

⁷ While the purpose of the CT virtual colonoscopy is to visualise the bowel, other organs in the chest, abdomen, and pelvis can be seen on the scan. Other findings in this context would be “extra-colonic”.

⁸ A spiculated nodule has irregular/jagged edges and a higher suspicion of cancer.

18. On reviewing the scan in response to this complaint, Dr B could see the lesion at the base of Mrs A's right lung, and agrees that the lesion should have been identified and reported. With the passage of time, Dr B is unable to recall whether he saw the lesion and failed to include it in the report, or did not see it at all.

Abdominal X-ray 24 January 2018

19. Mrs A was referred by her general practice to HBDHB for an X-ray of the abdomen, as she was experiencing ongoing abdominal pain and diarrhoea.
20. The X-ray was reported by Dr B on 24 January 2018 as: "The bowel gas pattern is unremarkable with no signs of intestinal obstruction." No other structures or pathology were noted in the report by Dr B.
21. On review by HBDHB, a second radiologist reviewer considered the lesion in the right lower lung to be perceptible on this abdominal X-ray.
22. Regarding the abdominal X-ray of 24 January 2018, Dr B noted that at that time he was reporting on a large number of plain X-rays and ultrasounds a day. Dr B recalls that both he and one other radiologist were reporting between 60–75 plain X-rays. Dr B told HDC that he also reported on 40 ultrasound scans per day.
23. Dr B stated that he has a standard reporting process, and in the case of abdominal X-rays such as Mrs A's, he would be looking for major issues like intestinal obstruction, pneumoperitoneum,⁹ free air, and stones. He stated: "Given this focus, it is easy to overlook a soft tissue nodule at the edge of the X-ray film during a continuous plain X-ray reporting session." Dr B noted that the best way to detect lung lesions is by chest X-ray rather than abdominal X-ray, as was the case here.

Subsequent events

24. Three years after the CTVC, Mrs A was seen at HBDHB on 28 February 2020 with abdominal/right flank pain and unintentional weight loss. She had a CT of the abdomen and pelvis on 28 February 2020, which identified an irregular mass in the right lung base that was concerning for primary lung cancer. A CT of the chest and a referral to a respiratory specialist were recommended. Sadly, after further investigation, Mrs A was diagnosed with lung cancer.
25. At the request of the respiratory team, the head of Radiology at HBDHB undertook a retrospective review of the CTVC performed on 4 November 2016. A spiculated node considered highly suspicious for cancer was visible on the CTVC images of the right lower lung at that time, and had not been reported. The report was updated with an addendum to document the lung nodule and note some emphysematic¹⁰ lung changes.

⁹ The presence of air within the peritoneal cavity.

¹⁰ Changes to the walls of the air sacs (alveoli) in the lungs.

HBDHB response to event

26. Following Mrs A's lung cancer diagnosis, on 20 March 2020 a respiratory specialist met with Mrs A and her family and discussed the missed opportunity for earlier diagnosis. A treatment injury claim was lodged with ACC, and the incident was reported as an SAC2 Adverse Event.¹¹
27. HBDHB conducted an Adverse Event Review, and a second expert opinion (further to the opinion obtained from HBDHB's head of Radiology) was obtained from HBDHB radiologist Dr D. All radiology reports from the time of the CTVC on 4 November 2016 until the scan taken on 28 February 2020 were reviewed by Dr D.
28. Between the CTVC on 4 November 2016 and the CT scan of the abdomen and pelvis on 28 February 2020, Mrs A had two chest X-rays at HBDHB (on 5 November 2016 and 5 July 2017) that did not identify the lung lesion. HBDHB's Adverse Event Review considered that chest X-rays taken during that time "would be unlikely to routinely show the lesion as the spiculated node was hidden behind the diaphragm and could not be seen. Detection and confirmation of the lesion was only possible with the CTVC, CT and abdominal imaging."
29. Dr D identified two instances where the tumour was missed on reporting:
1. Dr D noted that although the CTVC of 4 November 2016 was primarily to investigate the bowel, "the remainder of visualized and lower chest needs to be interrogated". He identified that the spiculated mass in the right lower lung was visible in the images and "should be picked up, reported and notified as an unexpected finding/suspicion of malignancy".
 2. The abdominal X-ray of 24 January 2018 showed an "ill-defined lesion ... and is likely to be in the lung". It "requires an appropriate search pattern to be detected. It is debatable whether the lesion is sufficiently conspicuous and detectable". Dr D noted: "I can understand that the lesion potentially gets missed if doing a busy or rushed reporting list."
30. Dr D's opinion is that the lung lesion was visible on the CTVC in 2016, and that an average radiologist should have detected this by applying an appropriate search pattern.

HBDHB Adverse Event Review findings and outcome

31. The review noted that all areas of an image should be reviewed for abnormalities and reported where present, and found that there were missed opportunities to detect the lung lesion in the CT scan of 4 November 2016 and the abdominal X-ray of 24 January 2018. The report concluded that there was "a direct causal link from the delay in identifying the lesion to the progression of [Mrs A's] illness as identified on 28 February 2020".

¹¹ A Severity Assessment Code (SAC) 2 event is one that results in permanent major or temporary severe loss of function that is not related to the natural course of the illness, or differs from the immediate expected outcome of the care management.

32. The review noted that it is accepted that diagnostic errors in radiology do occur, and that errors may be either perceptual or cognitive in nature, with both human and systems-based contributing factors. The review stated:

“[At the time of the error in 2016,] the Radiology department was under resourced with radiologists and workload was increasing. There was increased staff pressure due to staff shortages. Staff shortages and pressure therefore may have been a contributing factor in the reporting error on the 4th November 2016.

...

As we are unable to speak to the radiologist concerned the chronic understaffing of the department leads us to suggest that this error was likely a human error due to fatigue, distraction and overload.”

33. The review found that the failure to identify the lesion was due to individual staff factors, and the review report made a recommendation related to mitigation of the human error factor. In seeking to reduce errors, radiologists now use an “all images approach” to reading images, and the Radiology Department holds regular discrepancy meetings in which radiologists discuss and reflect on cases.
34. Dr B has since resigned from HBDHB and did not take part in the Adverse Event Review.

Further information

Dr B

35. Dr B told HDC:

“Firstly, I would like to start by stating how upsetting it was to learn of this situation, in particular that I missed two opportunities to recognise the abnormalities on [Mrs A’s] 4 November 2016 and 24 [January] 2018 test results. I would be grateful if you could please convey my sincerest apologies to [Mrs A] and her family for my oversights in her care and the distress these undoubtedly caused. I was personally heartbroken to be informed of these. My role as a doctor is always to protect my patients and help them in any way possible and I regret that I missed opportunities to do so in this case.

However, I also accept that humans are naturally prone to mistakes. Given the nature of the work health professionals do, such mistakes can have devastating consequences. I always knew this to be the case when I entered into this profession, but I proceeded with that risk because ultimately, I believed I would be able to help and do good for patients.”

36. Dr B noted that the work environment at HBDHB at the time required CTVC/colonograms to be read in a small side reporting room in the main CT room where the 3-D assessment software workstation was available. There were distractions in this environment, and continuous focus could be broken.

37. Dr B reported that chronic understaffing in the Radiology Department was at its worst in 2016–2017. He said that this “put tremendous pressure” on his daily work, and staff had “an increasingly heavy workload with shorter reading and reporting times”. The practice of double reading or even self-second reading to reduce the risk of errors was “virtually unattainable”. He noted that staff had raised concerns and requested additional resources to support the department, but this was not fulfilled.

HBDHB

38. HBDHB acknowledged that in 2016 the Radiology Department was facing considerable staffing and resource pressures. The sustained pressure and increasing clinical risk associated with long wait times and report turnaround times during 2016–2017 was recognised, and HBDHB provided HDC with the following table of reporting volumes:

Weekly Reporting volumes at the time when Mrs A’s examinations were reported.

	Week (04.11.2016)	Week (24.01.2018)
CT	47	12
Fluoro	6	1
MRI	13	7
Plain Films	75	45
Ultrasound	83	139
Radiologist	1 of 6 radiologists reporting	1 of 6 radiologists reporting Plus, out-sourcing of plain film reporting to tele-radiology provider

39. An external peer review that considered demand/capacity issues for the radiology service was undertaken in October 2016 to January 2017. The review noted the impact of a shortfall in radiologist hours, and concerns were raised about radiologists prioritising quantity over quality, and tensions within the team were seen as symptomatic of the Radiology team being under stress. The review stated:

“The Radiologist level constraint is resulting in the service having to decide between knowingly overloading the Radiologists with a volume of work they cannot reasonably be expected to get through, growing waiting lists by restricting the throughput of modalities, or a combination of the two. Both compromise the quality and safety of the HBDHB Radiology Service, including causing delays in patient care.”

ACC

40. External clinical advice was provided to ACC in relation to Mrs A’s treatment injury claim. The ACC radiology advisor, Dr E, noted that all four radiologists who undertook a blind¹²

¹² A “blind review” is where the reviewer looks at a set of radiology studies, not knowing which one is at issue. This provides an unbiased assessment without the benefit of hindsight.

review of the CTVC taken on 4 November 2016 reported the mass on the right lower lobe of the lung and suggested further imaging. The advisor was in agreement with this finding.

41. Dr E considered that the report was not of an appropriate standard, as it reported only on the virtual colonoscopy component, not the scan as a whole, which would include extra-colonic findings.
42. ACC also obtained a clinical report from Mrs A's oncologist, which it cited in the Treatment Injury Report. The oncologist reported to ACC that imaging of the chest in the CTVC in 2016 was not cross-sectional, and it was not possible to say at what stage the cancer would have been. Mrs A had no symptoms suggestive of lung cancer in 2016, but the oncologist considered it very likely that Mrs A had lung cancer at that time, and that if she had been diagnosed, it is likely she would have received treatment at an earlier stage with an improved prognosis.
43. ACC accepted Mrs A's treatment injury claim for disease progression of adenocarcinoma¹³ of the right lung.

Responses to provisional opinion

Dr B

44. Dr B was given an opportunity to respond to the relevant sections of the provisional opinion, and confirmed that he accepted the findings and had no further comments.

HBDHB

45. HBDHB was given an opportunity to respond to the provisional opinion. HBDHB accepted the provisional opinion as an accurate reflection of information provided, and supported the recommendations and follow-up actions.

Mr A

46. Mr A was provided with an opportunity to comment on the "information gathered" section of the provisional opinion. He is concerned that the radiologist failed to carry out his duties in a diligent and professional manner, and considers that regardless of staffing pressures and work overload, the radiologist should not have started new tasks until the work in front of him had been completed thoroughly. Mr and Mrs A noted that apologies cannot repair the harm suffered as a result of the missed diagnosis, and they believe that there should be accountability for the error and actions taken to ensure that matters of this nature do not occur again.

¹³ Adenocarcinoma is a malignant tumour originating in glandular epithelium (the lining of certain internal organs including the lungs).

Opinion: Preliminary matters

47. In order to assist my assessment of the standard of care provided to Mrs A, I obtained independent radiology advice from Dr Helen Moore. As part of her advice, Dr Moore noted:
- “Numerous studies have shown a significant rate of error in radiological reporting accuracy; such that unfortunately, both under reporting or misinterpreting imaging findings is relatively common, and can occur despite otherwise excellent accuracy and experience.
- ...
- [P]ublic statements [by medical and nursing professional bodies] raise the flag that there is current and ongoing risk of an increased rate of medical error across many DHBs and medical specialties across NZ, due to understaffing and increased workload.”
48. I acknowledge that radiology reporting is a complex perceptual and cognitive task, and I accept that some degree of human error is unavoidable. I also note that working conditions may increase the risk of error.
49. However, as stated by this Office previously, just because it is widely accepted that errors of perception (such that a radiologist misses an apparent abnormality that would have been detected by most of their peers in similar circumstances) occur in a small but persistent number of radiology interpretations, that is not determinative in assessing whether the standard of care has been met in a particular case.¹⁴
50. Whether the standard of care has been met will be assessed on a range of factors, including the clinical history of the patient and how obvious the abnormality is. The standard of care applicable in the present case is the care and skill that an ordinarily careful radiologist would exercise under similar circumstances.
51. As has been acknowledged previously,¹⁵ in the circumstances of an independent advisor reviewing radiology images, it is near impossible to recreate the precise working conditions or circumstances under which a radiologist reviewed the images originally. Independent advisors are aware of this context when providing advice to this Office.
-

¹⁴ Opinions 15HDC00685, 17HDC00415, 19HDC02399.

¹⁵ Opinion 15HDC00685.

Opinion: Dr B

52. Mrs A had four radiological investigations at HBDHB between November 2016 and January 2020.
53. My independent radiology advisor, Dr Moore, reviewed the chest X-rays taken on 5 November 2016 and 5 July 2017. Her opinion is that even with hindsight, the known right lower lobe lung lesion is not convincingly visible. She considers that the standard of these X-ray reports is good.
54. Dr Moore considers that the lesion was perceptible on the abdominal X-ray and CTVC. She said that the standard of the abdominal X-ray report is acceptable in light of the lesion being able to be missed even at the best of times. However, she stated that the lesion shown on the CTVC should have been noted, and that Dr B's CTVC report does not meet the accepted standard of practice.
55. I accept that Mrs A's lung lesion was visible on the CT scan of 4 November 2016, and consider that the failure to report on the lesion resulted in a missed opportunity for earlier diagnosis and treatment. Dr B has asked HDC to pass on his apologies to Mrs A and her family for the oversights in her care and the distress this caused.

CTVC — breach

56. Mrs A's CTVC undertaken on 4 November 2016 was for bowel screening after an unsuccessful conventional colonoscopy, and the request was in light of "evidence of significant colonic lesions". Dr Moore considers that the reporting of the CTVC on 4 November 2016 is of a satisfactory standard in regard to the colonic findings.
57. Dr B noted that the "natural focus" of the scan was on the colonic findings, and I also accept the Adverse Event Review statement that extra-colonic findings are less well characterised on CTVC than with a regular CT scan. However, the expectation is that extra-colonic findings still need to be addressed, and that if they are not addressed, this should be stated explicitly in the report.¹⁶
58. The radiologists involved in reviewing the CTVC (ACC and the Adverse Event Review) and my independent advisor all noted the presence of a mass in Mrs A's right lower lobe, and said that they would have suggested further imaging or other follow-up. On reviewing the CTVC himself, Dr B accepted that the lung lesion was visible at the time of reporting in November 2016.
59. Regrettably, no mention is made of extra-colonic review in Dr B's original report. Dr B is unable to recall whether the error was the result of a failure to identify the mass, or failure to include it in the report.
60. Regarding the lung lesion on the CTVC, Dr Moore advised that omitting to report the lesion is a significant error because at the size of about 12mm, the lung nodule would have been

¹⁶ Burling et al, CTC standards, An International Collaboration (2010) (cited in HBDHB's Adverse Event Review).

expected to be picked up as part of normal practice, given its peripheral position. She noted that it is visible on both lung and soft tissue windows. Dr Moore also noted:

“[U]nfortunately, both under reporting or misinterpreting imaging findings is relatively common, and can occur despite otherwise excellent accuracy and experience. It is important to note that such an error, occurring in isolation, does not signal general incompetence of radiological performance.”

61. Dr Moore advised that taking into account the significant workplace issues and environmental factors that contributed to the error, “peer disapproval of the individual is reduced and ‘system’ disapproval is increased”.
62. Overall, Dr Moore considered the failure to report the lung lesion on the 4 November 2016 CTCV to be an “error which is a serious departure from accepted practice, and viewed with moderate to severe disapproval”.
63. HBDHB acknowledged that the Radiology Department was under-resourced in 2016–2017, and I have taken this into account in considering whether there is a breach finding. Nevertheless, the consensus of opinion is that the lesion was visible on the CT scan in 2016 and should have been reported. The lesion was a significant finding, and Mrs A was specifically being screened for cancer in light of her family history. I consider that Dr B’s scan report did not meet an adequate standard for such care. Accordingly, I find that Dr B failed to 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).¹⁷

Abdominal X-ray — no breach

64. Mrs A’s abdominal X-ray from 24 January 2018 was reviewed as part of HBDHB’s Adverse Event Review, and was reviewed by my independent advisor. Most reviewers noted the lesion in Mrs A’s lung on the abdominal X-ray, although this was not unanimous.
65. The Adverse Event Review second opinion was that while the lesion is visible, it “requires an appropriate search pattern to be detected. It is debatable whether the lesion is sufficiently conspicuous and detectable.”
66. Dr Moore considers that although the lesion is perceptible on this X-ray, it “could be missed at the best of times, and almost certainly missed in a busy and distracting environment”. She stated:

“A couple of the radiologists to whom I showed this radiograph did not see the lesion until they had reviewed the [CTVC]. The others saw the density and suggested options such as CXR¹⁸ with lateral view and clinical correlation.”

¹⁷ Right 4(1) states: “Every consumer has the right to have services provided with reasonable care and skill.”

¹⁸ A chest X-ray.

67. Dr Moore advised that missing the lung lesion on this X-ray was “not a departure of [the] accepted standard of practice”.
68. I accept this advice. As mentioned above, while most of the HBDHB reviewers and my advisor noted the lesion on this X-ray, some reviewers and peers of my advisor did not. In my view, this indicates that the lesion was not sufficiently visible on this scan for it to have been the standard of care to have identified it. I agree that in clinical circumstances where a lesion is not sufficiently detectable, it is not a departure from the accepted standard of practice to miss it. I consider that the standard of the abdominal X-ray report was reasonable in the circumstances.
-

Opinion: HBDHB — breach

69. In his response to this Office, Dr B raised concerns that the systemic conditions in which he was working increased the risk of a human error occurring. Staffing concerns were identified by the radiologists, and additional resources were requested to address their workload and safety concerns, which Dr B felt were not fulfilled.
70. As a healthcare provider, HBDHB is responsible for providing services in accordance with the Code. As such, HBDHB is required to provide a safe and appropriate workplace environment and to ensure adequate processes to manage clinician workloads. In this case, I consider that Dr B’s error indicates broader systems and organisational issues at HBDHB.
71. HBDHB acknowledged that there were significant workplace issues with understaffing and a high volume/high distraction workload in 2016, which are known to increase error rates.
72. Dr Moore noted:

“It is clear that in 2016–2017, from the data provided by the [Chief Operating Officer] (COO) and the testimony of [Dr B], that the radiology department at HBDHB was under resourced with radiologists (and medical imaging technologists), and the work demands on the small team at that time were unsafe and unsustainable.

...

Although impossible to prove, this environment would almost certainly contribute to the chance of this error being made. In these circumstances, peer disapproval of the individual is reduced, and “system” disapproval is increased, because the perceived possibility of themselves making a similar tragic error in such conditions is seen as realistic.”

73. I am concerned about the standard of service provision and clinical workload that were in place in November 2016. HBDHB has acknowledged that the Radiology Department was facing considerable staffing and resource pressures at a time of increasing demand for services. I accept that this was a complex situation, and that these challenges were not able to be remedied easily or quickly.

74. I acknowledge that HBDHB recognised that there were capacity/demand issues during 2016, and approved a business case in 2017 to relieve pressure on the service by outsourcing some reporting and by recruiting staff. However, I am concerned that by the stage these concerns were acknowledged and action was taken, the constraint in radiologist capacity was compromising the safety and quality of the service and creating a clinical risk for consumers.
75. HBDHB has an obligation to ensure that consumers have services provided with reasonable care and skill, and that employees have the conditions necessary to perform their work to an appropriate standard. In this case, I consider that the DHB's response to increasing radiology workloads was insufficient to support the team to maintain standards in the face of increasing demands on the service. In light of the difficulties in recruiting additional staff, I am concerned that the level of monitoring to identify the capacity/demand mismatch permitted an unsustainable workplace situation to occur in the first instance. Accordingly, I find that HBDHB failed to provide services to Mrs A with reasonable care and skill, and breached Right 4(1) of the Code.

Changes made since events

HBDHB

76. Following the review of the Radiology Department, HBDHB adopted capacity and demand forecasting tools, including the National Radiology Service Improvement Initiative (NRSII) modelling tool. HBDHB also commenced recruitment and expanded the after-hours contract in 2017. This measure was acknowledged in the 2017 annual International Accreditation of New Zealand (IANZ) on-site assessment, which considers organisational and personnel matters as part of service accreditation, although concerns remained about recruitment and retention of radiology staff.
77. HBDHB advised that in response to the human error factor identified in the Adverse Event Review, measures were taken to mitigate the risk of reporting errors and minimise disruptions to workflow. A "Learning from Discrepancies Meetings" policy and procedure was established for radiologists; a memo was sent to radiologists reasserting the need to interrogate the whole image study independent of the clinical question; and an audit of CTVC and abdominal CT images was undertaken to ensure that lung bases were reviewed and findings documented.
78. In response to the provisional opinion, HBDHB provided HDC with the following information:
- HBDHB told HDC that radiologist staffing was funded for 11.4 full time equivalent (FTE)¹⁹ Senior Medical Officer (SMO) staff, and currently 11.8 FTE SMOs were employed, along with the use of teleradiology services for out-of-hours and plain film reporting.

¹⁹ Employed FTE counts staff up to a maximum of 1.0 FTE, based on their contracted number of hours compared to a 40-hour working week. For example, a person contracted for 30 hours is 0.75 FTE, and a person contracted for 40 hours or more is 1.0 FTE.

- HBDHB further provided HDC with results from an audit of lung base reporting on abdominal CT scans. Two hundred abdominal CT scans taken in 2020 were randomly selected to assess whether HBDHB radiologists working at that time were including lung base findings in their reports, and to confirm whether any pathology may have been missed. The audit found that 174 (87%) of scan reports mentioned lung bases. Of the 26 (13%) of scans where lung bases were not mentioned in reports, 87% were normal, from which it may be inferred that the radiologist had not reported a normal finding. Two scans (1%) contained unreported pulmonary nodules that required further assessment. While the majority of radiologists reported on lung bases, one radiologist was an outlier. As an outcome, the importance of reporting both positive and negative findings has been reinforced among the radiologist group.

Dr B

79. Dr B told HDC that since learning of Mrs A's situation he has taken even more care to slow down when reporting, and ensure that he maintains his generally high standards of diligence and thoroughness. He said that he will pay greater attention to any distracting factors, and will try to remove these where possible.
80. Dr B now works in private practice overseas, where he can "demand the ability to work at a slower more reasonable pace without undue pressure". This ensures that he can always use structural reporting techniques, be involved in quality assurance reviews with colleagues, and maintain a systematic approach and constant vigilance in reporting.

Recommendations

81. I recommend that Dr B:
- a) Provide a written apology to Mrs A and her family for his breach of the Code. The apology is to be sent to HDC within three months of the date of this report, for forwarding.
 - b) Implement a "checklist" structured reporting style, with clear headings for each organ in the body to provide a cue for each abdominal organ to be evaluated carefully, and a check that this has been done. Examples of five (anonymised) cases where this new reporting style has been used are to be sent to HDC within three months of the date of this report.
 - c) Familiarise himself with the various radiological manifestations of lung cancer, by way of self-initiated research and/or attendance at multidisciplinary meetings where cases with typical or unusual manifestations of lung cancer are shown. Evidence that this has been done is to be sent to HDC within nine months of the date of this report.

82. I recommend that Te Whatu Ora Te Matau a Māui Hawke's Bay (formerly HBDHB):
- a) Provide Mrs A and her family with a written apology for its breach of the Code. The apology is to be sent to HDC within three months of the date of this report, for forwarding.
 - b) Initiate contact with any clinician involved in a complaint or Adverse Event Review to ensure that they are aware that concerns have been raised, and to provide the opportunity to be involved in the investigation process.
 - c) Ensure that staff are aware of the formal processes available for clinicians to raise concerns about their working environment and the process whereby these concerns are acknowledged and addressed by the organisation. Feedback on this recommendation should be provided to HDC within three months of the date of this report.
 - d) Undertake an updated audit of 30 randomly selected abdominal CT scans to confirm improvement in reporting of lung bases. This audit is to identify whether remedial measures implemented by the Radiology Department are proved effective, or whether alternative remedial actions are required. Feedback on this recommendation should be provided to HDC within six months of the date of this report.
 - e) Consider the use of template reporting for CT colonography in conjunction with C-RADS (CT Colonography Reporting and Data System). The outcome of this consideration is to be sent to HDC within three months of the date of this report.
 - f) Consider adopting a routine practice of sending lung base windows to PACS (Picture Archiving and Communication System) for CTC and CT of the abdomen studies. The outcome of this consideration is to be sent to HDC within three months of the date of this report.

Follow-up actions

83. A copy of this report with details identifying the parties removed, except the expert who advised on this case and Hawke's Bay District Health Board (now Te Whatu Ora Te Matau a Māui Hawke's Bay), will be sent to the Medical Council of New Zealand, and it will be advised of Dr B's name in covering correspondence.
84. A copy of this report with details identifying the parties removed, except the expert who advised on this case and Hawke's Bay District Health Board (now Te Whatu Ora Te Matau a Māui Hawke's Bay), will be sent to the Royal Australian and New Zealand College of Radiologists and the Ministry of Health, 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 expert advice was obtained from radiologist Dr Helen Moore:

"I (Dr Helen Moore) have been asked to provide an opinion to the Commissioner on case number 20HDC00972. 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 Consultant Radiologist, FRANZCR, MBChB (1992). I work as Senior Medical Officer at Auckland City Hospital, and Auckland Radiology Group. I perform CT Colonography (CTC) regularly and am accredited in CTC with my professional college; the Royal Australian and New Zealand College of Radiologists (RANZCR). I am on the CTC accreditation committee for RANZCR and involved in teaching/education in this area as well other Body Imaging subspecialities.

FACTUAL SUMMARY from the documents made available to me: The patient underwent a CTC, performed at HBDHB and read by [Dr B] on 4/11/2016. No abnormality was reported. Two chest radiographs and an Abdominal radiograph were subsequently performed, the latter most recently on 24/1/2018, all with no significant finding reported. It subsequently came to pass that a CT was performed on 28/2/2020 for epigastric pain. This identified a mass at the right lung base, and the patient was diagnosed with lung cancer. It then became apparent upon review that the CTC in 2016 had shown the right lung base tumour, but this had not been reported.

BRIEF: Please review the provided documentation and scans and advise whether you consider the care provided to [Mrs A] by [Dr B] and Hawke's Bay DHB was reasonable in the circumstances, and why.

REVIEW PROCESS:

Part 1. I provided a report on each of the above imaging studies, in temporal order, without knowledge of the situation. This was performed, as much as possible, as if I was reporting in daily work.

Part 2: I was then provided with background information about the situation and asked to give my opinions, with attention to whether the reports meet accepted practice. If they departed from this, to explain why, and how significant the departure is considered to be, and how it would be viewed by my peers. Information includes the imaging reports, Complainant letter and Responses from HBDHB management (COO) and the radiologist concerned. I am not privy to the Adverse Event Review findings from HBDHB or the IANZ review documents.

CTVC — The standard of [Mrs A's] CTVC report dated 4 November 2016 provided by [Dr B]: The CTC was technically well performed and there were no concerns regarding reduced visibility due to low dose, movement artefact or other potential challenges. The report is of satisfactory standard in regard to the colonic findings.

In regard to the extra-colonic findings, the lesion at the right lower lobe (RLL) of the lung was not reported. No mention was made of any extra-colonic review in the report. I cannot see a CRADS (CT Colonography Reporting and Data System) category assigned to the report.

It is recognised that extracolonic findings are less well seen and less well characterised on CTC, given the lack of intravenous contrast and lower dose than regular CT, but the standard is that they still need to be addressed. If they are not assessed this should be explicitly stated in the report. Reference: CTC Standards, An International Collaboration, Burling et al 2010.

To not report this lesion is a significant error because at the size of about 12mm, the lung nodule would have been expected to be picked up as part of normal practice, given its peripheral position. It is visible on both lung and soft tissue windows. This is an 'under-reading error.' (This is the most common error type, in which an examination is reported as normal, although there is an undeniable and detectable abnormal finding.) It is not possible to know whether it was a perceptual or cognitive error. The under-reporting was likely also influenced by 'abnormality lying outside the margin/area of interest' sub category of error, because this study was performed to evaluate the colon. However, as mentioned above, the other 'extra-colonic' findings still require review and this is an accepted standard. Given the relative conspicuity of the RLL lesion, it is quite possible that it was seen but then not included in the report.

Numerous studies have shown a significant rate of error in radiological reporting accuracy; such that unfortunately, both under reporting or misinterpreting imaging findings is relatively common, and can occur despite otherwise excellent accuracy and experience. It is important to note that such an error, occurring in isolation, does not signal general incompetence of radiological performance. There is a large body of literature which is available on Pubmed on the subject of medical error for further detail if required. The following two references are relevant in that they pertain to CT oncology and CTC, and are generally representative:

1. Discordant interpretations occurred in 31–37% of Oncological CT with change in staging in 19% and change in patient treatment in up to 23%. Ref: *Insights Imaging* 2017 Feb;8(1): 172–182.
2. A study of 60 CTC extracolonic findings with 6 month follow up found an error rate of 21%, of which 3% were highly significant. (Highly significant means diagnostic or therapeutic intervention recommended, such as a cancer or other life threatening finding, or interpretations leading to inappropriate treatment or complications). RSNA report 2004, M Zalis et al.
<https://www.researchgate.net/publication/266134894>

There are also review factors to consider when assessing this case; foremost being hindsight bias, which affects myself, my colleagues and other HBDHB colleagues who reviewed these images. This bias tends to make an error seem even worse i.e. almost

impossible to have overlooked. I have shown the CTC images to 6 colleagues who range from senior to junior consultant radiologists, and who range from experienced Body CT and CTC radiologists, to in-training for interpretation of CTC, or not trained in CTC. They all detected the lesion at the RLL and raised that it was concerning for malignancy.

The concept of normal or accepted practice is always evolving, but individual accuracy is inter-dependent with the systems in which radiologists work. I have included the following excerpt published from [Insights Imaging](#), 2017 Feb; 8(1): 171–182.

‘Frequent interruptions during the performance of complex tasks such as reporting of cross-sectional studies can lead to loss of concentration and failure to report abnormalities identified but forgotten when the radiologist’s attention was diverted elsewhere. Frequent clinico-radiological contacts have been shown to have a significant positive influence on clinical diagnosis and further patient management; these are best undertaken through formal clinico-radiological conferences [34], but are often informal, and can have a distracting effect when they interfere with other, ongoing work. Common to all of these system issues is the theme of fatigue, both visual and mental.’

Considering all these factors, in my opinion, the standard of the CTC report is less than accepted standard of practice, by a moderate to severe degree. It was viewed with moderate to severe disapproval by my peers, but at the same time it was considered to be a fairly possible error if working in an excessively busy distracting environment. This environment has been recognised as present during the time the error was made at HBDHB in 2016, by IANZ and hospital management, and is discussed further below.

Chest x-ray from 5 November 2016 — The standard of [Mrs A’s] x-ray report was good. Even with hindsight, the known RLL lung lesion is not visible.

Chest x-ray from 5 July 2017 — The standard of [Mrs A’s] x-ray report dated 5 July 2017 was good. Even with hindsight, the known RLL lung lesion is not convincingly visible.

Abdominal x-ray from 24 January 2018 — The standard of [Mrs A’s] x-ray report dated 24 January 2018 was acceptable. The lesion in the RLL is perceptible on this AXR projected over the liver shadow, but could be missed at the best of times, and almost certainly missed in a busy and distracting environment. A couple of the radiologists to whom I showed this radiograph did not see the lesion until they had reviewed the CTC. The others saw the density and suggested options such as CXR with lateral view and clinical correlation.

Hence, in my opinion the miss of the RLL lesion on this AXR is not a departure of accepted standard of practice.

Hawke’s Bay DHB — Comment on: The adequacy of the systems in place at Hawke’s Bay DHB at the time of these events (including policies and processes, staffing and support provided to its radiologists, managing of the workload at the DHB and the working environment for its radiologists):

This is a broad and complex topic; which may require supplementation by a radiologist with experience as a clinical director, and input from service managers. However, I have been involved with departmental staffing and resource projects including job-sizing, as well as developing systems for best practice in service provision and multidisciplinary meetings.

It is clear that in 2016–2017, from the data provided by the COO and the testimony of [Dr B], that the radiology department at HBDHB was under resourced with radiologists (and medical imaging technologists), and the work demands on the small team at that time were unsafe and unsustainable. According to information from [Dr B] this was identified by the radiologists, with requests allegedly made to management to address their workload and safety concerns, which he felt were not heeded. I cannot assess the accuracy of that, but it is well known in the public health system that such issues are often unable to be fixed in a timely fashion. The specific reasons for this are not available to me, but usually are due to lack of FTE or ability to fill FTE, combined with the lack of funding to pay for locum cover (and/or lack of locum availability).

The COO letters refer to an internal review in response to the concerns about working conditions in the Radiology Department, which is proof the concerns were heeded. After the internal review he refers to an external review, and I assume the latter to be the IANZ accreditation report in 2017. The pressures described above were confirmed in the IANZ report, with corrective actions required. According to the data supplied by the COO there were actions undertaken, and ‘the Radiology department was commended (by IANZ) (International Accreditation New Zealand) on its recognition of the issues and immediate action undertaken to mitigate the associated risks.’ Initial measures included use of locum services, external teleradiology services and after hours/weekend reporting.

There were also efforts directed at mitigating human factors, such as reducing interruptions, attention to workload, and audit/discrepancy meetings, which I understand have continued. Although many improvements seem to have been made fairly quickly, some actions such as actual increase in FTE take time to implement. From [Dr B’s] account, he felt compelled to leave the hospital in 2018, and work [overseas] in a position with better conditions, in order to look after his own wellbeing. This is well before he even knew of his tragic error. In his words: ‘It put me in a position of risk where I felt my employers were no longer staying true to their duty to ensure I could safely carry out my role without real consequences on my personal health and safety.’

Should [Dr B] and his colleagues have declined to work in those conditions sooner, in the interests of patient and personal safety? The ability to accurately self-monitor one’s ability to practise safely is not practically possible for most people in the heat of the moment, and is also reduced in a chronically understaffed environment as described at HBDHB, due to normalisation of workload and fatigue. This comment is not to evade personal responsibility, but rather to recognise that the situation is complex. In many respects, the medical workforce in general is its own worst enemy, as doctors and other

team members tend to keep working under poor conditions, and when they know they are excessively fatigued or stressed or unwell, in order to keep serving the patients and not let their colleagues down. This is well documented as presenteeism; meaning ‘attending work whilst unwell physically, mentally, or emotionally and therefore not performing at full ability’. Quite apart from being a productivity issue, it is a safety issue in the medical workforce, and has been specifically recognised and studied in the NZ Senior Medical Workforce. Reference NZMJ 2017, Vol 130 No 1449.

System improvements and efficiencies, while very important, will not make up for true understaffing and lack of resources. The resultant spiral of workarounds and staff burnout, with associated patient safety risks from reduced quality of care, and subsequent loss of staff, is a concerning issue for our health system and the patients who rely on it. This situation is not uncommon across NZ, and in many other countries. Ultimately it is a political decision of how much to fund the public health system. Broadly speaking, the return on investment in public health is undeniable and large, whether measured in health gains to society and individuals, or economic gain. Unfortunately because it requires significant spending up front, no government seems to want to be the one to make this investment; particularly with so much deferred infrastructure maintenance expenditure required right now in NZ, just to maintain the status quo.

The Association of Salaried Medical Specialists (ASMS) has recently stated in its December 2021 submission on Pae Ora (Heathy Futures) Bill, that they ‘... highlight the significant shortages of medical specialists (senior doctors and dentists). We estimate that shortage to be 24% across the country. In addition, modelling by the Ministry of Health shows the projected need for specialists is greater than the projected growth of the specialist workforce. This modelling does not consider the current unmet health need, nor does it acknowledge current specialist workforce shortages’. The NZ Nursing Organisation has similar concerns, with this recent public statement: ‘Nurses are ignored or side-lined when they raise the alarm. Agreed escalation processes that would reprioritise less urgent care are not being used to reduce pressure on our health system, and staffing shortages are not being proactively addressed.’ Ms Barker, NZMO, Dec 21 2021.

These public statements raise the flag that there is current and ongoing risk of an increased rate of medical error across many DHBs and medical specialties across NZ, due to understaffing and increased workload.

I note that [Dr B] was unaware of his error until approximately April 2021 and was not involved in the Adverse Event Review process. Optimally, he should have been informed of this error at the time of the Review in order to increase accuracy of information provided for the Review, and crucially to have the opportunity to remedy/improve his practice. He states: ‘I confirm that I was not consulted or involved in relation to the HBDHB’s Adverse Event Review process. The provision of the report in your letter is the first I have seen this review and its conclusions.’

CONCLUSION:

To not report the RLL lung lesion on the CTC is an unfortunate error which is a serious departure from accepted practice, and viewed with moderate to severe disapproval by my peers. There were significant workplace issues with understaffing and high volume-high distraction workload in 2016, which are known to increase error rates. Although impossible to prove, this environment would almost certainly contribute to the chance of this error being made. In these circumstances, peer disapproval of the individual is reduced, and 'system' disapproval is increased, because the perceived possibility of themselves making a similar tragic error in such conditions is seen as realistic.

RECOMMENDATIONS for improvement that may help to prevent a similar occurrence in the future:

In regard to HBDHB, the policies and systems put in place after the IANZ review are excellent and appropriate, and will reduce the risk of under-reporting and other errors happening again. I am informed that these improvement processes include: Increased FTE and locum use according to the best available NZ data (from the National Radiology Service Improvement Initiative — Canterbury model), Allocation of a Duty radiologist to manage clinical queries and reduce interruptions at reporting, Monthly discrepancy and learning meeting, Audit of CTC and CT abdomen images to ensure lung bases have been reported, Hybrid model of in house and out-sourced service reporting to reduce workload, and monitoring of workload.

However, it is of concern that there was such a perceived delay in the improvement of the work environment, according to [Dr B], from when concerns were first raised. Actions taken sooner may have reduced the chance of this error occurring, and also reduced the likelihood of losing a Radiologist from the NZ medical workforce. If not already addressed, HBDHB management should review the reasons for this delay and implement changes as required.

This tragic error can be reflected upon in the setting of our wider public health system issues. As outlined by data from ASMS and NZNO, there is ongoing significant SMO and nursing staffing shortage across the country. I recommend that this is addressed in good faith by fund-holders and policy makers, in order to prevent increases in medical errors/patient harm, and prevent further loss of the health workforce. Many solutions have been outlined by these organisations, and need to be taken seriously and implemented.

I recommend that any doctor being the subject of a complaint is involved in its review, optimally at the time of the Adverse Event Review, both to provide more detailed information, and to be able to have the opportunity to improve or remedy their practice. I am unaware of any other concern regarding [Dr B's] standard of practice, and assume that his cases were included in the CT lung base audits carried out by the department. If these audits found any cause for ongoing concern regarding his error rates compared to his peers then this information should be conveyed to him and

further audit of his more recent work should occur, tailored to the areas of concern. For example review of 50 CT abdomen cases over the last couple of years, to ensure the lung bases are being accurately reviewed.

I recommend the use of template reporting for CT Colonography in conjunction with C-RADS (CT Colonography Reporting and Data System. Radiology 2005, 236). This approach reduces error by providing headings that serve as reminders for the reporting doctor, for example a basic Template as follows: Indication, Technique, Findings — Colonic and Extra-colonic, Opinion, C-RADS C_E_. The use of CRADS aids evidence based management and optimises audit processes by categorising the significance of colonic and extracolonic findings. This is the most widely used CTC quality system in NZ (present on 91.6% of 444 CTC reports in a Northern Metro DHB audit in 2015. Reference: CTC Service Improvement Initiative, Northern Regional Alliance 2015.)

I recommend the routine practice of sending lung base windows to PACS (Picture Archiving and Communication System) for CTC and CT abdomen studies. This will serve both as an aid for reporting efficiency and reminder for specific lung base review.”

Dr Helen Moore’s “blind review” report on images received:

“HDC 20HDC00972

CT COLONOGRAPHY 4/11/2016, 2.41pm.

INDICATION: Colonoscopy for strong family history of colorectal cancer. Unable to progress through the colon secondary to diverticulosis and likely pelvic adhesions. Evidence of significant colonic lesions.

TECHNIQUE: The study is reported retrospectively and I do not have the details of the bowel preparation technique. Air or Carbon dioxide was introduced into the rectum. Multislice helical scans were obtained in both the supine and prone positions. Images were viewed in various planes, in 2D and 3D reconstructions.

FINDINGS: Bowel preparation is good however there is a large amount of contained residual fluid in the colon. This has not been iodine tagged, which reduces specificity, but generally shifted well between prone and supine images with overall satisfactory visualisation. Distension was good.

There is moderate diverticulosis of the colon, particularly involving the sigmoid. No active inflammation is demonstrated. Normal ileocaecal valve. No mass lesion or definite polyp. Mild focal thickening is present along the left side of the mid rectum on both series, about 8mm diameter and 2mm thick, suspicious for a polyp. A similar smaller possible polyp is present along the left wall of the distal sigmoid colon, 6mm. Due to the lack of fecal tagging it is not possible to be sure whether these represent adherent fecal residue or small polyps.

EXTRACOLONIC FINDINGS: The abdominal organs have normal size and contour on this non-contrast study. No enlarged abdominal or pelvic lymph nodes. No free fluid or air. Normal calibre aorta.

A lobulated solid nodule is present at the right lower lobe, measuring about 12 mm. It has spiculated tethering to the pleura. The left lung base is clear, with note made of a Bochdalek hernia containing fat. Bibasal emphysema noted.

No destructive bone lesion.

OPINION: Moderate sigmoid diverticulosis. No colonic malignancy. Possible 8mm flat polyp left rectal wall and 6mm polyp distal sigmoid colon. The lack of bowel tagging preparation reduces specificity of these findings and correlation with recent distal endoscopic findings is recommended.

Incidental finding of a 12 mm solid nodule at the right lower lobe raising possibility of neoplasia. Respiratory specialist opinion is recommended for further assessment.

Dr HELEN MOORE
Radiologist

Note: CT colonography is not intended for the detection of diminutive polyps (those 5mm or smaller), the presence or absence of which may not affect patient management decisions. It should also be noted that although extracolonic pathology can certainly be detected on CTC, this low dose examination is not optimised for this.

CRADS Code: C1E4

Chest x-ray PA from 5 November 2016, 12.50pm. Nb image notation date 11/5/2016

Clinical details: Colonoscopy and polyp removed yesterday. Today, increased abdominal pain and guarding. PR bleed. Query free air.

FINDINGS: No prior radiographs for reference.

Heart size is at the upper limit of normal. Mediastinal and hilar contours are normal.

The lungs are well inflated and no focal abnormality is demonstrated.

Minor blunting of the left costophrenic angle is noted, which could be long-standing or due to a trace of pleural fluid. No free air is demonstrated under the diaphragm.

No obvious bony abnormality.

COMMENT: No evidence of perforation, although this cannot be completely excluded on imaging. Ongoing clinical review is recommended.

Dr HELEN MOORE
Radiologist

Chest x-ray 5/7/2017 PA image (notation on films 7/5/2017).

Clinical details: Tightness of chest.

FINDINGS: Reference to the prior study of 5/11/2016.

Heart size, cardiac and mediastinal contours remain normal.

The lungs remain well inflated. Stable blunting of the left costophrenic angle. No focal lung abnormality is detected. No evidence of pleural fluid.

No obvious bone abnormality.

OPINION: No cause of symptoms has been demonstrated.

Dr HELEN MOORE
Radiologist

Abdominal x-ray 24/1/2018

Clinical details: Abdominal pain

FINDINGS: Supine study. The bowel gas pattern is normal with gas seen through to the distal colon. No faecal loading. No dilated or thick-walled bowel loops are demonstrated. No evidence of free air on this supine view.

Note is made of irregular partly rounded increased density in the right upper quadrant, which may reflect pathology in the lower lung or possibly liver.

Mild curvilinear calcification projected over the left upper quadrant is possibly vascular or related to costal cartilage. Mild degenerative changes are noted in the spine.

COMMENT: No cause of pain has been identified. A PA and Lateral Chest radiograph is recommended for further evaluation of the right upper quadrant density.

Dr HELEN MOORE
Radiologist

Appendix B: HBDHB Adverse Event Review

ADVERSE EVENT 83306



Adverse Event Review

Incident Number:	...
Name:	[Mrs A]
NHI:	...
Date of Incident:	4/11/2016
SAC Event	Provisional SAC 2
Commissioned by:	Chair of HBDHB Clinical Event Advisory Group
Report Due Date:	September 2020
Review team:	Radiology Manager Head of Department — Radiology Patient Safety Advisor
Distribution:	Clinical Event Advisory Group Relevant HBDHB Managers Other agencies who may enquire into this event:
Classification of Event	Clinical Process — Missed diagnosis

Objectives

- To conduct an internal organisation review and establish the facts related to care provided to [Mrs A] between 04.11.2016–28.2.2020
- Analyse the facts and establish contributing factors and cause of the event.
- To formulate recommendations to meet the criteria of SMART (Specific, Measurable, Achievable, Realistic, Timely).

The report is, in part, intended to ensure that actions that could be taken to prevent future harm are clearly documented and able to be shared with other relevant health service providers.

Executive Summary

On 04/11/2016 [Mrs A] had a colonoscopy because she had a strong family history of colorectal cancer. An 8 mm polyp in the sigmoid colon was resected and retrieved, but because of procedure difficulties a plan was made to perform a CT virtual colonoscopy (CTVC) later that day and this was completed in the afternoon. **The CTVC was reported on by [Dr B] and no lung nodule was identified and reported on at that time.**

A chest x-ray was taken on 5/07/2017 because of a left respiratory tract infection and **no abnormal findings were described at that time.** This was followed by an abdominal x-ray taken on 24/01/2018 because [Mrs A] had abdominal symptoms **and no abnormalities were found at that time.**

On 28/02/2020 [Mrs A] had a CT Pelvis and Abdomen booked due to continuing abdominal symptoms. The CT report documents *'an irregular mass within the right lung base which is concerning for primary pulmonary malignancy. An additional pulmonary nodule at the posterior basal segment of the left lower lobe would be concerning for a metastatic deposit'*.

On 05/06/2020, the Radiologist [Dr C] retrospectively reviewed images on the CTVC performed originally on 4/11/2016 on the request of the respiratory team and documented *'there is a 14/12 mm ... spiculated node in the right lower lobe with contact to the pleura. This nodule should be considered highly suspicious for cancer'*.

On notification of this information [a respiratory physician] spoke to [Mrs A] and explained the error that had occurred. He ensured that an ACC 45 claim was submitted and this has been processed. It was explained to [Mrs A] that an Adverse Event review would occur and that she would be advised of the findings with full disclosure.

A second expert opinion was sought by Radiologist [Dr D] who reviewed all the radiology reports from 2016 to 05/02/2020. He identified two instances where the tumour was missed on reporting (see below).

There was a delay of 3 years and 3 months between the CTVC in 2016 and the CT Pelvis and abdomen in 2020 which caused a delay in diagnosis and treatment. The review has found that Human Error was responsible for the event occurring and recommendations have been implemented to mitigate the chance of this reoccurring. It is recommended that this event be classified as a SAC 2.

As of August 2020, health records show that [Mrs A] had a restaging CT scan and that there is evidence of good response to the treatments prescribed particularly with a reduction in the lung lesions and also in the two liver lesions which had developed previously. The Oncologist had documented that there is no evidence of progressive disease and that the metastatic lung cancer is responding to chemotherapy.

Methodology

London Protocol

The Team gathered information via:

- Examination of patient's health record
- Examination of the Radiology Information System (RIS)
- Review of policies and procedural guidelines
- Review of the literature related to best practice relating to the incident type
- Information and suggestions for improvement from medical staff.
- Sourcing best practice available information.

Staff Involved

- Radiologist — [Dr B] (no longer employed by HBDHB)
- HOD Radiologist — [Dr C] (*First expert Opinion and retrospective reviewer of the 2016 CTVC completed on 05/06/20*).
- Radiologist — [Dr D] (*Second Expert Opinion and retrospective reviewer of all images from the CTVC in 2016 to February 2020*).

Findings

Relevant Past Medical history — [Age]

- COPD
- Severe depression
- Osteoporosis
- Hyperlipidaemia
- Hypothyroidism
- Hypertension
- Diverticulosis

Timeline

Date/Time	Action	Comments
4.11.16	Colonoscopy booked for strong family history of colorectal cancer. <u>Colonoscopy Summary</u> - Severe diverticulosis in the recto-sigmoid colon and in the sigmoid colon. There was narrowing of the colon in association with the diverticular opening. One 8 mm polyp in the sigmoid colon. Resected and retrieved. <u>Plan:</u> - Perform a virtual colonoscopy today.	
4.11.16	Referral to radiology for CT Virtual Colonoscopy following failed colonoscopy.	Colonoscopy unable to progress beyond sigmoid colon secondary to diverticulosis and likely pelvic adhesions
4.11.16 14:58	CT virtual Colonoscopy performed	Where possible failed Colonoscopy have CTVC on same day if considered safe to proceed after polyp removal. If at risk for bleeding colonoscopy will be referred for 30 days.
4.11.2016 15:41 Hospital Radiology Report	CT Virtual Colonoscopy reported by Dr	No note of lung spiculated mass on report
5.11.2016 Hospital Radiology Report	<u>Chest X-ray reported & Clinical Details Provided.</u> - Colonoscopy and polyp removed yesterday. Today, increased abdominal pain and guarding. PR bleed. <u>Clinical Question.</u> Free air? <u>Examination.</u> XR Chest Findings. Previous chest x-ray of 26 February 2016. No sign of pleural effusions or pulmonary consolidations. Minimal blunting of the left costophrenic angle is unchanged when compared to the previous chest x-ray. Heart size unchanged,	No spiculated mass seen

	no signs of intrapulmonary fluid overload. No signs of free abdominal air	
2016	In 2016, the Radiology department was under resourced with radiologists and workload was increasing. A review from the International Accreditation New Zealand Accreditation (IANZ) in 2017 highlighted the clinical risk of under staffing and lack of radiologists within the HBDHB Radiology department. There has been improvement in staffing establishment since 2016.	As we are unable to speak to the radiologist concerned the chronic understaffing of the department leads us to suggest that this error was likely a human error due to fatigue, distraction and overload.
5.7.2017	Chest X-ray – 68 Female – LRTI ongoing SOB and chest tightness. Left basal Creps	
6.7.2017 Hospital Radiology Report	Chest x-ray reported. Clinical Details Provided. Tightness of chest Clinical Question. Examination. XR Chest Findings. No significant lung or pleural pathology. Cardiomeastinal complex is normal. No significant change in status since 05/11/2016	Lesion not visible X-rays compared – 5.11.16 with 6.7.17.
24.1.2018 Hospital Radiology Report	Abdomen X-ray via GP On going abdominal pain and diarrhoea symptoms, query cause.	
25.1.2018 Hospital Radiology Report	Abdomen x-ray reported: Clinical Details Provided. Abdominal pain Clinical Question: Examination. XR Abdomen. Findings: The bowel gas pattern is unremarkable with no signs of intestinal obstruction (AA)	NAD

<p>28.02.2020 18:26</p> <p>Hospital Radiology Report</p>	<p>CT Pelvis and Abdomen via ED Unwell – epigastric pain ? Bowel obstruction / Hepatomegaly</p>	
<p>28.02.20 19:11</p>	<p>TELERADIOLOGY REPORT – RADIOLOGY Date seen: 28/02/2020 18:07 Date reported: 28/02/2020 17:11 Examination. CT Abdo/Pelvis Findings: CT ABDOMEN AND PELVIS CLINICAL NOTES:</p>	<p>Lesion is seen</p>
	<p>Unwell for the past 2 weeks. Initially epigastric pain then burning flank pain right more than left. Nausea, light-headedness, and bowels not opening. Palpable liver. Generalised abdominal tenderness and weight loss in the 6 months.</p> <p>FINDINGS: There is an irregular mass within the right lung base which is incompletely imaged. This has maximal axial measurements of 44 mm x 39 mm. The mass demonstrates broad contact with the pleural surface. No definite invasion of the chest wall. An additional 5 mm nodule is noted within the posterior basal segment of the left lower lobe. No pleural effusion is detected. The liver is enlarged measuring 19.6 cm in craniocaudal dimension. No suspicious hepatic lesion is detected. The remainder of the imaged upper abdominal solid organs are unremarkable.....”</p> <p>CONCLUSION: Irregular mass at the right lung base which is incompletely imaged with maximal axial measurements of 44 mm x 39 mm is concerning for primary pulmonary malignancy. An additional 5 mm pulmonary nodule at the posterior basal segment of the left lower lobe would be concerning for a metastatic deposit. Hepatomegaly but no suspicious hepatic lesion. No definite metastatic disease within the abdomen and pelvis.....Findings discussed with Dr [redacted] at 17:01 AEDT, 28/02/2020. Recommend CT chest for completion and respiratory specialist referral.</p>	

<p>5.6.2020</p> <p>Retrospective report requested.</p> <p>Dr reviewed 2016 report</p>	<p>HOD reviewed images on CTVC performed on 4.11.16 as requested by respiratory team</p> <p>Addendum: Image review based on scans done in February 2020 at request of the respiratory team. There is a 14 x 12 mm slightly irregular minimally spiculated nodule in the right lower lobe with contact to the pleura. This nodule should be considered highly suspicious for cancer. There are also some emphysematic changes.</p>	<p>Lesion noted from CT Abdo/Pelvis on 28.2.20.</p> <p>This is 3 years and 3 months after initial CT VC looking for reasons for abdominal pain.</p>
<p>28/02/2020</p> <p>Chest X-Ray</p>	<p>Teleradiology Report – radiology</p> <p>Signed off Dr</p> <p>FINDINGS</p> <p>The cardiothoracic ratio is normal. No hilar, or mediastinal mass, or lymphadenopathy.</p>	<p>No mention of lesion</p>
	<p>The lungs are shown with coalescing/ confluent parenchymal opacity through the right lower zone. No pleural mass, or collection. No focal bone lesion.</p> <p>CONCLUSION</p> <p>Coalescing/ confluent opacity consistent with acute infective pneumonia. A follow up film in 8 weeks is advised to ensure clearance.</p>	
	<p>Follow up history: -</p> <p>29.02.20 – CT Neck and Chest</p> <p>3.3.20 – Chest biopsy</p> <p>3.3.20 Chest x-ray</p> <p>4.3.20 - Chest x-ray</p> <p>11.3. 20 - Chest x-ray</p> <p>16.3.3.20 – chest x-ray</p> <p>17.03.20 Chest biopsy</p> <p>17.3.20 – chest x-ray</p> <p>17.3.20 – chest x-ray</p> <p>The case was discussed at radiology discrepancy meeting.</p> <p>Patient disclosure was reported as completed</p>	

Imaging reports

Type	Original reports	Radiologist [Dr C] — First expert opinion	Radiologist [Dr D] — Second expert opinion
CT Virtual Colonoscopy 04/11/2016	Findings. Satisfactory distension of the large bowel is achieved. There is slight thickening of the wall of the sigmoid colon with multiple diverticuli. No evidence of any significant colonic masses or large polyps can be seen. Radiologist [Dr B]	Image review based on scans done in February 2020 at request of the respiratory team. There is a 14 x 12 mm slightly irregular minimally spiculated nodule in the right lower lobe with contact to the pleura. This nodule should be considered highly suspicious for cancer. There are also some emphysematic changes.	Although study to investigate the bowel, the remainder of visualised and lower chest needs to be interrogated. 1.2 cm speculated mass lesion right lower lobe, visible in soft tissues window, and definitively visible in lung window, visible in supine and prone imaging, should be picked up, reported and notified as an unexpected finding/suspicion of malignancy
Chest X-ray 05/11/2020	Chest X-ray – Colonoscopy and polyp removal yesterday. Today increasing abdomen pain /guarding plus PR Bleed. Query free air.	No report	5/11/16 X-Ray chest PA Erect Good quality exposure. Even knowing about the lesion and its location, I cannot see it on this PA (X-Ray).
Abdo X-Ray 24/01/2018	Abdomen x-ray reported: Clinical Details Provided. Abdominal pain Clinical Question: Examination. XR Abdomen.	No report	24/01/2018 Abdomen AP Supine Ill-defined lesion in keeping projects onto the liver and is likely to be in the lung. The normal search pattern of a radiologist should detect this lesion. If

	<p>Findings: The bowel gas pattern is unremarkable with no signs of intestinal obstruction ...</p> <p>Radiologist [Dr B]</p>		<p>rushed, the lesion might have been overlooked. The detection of such a finding should result in comparison with priors and recommendation of further imaging.</p>
<p>CT Pelvis and Abdomen 28/02/2020</p>	<p>TELERADIOLOGY REPORT – ...</p> <p>RADIOLOGY</p> <p>Date seen: 28/02/2020 18:07 Date reported: 28/02/2020 17:11</p> <p>Examination. CT Abdo/Pelvis</p> <p>FINDINGS: There is an irregular mass within the right lung base which is incompletely imaged. This has maximal axial measurements of 44 mm x 39 mm. The mass demonstrates broad contact with the pleural surface. No definite invasion of the chest wall. An additional 5 mm nodule is noted within the posterior basal segment of the left lower lobe. No pleural effusion is detected. The liver is enlarged measuring 19.6 cm in craniocaudal dimension. No suspicious hepatic lesion is detected. The remainder of the imaged upper abdominal solid organs are unremarkable. Note made of prominent bilateral extrarenal pelves. No radiopaque gallstones. Extensive sigmoid diverticular disease and scattered diverticula are noted elsewhere throughout the colon. The lack of intra-abdominal fat makes assessment difficult.</p>	No Report	<p>28/02/2020</p> <p>Apart from the reported abdominal findings , clearly visible 4.5 cm right lower lobe speculated lesion suspicious for bronchogenic carcinoma until proven otherwise</p>

	<p>Allowing for this, no features of acute inflammation. No intra-abdominal free fluid or free air. No dilated loops of small or large bowel to suggest obstruction. Moderate amount of faecal material within the colon. No enlarged upper abdominal, retroperitoneal, or pelvic lymph nodes. Extensive calcific atherosclerosis involving the abdominal aorta without aneurysmal dilatation. No suspicious osseous lesions.</p> <p>CONCLUSION:</p> <p>Irregular mass at the right lung base which is incompletely imaged with maximal axial measurements of 44 mm x 39 mm is concerning for primary pulmonary malignancy.</p> <p>An additional 5 mm pulmonary nodule at the posterior basal segment of the left lower lobe would be concerning for a metastatic deposit.</p> <p>Hepatomegaly but no suspicious hepatic lesion. No definite metastatic disease within the abdomen and pelvis. Extensive sigmoid diverticular disease and scattered diverticula elsewhere throughout the colon without features of acute inflammation. Moderate faecal loading noted. Findings discussed with</p> <p>Dr ... at 17:01 AEDT, 28/02/2020.</p> <p>Recommend CT chest for completion and respiratory specialist referral.</p> <p>Signed off by Radiologist Dr ...</p>		
Chest X-Ray	TELERADIOLOGY REPORT – ...	No report	28/02/2020 XR Chest PA ERECT

<p>PA Erect 28/02/2020</p>	<p>RADIOLOGY Date seen: 28/02/2020 18:30 Date reported: 02/03/2020 14:46 Examination. XR Chest</p>		<p>3.6 cm right basal pulmonary mass lesion highly suspicious for bronchogenic carcinoma and requiring a specialist chest opinion and further workup (CT, Biopsy)</p>
	<p>Findings: X-RAY CHEST CLINICAL HISTORY Epigastric and flank pain. FINDINGS The cardiothoracic ratio is normal. No hilar, or mediastinal mass, or lymphadenopathy. The lungs are shown with coalescing/confluent parenchymal opacity through the right lower zone. No pleural mass, or collection. No focal bone lesion. CONCLUSION Coalescing/confluent opacity consistent with acute infective pneumonia. A follow up film in 8 weeks is advised to ensure clearance. Signed off by Dr ...</p>		

[Dr D] Summary — Second expert opinion

“I think that the lesion that turned out to be lung cancer was visible on CTVC in 2016 and an average radiologist should have detected the right lower lobe lung lesion by applying an appropriate search pattern which basically means looking at everything that has been imaged and documented on PACS.

Detection of the lesion at the time should have triggered an alert as unexpected finding to consider review by/referral to a chest physician and a radiologist’s recommendation to perform at least a follow up CT in 3 months to see whether the lesion is growing. Nowadays we have a more robust alert system for a case like this, I cannot comment on what system was in place in 2016 as I have only started working at HBDHB in 2017.

I think that an average radiologist would raise concerns about a high chance of bronchogenic carcinoma, as there are not many differential diagnoses to consider.

I struggle to see the lesions on subsequent XR examinations of the chest in 2016 and 2017 and think they are non-detectable.

The lesion becomes visible on XR of the abdomen in 2018. But again requires an appropriate search pattern to be detected. It is debatable whether the lesion is sufficiently conspicuous and detectable. If detected this should have triggered comparison with priors and further imaging by CT. I can understand that the lesion potentially gets missed if doing a busy or rushed reporting list.

In CT in 2020 the lesion is clearly visible even to the non-radiologist eye.

The lesion on CTV in 2016 was not reported for specific reasons that I am not aware of.

In general, these omissions can occur due to perceptual errors (caused by wrong search pattern i.e. not looking at everything imaged, satisfaction of search, fatigue, distraction/interruption) or less often cognitive/interpretive errors.

Analysis

The purpose of the first colonoscopy on 4th November 2016 was to look at the patient’s bowel within the context of a strong family history of bowel cancer. Due to probable adhesions the investigation was unable to progress and CTVC was booked for later the same day. The report written following the scan noted ‘*Satisfactory distension of the large bowel is achieved. There is slight thickening of the wall of the sigmoid colon with multiple diverticuli.*’

Retrospective reporting completed in 05/06/2020 showed that also visible on the scan was a 14mm x 12mm spiculated nodule in right lower lung lobe which had not been mentioned in the 2016 report. The nodule was either not noticed as it was sitting in the lower lung lobe and the radiologist was focusing on the colon, or the radiologist noticed the nodule but became distracted and failed to document this in his report.

Expert opinion states that a structured approach is required when reading images. The reporting radiologist is obliged to look and report, where appropriate, all of the images that can be seen. More newly trained Radiologists undertake the 'all images' approach as this is the expectation within Radiology at this time. The Radiologist in 2016 would have also been expected to have looked at the extra colonic findings and commented where appropriate on everything that could be seen. The final step would then have been to look at the colonic findings only. In summary all areas should be reviewed for abnormalities and where present, reported.

Numerous studies have looked at diagnostic error rates in Radiology. There is an estimated day to day rate between 3–5%, with contributing factors being both human and system based. Human error can and does occur. Diagnostic errors in Radiology may either be perceptual or cognitive. A perceptual error is deemed to have occurred when an abnormality is retrospectively determined to have been present on a diagnostic image but was not seen by the interpreting radiologist at the time of primary interpretation. However, an increased incidence of perception error may be attributable to specific risk factors. These include poor conspicuity of the target lesion on the image; reader fatigue; an overly rapid pace of performing interpretations; distractions, such as phone calls, e-mails, and other Internet-based distractions or interruptions; and a phenomenon known as satisfaction of search, whereby the finding of one abnormality on an image results in a second abnormality being overlooked, ostensibly because the radiologist is satisfied with the results of his or her search.

On 28th February 2020, [Mrs A] presented to the Emergency Department unwell, with epigastric pain, requiring CT for definitive diagnosis. The Teleradiology report from [the radiology service] using an "all images" approach noticed and reported an irregular mass within the right lung base measuring 44mm x 39mm. Without comparison of the CT on 4th November 2016 the irregular mass at the right lung base was considered a new finding and appropriate referrals and follow up diagnostics commenced.

Following this report, [Mrs A] had a neck CT and chest CT followed by chest biopsy on the 3rd March 2020 and another on the 17th March 2020. On the 20th March [Mrs A's] General Practitioner received a letter from [a respiratory specialist] noting:-

'Impression Likely primary lung cancer — biopsy pending but small sample — Nodules seen right lower lobe on CT colonography 2016 but not reported (internal route cause analysis for missed abnormality underway — fully disclosed to patient today with family). Radiologically the appearances are very much in keeping with a lung cancer with metastasis within the lung. There does not appear to be any lymph node involvement on the CT scan and there is no evidence of extra thoracic disease in bone, liver or elsewhere. Looking back through her radiology there was a right lower lobe nodule apparent on the CT colonography in 2016 which was not reported. This has been highlighted with an internal radiology process for missed abnormalities. I disclosed to [Mrs A] and her family that there was an abnormality visible on that CT scan but it was not brought to the attention of the respiratory team or any other doctors — this does constitute a missed opportunity for earlier diagnosis and potentially intervention and is certainly not the sort of error that we want the hospital to be

making. The Radiology Department will be examining the circumstances of this missed report, but I have welcomed a complaint from [Mrs A's] family if they were to want to escalate from their perspective'.

Due to the 'human error' aspect of this review, two expert opinions were used to report on the images. The first expert opinion reviewed and analysed the 2016 CTVC report. The second expert opinion reviewed all imagery produced between 2016 and the end of February 2020 and has identified two reports when the lesion was not identified during this period:

- CTVC — 04/11/2016
- Abdo X-Ray — 24/01/2018

Conclusion

The images from the initial CT scan on the 4th November 2016 contained a spiculated nodule measuring 14mm x12mm in the right lung base which was unreported. The images from the second CT scan on the 28th February 2020 showed the same spiculated nodule measuring 44mm x 39mm. The delay in diagnosis of 3 years and 3 months resulted in the delay of treatment of a primary lung tumour and incurred harm to the patient. The collected evidence points towards human error. Either the Radiologist (A) viewing the images did not look at the lung bases or did but forgot to comment on them following a distraction. It is apparent from the investigations and subsequent diagnosis that the initial spiculated nodule was missed on the CT in 2016. Human perceptual error could be accredited as the reason this occurred. This may have been secondary to high work load, distraction during the image reading or because of 'Satisfaction of search' having identified multiple diverticuli within the sigmoid wall. There is a direct causal link from the delay in identifying the lesion to the progression of illness as identified on 28th Feb 2020.

A missed opportunity also occurred on 24/01/2018 when an Abdo AP Supine X-Ray was completed. The initial hospital report was completed by Radiologist who stated '*Abdomen x-ray reported: Findings: The bowel gas pattern is unremarkable with no signs of intestinal obstruction*'. However, the second expert opinion identified a lesion and documented '*an ill-defined lesion in keeping projects onto the liver and is likely to be in the lung. The normal search pattern of a radiologist should detect this lesion. If rushed, the lesion might have been overlooked. The detection of such a finding should result in comparison with priors and recommendation of further imaging*'.

Expert Opinion advises that chest x-rays taken during the period under consideration would be unlikely to routinely show the lesion as the spiculated node was hidden behind the diaphragm and could not be seen. Detection and confirmation of the lesion was only possible with the CTVC, CT and abdominal imaging.

In 2016, the Radiology department was under resourced with radiologists and workload was increasing. There was increased staff pressure due to staff shortages. Staff shortages and pressure therefore may have been a contributing factor in the reporting error on the 4th

November 2016. A review from the International Accreditation New Zealand Accreditation (IANZ) in 2017 further highlighted the clinical risk of under staffing and lack of medical imaging radiologists within the HBDHB Radiology department. This has since been ameliorated with appropriate numbers of staff now recruited. In seeking ways to reduce errors radiologists now use 'all images approach' to reading images and regular discrepancy meeting are held within the department between the Radiologists. The Radiologist involved in this Human error no longer works for HBDHB.

As of August 2020, health records show that [Mrs A] had a restaging CT scan and that there is evidence of good response to the treatments prescribed particularly with a reduction in the lung lesions and also in the two liver lesions which had developed previously. The Oncologist had documented that there is no evidence of progressive disease and that the metastatic lung cancer is responding to chemotherapy.

Care Delivery problems — Individual staff factors

1. Failure to identify lesion on imaging resulting in delayed diagnosis

Contributory Factors

RECOMMENDATIONS

	Recommendation	Action	Named Lead	Date for completion
1	Mitigate Human Error factor	Discuss event at regular Discrepancy Dept Meeting. Memo to all Dept Radiologists reasserting the 'all images' approach and informing team of audit to come. Audit of CTVC and CT abdomen images to ensure lung bases are reviewed and findings documented	HoD HoD HoD	Immediate (completed) Immediate 6 months analysis — by Dec 2020

Incidental Finding — Nil

Addendum

According to both Brady (2017) and Berlin (2014) an estimated day to day rate is between 3–5%, with contributing factors being both human and system based. Radiologic diagnostic

interpretation is 'complex' (Bruno, Walker & Abujudeh 2015) reliant on appropriate referral, high quality images and skilled professionals. Diagnostic errors in radiology may either be perceptual or cognitive with an estimate of perceptual errors as high as 60–70%. A perceptual error is deemed to have occurred when an abnormality is retrospectively determined to have been present on a diagnostic image but was not seen by the interpreting radiologist at the time of primary interpretation. The underlying causes of this type of error remain poorly understood. However, an increased incidence of perception error may be attributable to specific risk factors. These include poor conspicuity of the target lesion on the image; reader fatigue; an overly rapid pace of performing interpretations; distractions, such as phone calls, e-mails, and other Internet-based distractions or interruptions; and a phenomenon known as satisfaction of search, whereby the finding of one abnormality on an image results in a second abnormality being overlooked, ostensibly because the radiologist is satisfied with the results of his or her search.

REFERENCES

- Berlin L (2014) **Published online:** 08 Jan 2014 doi <https://doi.org/10.1515/dx-2013-0012> .
- Berlin L. (2000) Hindsight bias. AJR. 2000; 175:597–601. doi: 10.2214/ajr.175.3.1750597
- Brady (2016) **Published online:** 07 Dec 2016. doi [10.1007/s13244-016-0534-1](https://doi.org/10.1007/s13244-016-0534-1)
- Bruno, Walker & Abujudeh (2015) **Published Online:** 14 Oct 2015 <https://doi.org/10.1148/rg.2015150023>”