Diagnostic Radiologist, Dr C

Radiology Service

A Report by the

Health and Disability Commissioner

(Case 17HDC02239)

Health and Disability Commissioner

Te Toihau Hauora, Hauātanga

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Executive summary

1. Mr A (aged 67 years at the time of the events) was referred by his doctor for a computed tomography (CT) colonography. He was well at the time, but decided to have the colonography privately, owing to a family history of bowel cancer.

2. The CT colonography was performed by Dr D at the radiology service on 10 September 2015. Two scans were performed, in the prone (face down) and supine (face up) positions.

3. Dr D told HDC that on analysing the images, he had difficulty deciding whether or not an appearance in the caecum was abnormal. He said that it looked like a mass of faeces, and fulfilled criteria for this, including that it changed shape and moved between the two scans. After reviewing it for a prolonged length of time, he could not reach a conclusion, but his starting point was that it was faecal residue.

4. Dr D sought a second opinion from a colleague, Dr C. Dr C performed a second read of the study, and concluded that the abnormality in the caecum was retained faecal material. He told HDC that the basis of this decision was that between the prone and the supine scans, the abnormality moved from one side of the colon to the other as the patient changed position.

5. Dr C said that he did not completely dismiss the possibility of a tumour; rather, his interpretation was that it was most likely faecal residue. He noted that he did not complete the final report. However, Dr C did not record a differential diagnosis in the CT colonography register, used for seeking second opinions.

6. Dr D told HDC that following Dr C's opinion, he reviewed the scan again and accepted Dr C's conclusion, and reported the examination accordingly. The CT colonography report dated 10 September 2015 documented the results as normal, and recommended a follow-up ultrasound in five years' time.

7. In May 2017, Mr A became unwell. A blood test indicated abnormal liver function, and he was referred for an abdominal ultrasound, which suggested liver metastases.

8. A CT scan of the chest, abdomen, and pelvis on 25 July 2017 showed a 53mm mass in the ascending colon, with bilobar liver metastases and lung metastases. An ultrasound-guided liver biopsy in August 2017 confirmed the diagnosis of metastatic bowel cancer. Owing to the extent of the disease it was considered incurable, and Mr A was commenced on palliative chemotherapy.

Findings

9. Adverse comment was made about Dr D's care.

10. It was found that Dr C breached Right 4(1) of the Code. The Commissioner considered that as the second reader, Dr C's incorrect interpretation of the colonography abnormality, and failure to note the differential diagnosis of a possible lesion (despite not having dismissed

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this possibility), and accordingly to recommend further testing, comprised a significant departure from the accepted standard of care.

11. The radiology service was not found vicariously liable for Dr C's breach of the Code.

Recommendations

12. It was recommended that Dr C (a) provide a written letter of apology to Mr A; (b) complete a relevant CT colonography training course; and (c) perform an audit of the last 50 CT colonography cases he has reported, with a peer review of each to identify whether these are in line with standard practice.

Complaint and investigation

13. The Health and Disability Commissioner (HDC) received a complaint from Mrs B about the services provided by Dr C and the radiology service to her father, Mr A. The following issues were identified for investigation:

- *Whether Dr C provided Mr A with an appropriate standard of care in September 2015.*
- *Whether the radiology service provided Mr A with an appropriate standard of care in September 2015.*

14. The parties directly involved in the investigation were:

Mr A	Consumer
Mrs B	Complainant/daughter
Dr C	Provider/diagnostic radiologist
Radiology service	Provider/radiology clinic

15. Further information was received from:

Dr D	Provider/diagnostic radiologist
District Health Board	Provider
Accident Compensation Corporation (ACC)	

16. Independent expert advice was obtained from Dr Helen Moore, a radiologist, and is included as **Appendix A**.

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Information gathered during investigation

Introduction

17. Mr A (aged 67 years at the time of the events) was referred by his doctor for a computed tomography (CT) colonography.[1] Mr A's daughter, Mrs B, told HDC that he was well at the time, but decided to have a CT colonography privately owing to a family history of bowel cancer.

CT colonography in September 2015

18. On 10 September 2015, Mr A's CT colonography was performed by Dr D at the radiology service.

19. Dr D told HDC that the scan involves a regimen to clear the colon for two days prior to the scan, and a contrast medium[2] taken to tag any residual faecal material. Two scans are performed, in the prone (face down) and supine (face up) positions.

20. Dr D told HDC that he analysed the images. There was an appearance in the caecum (a pouch at the beginning of the large intestine) which he had difficulty deciding whether or not was abnormal. He said that it looked like a mass of faeces, and fulfilled criteria for this, including that it changed shape and moved between the two scans. He stated that after reviewing it for a prolonged length of time he could not reach a conclusion, and, in response to my provisional report, noted that his starting point was that the appearance was faecal residue.

21. Dr D therefore sought a second opinion from a colleague, and used the relevant policy, which involved recording all CT colonographies in a paper-based register, obtaining a second opinion in the presence of doubt, and recording in the register where the second opinion was sought and any findings.

22. Dr C performed the second read of the study. He told HDC:

> "On review of the study I concluded that the abnormality in the caecum was due to retained faecal material. The basis of this decision was that between the prone and the supine scans, the abnormality moved from one side of the colon to the other as the patient changed position."

23. Dr C recorded on the CT colonography register:

> *"? faecal mass in caecum*
> *2nd opinion requested*
> I[mpression] *faeces"*

24. Dr C said that he did not completely dismiss the possibility of a tumour; rather, his interpretation was that it was most likely faecal residue. He noted that he did not

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[1] CT colonography uses CT scanning to obtain images of the colon. This is a non-invasive procedure.

[2] A substance used to contrast an internal part with its surrounding tissue for imaging.

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complete the final report. Dr C did not record a differential diagnosis[3] to reflect that he had not dismissed the possibility of a tumour.

25. Dr D told HDC that he reviewed the scan again following Dr C's opinion, accepted Dr C's conclusion, and reported the examination accordingly.

26. The CT colonography report dated 10 September 2015 documented the results as normal, and recommended a follow-up ultrasound in five years' time.

Subsequent events

27. Mrs B told HDC that in May 2017, her father became unwell with a persistent cough, lack of energy, and significant weight loss. A blood test indicated abnormal liver function, and Mr A was referred for an abdominal ultrasound, which suggested liver metastases.

28. A CT scan of the chest, abdomen, and pelvis on 25 July 2017 showed a 53mm mass in the ascending colon,[4] with bilobar liver metastases[5] and lung metastases. An ultrasound-guided liver biopsy in August 2017 confirmed the diagnosis of metastatic bowel cancer.

29. Owing to the extent of the disease it was considered incurable, and Mr A was commenced on palliative chemotherapy.

30. Dr C told HDC that Mr A's case was reviewed at the radiology service's audit meeting in August 2017. It was considered that the scan had been misinterpreted because of the rotation of the caecum, which allowed the lesion[6] to move between the prone and supine scans, which was now recognised as not necessarily due to the area of abnormality being loose within the colon.

Further information — Dr C

31. Dr C acknowledged that his interpretation was incorrect, and he is deeply remorseful for his role in this. He sincerely apologises to Mr A and his family.

32. In response to my provisional report, Dr C told HDC that Dr D came to his own opinion, then sought a second opinion from him, and then took into account that second opinion when reaching his final opinion.

33. Dr C told HDC that at the time of the initial review, he understood that movement of the abnormality in the way described was consistent with residual faecal material. He reported that in 2015, he was not aware of the possibility of caecal rotation as a cause for the movement of the abnormality between the scans.

34. Dr C stated that it is unfortunate that his assessment of the lesion was that it moved during a change in position, opposed to assessing that it was fixed. He recognises that

[3] The distinguishing of a disease or condition from others presenting with similar signs and symptoms.
[4] The first part of the large intestine, passing upwards from the caecum.
[5] Cancer that has spread to both lobes of the liver.
[6] An area of abnormal tissue change.

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there was a confirmed fixed portion of the lesion close to the ileocaecal valve,[7] which he missed. He said that in this case, he placed more weight on the mobility of the lesion, as opposed to the soft tissue density.

35. Dr C stated that as a result of this case, each individual radiologist at the radiology service changed his or her practice. All radiologists who read CT colonographies were provided with an update about the potential effect of caecal rotation, and they have reflected on their approach to second opinions.

36. Dr C reported that he now has a lower threshold for referring patients for colonoscopy if there are indeterminate findings, and, if an indeterminate finding is present and a second read performed, he now includes this in the report. A proposed amendment to the process of obtaining a second opinion has also been discussed.

Further information — Dr D

37. When asked whether he had any concern or doubt about the validity of the second opinion, Dr D told HDC that he had, and still has, a very high regard for the quality of Dr C's work, and had no concern at the time that Dr C might be in error. Dr D said that he values the quality of Dr C's work above his own, and completely accepted Dr C's view and issued the report accordingly. Dr D acknowledged that this was insufficiently critical, and said that now he would not rely on a second opinion for complete reassurance in a similar instance.

Further information — the radiology service

38. The radiology service's policy was to record all CT colonographies in a paper-based register and to obtain a second opinion in the presence of doubt. There is space on the register to record that a second opinion has been sought, and any findings. The radiology service told HDC that individual radiologists have changed their practice with regard to assessing movement of the caecum, and also regarding second opinions.

ACC treatment injury report and expert advice

39. Information received as part of the complaint included the ACC Treatment Injury report and ACC expert opinion.

40. The ACC treatment injury claim was filed by Mr A's treating oncologist in August 2017. In the claim, the oncologist documented that on retrospective review by a multidisciplinary team, the now-identified primary lesion in the ascending colon can be seen on the 2015 CT colonography.

41. ACC sought expert clinical advice from a radiologist. The radiologist performed a blind review of the imaging from September 2015, and identified a large 5cm polypoid[8] mass in the ascending colon, necessitating a recommendation to seek urgent surgical opinion. The

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[7] The valve between the caecum and the ileum of the small intestine. The ileum is the third and longest portion of the small intestine.

[8] Resembling or in the form of a polyp (a mass of tissue that bulges or projects outward or upward from the normal surface level).

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radiologist also arranged for review of the imaging by four other radiologists, who all identified that the major finding was the large polypoid tumour of the ascending colon. The radiologist concluded that a diagnosis of ascending colon tumour should have been made on 10 September 2015.

Responses to provisional decision

Dr C

42. Dr C was given an opportunity to respond to the provisional report and, where relevant, his comments have been incorporated into this report.

The radiology service

43. The radiology service was given an opportunity to respond to the provisional report. It acknowledged that there was a significant delay in the diagnosis of bowel cancer for the patient involved. The radiology service prides itself on providing the highest possible standard of care, and sincerely apologised to Mr A and his family for failing to achieve this standard.

44. The radiology service advised that all technical suggestions for improvement have already been implemented, and most were in place significantly before this incident occurred. A new initiative of quality assurance programmes for all of the radiology service is now being coordinated, to ensure that its clinical guidelines and policies meet or exceed RANZCR and local standards. The radiology service said that all CT colonographies performed or reported at the radiology service sites met or exceeded the RANZCR technical standard prior to and after the incident in 2015, and all CT colonography reporting radiologists meet the standard for experience.

Dr D

45. Dr D accepted the overall statements about his care and considered these to be generally accurate and fair. He stated: "I have learnt a great deal from this case … I am very sorry for [Mr A] and his family that I did not get the report right and missed an opportunity to have a positive contribution to his welfare rather than the tragedy which unfolded following my error."

Mrs B

46. Mrs B was given an opportunity to comment on the "information gathered" section of the provisional report. She stated that between Dr D's uncertainty and Dr C's doubts, there was surely enough evidence to warrant further investigation. She commented that Dr C had the opportunity to record on the register his doubts as to the possibility of a tumour being present, but nothing was noted.

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Opinion: Dr C — breach

Interpretation and reporting of the CT colonography

47. In September 2015, Mr A had a CT colonography. Dr C's colleague, Dr D, was uncertain about an abnormal appearance in the caecum, and decided to obtain a second opinion. Dr C's opinion was that the appearance was of residual faecal matter, on the basis that between scans the abnormality moved from one side of the colon to the other as the patient changed position. Dr C stated that he did not completely dismiss the possibility of a tumour. The CT colonography register recorded Dr C's impression of "faeces", and did not record a differential diagnosis to reflect that he had not completely dismissed the possibility of a tumour.

48. Dr C said that at the time, he understood that movement of the abnormality was consistent with residual faecal material, and he was not aware of the possibility of caecal rotation. He stated that his assessment of the lesion was that it moved, and he recognises that he missed the fixed portion of the lesion close to the ileocaecal valve. He said that in this case, he placed more weight on the mobility of the lesion, as opposed to the soft tissue density.

49. My expert advisor, radiologist Dr Helen Moore, advised that in the CT colonography interpretation process, the main criteria for deciding whether a lesion is real or an artefact/pitfall are: whether it is fixed during change in position (as real lesions are attached to the bowel wall or a fold); its morphology;[9] and whether it is of soft tissue density.

50. Dr Moore advised that in this case the mass was both fixed and mildly mobile, which is a potentially confusing factor. The mobile portion extended superiorly[10] and flopped against the dependent bowel wall in each position, which she advised is a well-known characteristic of a pedunculated lesion.[11] She advised that alternatively, a soft laterally[12] spreading tumour (which often can be large, as in this case) can move considerably with a fold during change in position. However, she said that the overall position was essentially similar between the prone and supine scan. She noted that the mobility of the bowel that occurs with changing position is expected and useful in CT colonography, as a real lesion will not disappear. She advised that rotation of the caecum is not an issue, particularly when reviewed as expected in multiple planes.

51. Dr Moore advised that this mass had a lobulated margin, and larger polypoid tumours may have this morphology. Large polypoid tumours with surface folds, as in this case, cause trapping of the tagging agent, and this does not mean that the tagging is adherent to faecal residue. She said that the overall morphology was also essentially unchanged between the two positions, which is in keeping with a real soft tissue mass.

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[9] Shape or structure.
[10] In or to a more upward position or direction.
[11] A lesion that is attached by a peduncle — a narrow stalk by which a tumour or polyp is attached.
[12] Sideways.

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52. Dr Moore advised that this mass was of soft tissue density, which was a crucial discriminator in this case, as faecal material is heterogenous — a mix of solid, gas, and liquid. She said that it is not conceivable that a lump of faecal residue this size would be so homogenous. She noted also that the fact that the remainder of the colon was well prepared goes against the mass being faecal residue. Dr Moore's ultimate finding identified a lobulated 5.5cm mass of the ascending colon, suspicious for colonic malignancy and necessitating a recommendation of a referral for colonoscopy.

53. Dr Moore also arranged for reviews by two CT colonography accredited radiologists, a registrar, and a radiologist who does not perform CT colonography. Dr Moore reported that they all independently located the mass lesion in the ascending colon and categorised it as highly suspicious for malignancy.

54. Dr Moore reported that reviews were also performed by another less-experienced CT colonography radiologist and another radiologist who does not perform CT colonography, and they both gave differential diagnoses of faecal residue. However, they both stated that they would obtain a second opinion and further investigation of some form. They also noted that as the remainder of the colon was well prepared, faecal residue causing the lesion was less likely, and no air bubbles were seen within the lesion.

55. Dr Moore advised that Dr C's interpretation was less than standard practice for a CT colonography accredited practitioner. She noted that although the large size of the tumour is uncommon for CT colonography, it does happen, and if the usual criteria are followed, then correct interpretation would be achieved.

56. Dr Moore advised that bowel rotation was not a feasible concern, and the lesion remained visible no matter what the rotation of the bowel caecum. She said that this added weight to the likelihood of the abnormality being a real lesion.

57. Dr Moore advised that although it is acceptable to raise a differential diagnosis of tumour versus faecal residue, it is not considered acceptable to completely dismiss the possibility of a tumour, given the characteristics of this CT colonography.

58. Dr Moore considers that there was an unfortunate error of interpretation, followed by a lack of further investigation, which comprised a suboptimal standard of care. She noted that it is standard practice to proceed with further tests if there are ongoing reasonable doubts. Dr Moore said that the documents provided no reason to think that there was any further uncertainty after Dr C provided his opinion. However, Dr C stated that he did not completely dismiss the possibility of a tumour.

Conclusion

59. Dr Moore considers that overall in this case there was a significant departure from the accepted standard of care. In her view, the departure from the standard of care primarily applies to Dr C, as his opinion was the main reason for the final report. In response to my provisional report, Dr C stated that he accepts that his impression was not correct, but it

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was Dr D who came to his own opinion, then sought an opinion from him (Dr C), which Dr D took into account when coming to his final opinion.

60. I acknowledge that Dr D may have formed his own opinion prior to seeking an opinion from Dr C. However, if Dr D had been certain about his opinion, he would not have sought another one from Dr C. As such, I agree with Dr Moore's advice that Dr D followed the process to obtain a second opinion from Dr C because he could not reach a conclusion on analysing the image. Therefore, as the second reader, Dr C had the responsibility to interpret the imaging with reasonable care and skill.

61. Dr C's opinion was that the appearance was that of residual faecal matter. His assessment was that between the prone and the supine scans the abnormality moved, rather than that it was fixed during the change in position.

62. In contrast, Dr Moore identified a lobulated 5.5cm mass in the ascending colon, suspicious of colonic malignancy. She advised that the mass was both fixed and mildly mobile, but that the overall position was essentially similar between the prone and supine scans. Dr C has acknowledged that he missed the fixed portion of the lesion.

63. Dr C said that he placed more weight on the mobility of the lesion, as opposed to the soft tissue density. However, Dr Moore advised that the mass being of soft tissue density was a crucial discriminator in this case, as it was not conceivable that a lump of faecal residue this size would be so homogenous. She advised that the overall morphology was also essentially unchanged between the two positions, which is in keeping with a real soft tissue mass.

64. Dr Moore also advised that bowel rotation was not a feasible concern, and the lesion remained visible no matter what the rotation of the bowel caecum. She said that this added weight to the likelihood of the abnormality being a real lesion.

65. I accept that Dr C considered the possibility of the mass being a lesion, and his contention that he did not completely dismiss this possibility. However, his final opinion provided to Dr D did not reflect this, and he did not provide a differential diagnosis for Dr D to consider. Further, in definitively finding that the mass was residual faecal matter, and not noting the differential diagnosis of a possible lesion or recommending further testing, I consider that, in effect, he did not leave open the possibility of a tumour (despite not having actually dismissed this possibility).

66. I note that in the six reviews arranged by Dr Moore, four of the reviewers independently located the mass in the ascending colon and categorised it as highly suspicious for malignancy, while the two who gave a differential diagnosis of faecal residue stated that they would obtain a second opinion and further investigation of some form.

67. I note also that the ACC expert's blind review and the reviews by the expert's colleagues detected the polypoid tumour of the ascending colon. There appears to be an overwhelming consensus that this imaging showed that the mass was more likely to be a tumour than faecal residue, or at the very least, required further investigation.

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68. I accept Dr Moore's advice, and find that Dr C failed to correctly interpret the abnormality detected in Mr A's CT colonography in September 2015. This, with a lack of further investigation, comprised a significant departure from the accepted standard of care.

69. For the above reasons, I find that Dr C did not 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).

Opinion: Radiology service — no breach

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

71. In this case, the radiology service had in place a "CTC Reporting" policy to guide staff. The policy provides a process for recording all CT colonographies in a paper-based register, and obtaining a second opinion in the presence of doubt. There is space on the register to record a second opinion having been sought, and any findings. In this case, the policy was followed.

72. The radiology service advised that its policy meets the technical requirements as outlined in the Royal College of Radiologists' standard on CT colonography. I note that Dr Moore advised that the overall technical quality, imaging processes, and record-keeping were in good order.

73. The radiology service also advised that other than the "CTC Reporting" policy, it did not have in place other policies to guide the interpretation of CT colonographies. However, radiologists who perform CT colonographies must meet the CT colonography training requirements, receive certification to perform CT colonography, and maintain annual ongoing competency requirements. The radiology service told HDC that its CT colonography reporting radiologists have met and maintain the Royal Australian and New Zealand College of Radiologists credentialling requirements.

74. In this case, I consider that the errors that occurred did not indicate broader systems or organisational issues at the clinic. The radiology service had a policy in place to obtain a second opinion in the presence of doubt, and it ensures that its CT colonography reporting radiologists meet and maintain their credentialling requirements. I also accept the advice of my expert that the overall technical quality, imaging processes, and record-keeping at the radiology service were in good order. In light of this, I consider that the radiology service did not breach the Code directly.

75. In addition to any direct liability for a breach of the Code, under section 72(2) of the Health and Disability Commissioner Act 1994 (the Act), an employing authority is vicariously liable for any acts or omissions of its employees. A defence is available to the employing

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authority of an employee under section 72(5) of the Act if it can prove that it took such steps as were reasonably practicable to prevent the acts or omissions.

76. The radiology service is an employing authority for the purposes of the Act. On 10 September 2015, Dr C was an employee of the radiology service. As set out above, I have found that Dr C breached Right 4(1) of the Code for failing to provide services to Mr A with reasonable care and skill.

77. As noted above, the radiology service had a "CTC Reporting" policy in place to obtain a second opinion in the presence of doubt, and it ensures that its CT colonography reporting radiologists meet and maintain their credentialling requirements, and my expert has advised that the overall technical quality, imaging process, and record-keeping at the radiology service were in good order.

78. I also note Dr Moore's advice that Dr C's interpretation was incorrect and less than standard practice for a CT colonography accredited practitioner. In Dr Moore's opinion, there was an unfortunate error of interpretation, followed by a lack of further investigation, which comprised a suboptimal standard of care.

79. I am satisfied that the radiology service took such steps as were reasonably practicable to prevent such an error. Accordingly, I do not find the radiology service vicariously liable for Dr C's breach of the Code.

Dr D — adverse comment

80. While Dr D was the clinician who performed Mr A's CT colonography and issued the report in September 2015, my independent expert advisor, Dr Moore, advised that Dr D's assessment and reporting were adequate. She stated:

> "[Dr D] did not know how to completely assess the lesion but had insight into this and took appropriate action by obtaining a second opinion."

81. Dr Moore advised that this is standard practice. She noted that if Dr D still had any doubt or concern about the validity of the second opinion, he should have sought further review.

82. Dr D told HDC that he was not concerned about the validity of the second opinion, although he acknowledged that he may have been insufficiently critical of the second opinion.

83. I accept Dr Moore's advice that the care provided by Dr D was adequate. While Dr D was the clinician who issued the report, I share Dr Moore's view that he appropriately sought a second opinion when he was unsure how to interpret the detected abnormality. In response to my provisional opinion, Dr D advised that his starting point was faecal residue; however, it is evident that he was unsure of his diagnosis, otherwise he would not have sought a second opinion. I am satisfied that when Dr D received Dr C's second opinion, he followed this advice because he did not have concerns about it. I do, however, concur with Dr D's assessment that he could have been more critical of the second opinion he received, and reported this accordingly.

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Recommendations

84. I recommend that Dr C:

a) Provide a written letter of apology to Mr A for the breach of the Code identified in this report. The apology letter should be sent to HDC within four weeks of the date of this report, for forwarding to Mr A.

b) Complete a relevant CT colonography training course, and provide evidence of his attendance at this training, within three months of the date of this report.

c) Perform an audit of the last 50 CT colonography cases that he has reported, with a peer review of each to identify whether these are in line with standard practice. A documented report of the results of this audit, and any changes made as a result of the audit, should be provided within three months of the date of this report.

85. I recommend that the radiology service consider my expert's technical suggestions for improvement, namely that thinner slices are kept on PACS for all CT colonographies to enable subsequent remote review on a 3D workstation if required. In response to my provisional report, the radiology service advised that all of the technical suggestions for improvement had already been implemented. As such, I consider this recommendation to have been met.

Follow-up actions

86. A copy of this report with details identifying the parties removed, except the expert who advised on this case, will be sent to the Medical Council of New Zealand, and it will be advised of Dr C's name.

87. A copy of this report with details identifying the parties removed, except the expert who advised on this case, will be sent to the district health board, the Royal Australian and New Zealand College of Radiologists, and the Health Quality & Safety Commission, and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

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Appendix A: Independent advice to the Commissioner

The following expert advice was obtained from Dr Helen Moore:

"HDC REPORT

29 June 2018

Reference: C17HDC02239

Author: Dr Helen Moore
Radiologist, Auckland City Hospital, Auckland Radiology Group
MBChB, FRANZCR

I have been asked to provide an opinion to the Commissioner on case number C17HDC02239.

I have read and agree to follow the Commissioner's guidelines for Independent Advisors.

I am a Consultant Radiologist, 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 involved in reviewing CTC accreditation and standards for my college (RANZCR). I lecture at annual or biannual CTC courses to aid radiologists obtaining accreditation in CTC according to RANZCR guidelines.

I have reviewed all the documents supplied to me by courier and the CD of the CTC investigation in question.

FACTUAL SUMMARY from the documents given:

The patient underwent a CTC, performed by the radiology service in September 2015.

The first reader was uncertain regarding a possible mass in the right colon, and obtained a second opinion. The second opinion was that there was no mass, and the appearance was due to residual fecal matter.

After feeling unwell in May 2017 the patient had an Ultrasound which suggested liver metastatic disease, subsequently shown also on CT scan in July 2017. This also demonstrated a right colon mass, consistent with the primary site.

REVIEW PROCESS:

I have opened the CD of the 2015 CT Colonography (CTC) in question, in a standard 2D radiology viewer for initial 2D read as per my usual practice. The image data was available in 5mm slice thickness, and according to the CTC standards 2010 they should be 3mm or less. I noted that the original read was performed with fine slices on a workstation, which is best practice, so this 5mm slice thickness would not affect their reading. It could have limited my review; however it ended up making no difference in

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this particular case, as there is an obvious abnormality in the right colon, being the mass in question. I did not perform a 3D review as it would not change or enhance my assessment of this lesion.

In regard to the family history of bowel cancer, this should not change the way in which the CTC is read.

My radiology findings, in summary form, would be:

Technical quality: Good preparation and distension.

Colonic Findings: There is a lobulated 5.5cm mass of the ascending colon, extending to the Ileocaecal Valve. It has a polypoid mobile superior component with a finely lobulated margin. This is partially coated by tagging agent. It is of homogenous soft tissue density. No evidence of ICV obstruction or luminal narrowing, or extension beyond the bowel wall. The mass is suspicious for colonic malignancy. Referral for colonoscopy is recommended.

PEER REVIEW:

To ensure that my opinion was representative and reasonable, the 2D standard CT images were separately reviewed by two less experienced radiologists who are accredited in CTC, and a registrar, and a radiologist who does not perform CTC. I was not present during these reviews. They independently located the mass lesion in the ascending colon and categorized it as highly suspicious for malignancy. They all thought it was clearly visible and did not give a differential diagnosis of fecal residue.

Another less experienced CTC radiologist, and another radiologist who does not perform CTC, both gave a differential diagnosis of tumour vs fecal residue and both would obtain a second opinion. Both clarified this by saying they would also get further investigation of some sort and would not leave it completely. Both commented that the remainder of the colon was well prepared which would make the likelihood of fecal residue causing the lesion to be less likely, and no air bubbles were seen within the lesion (the latter would indicate fecal residue).

My personal experience of this situation in real practice: A few years ago a colleague misinterpreted a similar type of lesion in the distal left colon and thought it was fecal residue. This was corrected on the same day, after second review.

RATIONALE and STANDARD CTC INTERPRETATION PROCESS:

The basic process of CTC is to locate a possible lesion and then decide: is it real (polyp or cancer), or it is a pitfall or artefact. The latter are most commonly due to residual feces (present in small amounts in most cases), or a long list of less common pseudolesions.

The main criteria to decide whether a lesion is real are:

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Is it fixed during change in position — as real lesions are attached to the bowel wall or a fold.

In this case it is both fixed and mildly mobile, a potentially confusing factor. The fixed portion is close to the IC valve, and the mobile portion extends superiorly, flopping against the dependent bowel wall in each position. This mobility is a well known characteristic of a lesion which is pedunculated (arises from a relatively narrow base or stalk), alternatively a soft laterally spreading tumour (often large as in this case) can move considerably with a fold during change in position. However the overall position is essentially similar between the prone and supine scan. Mobility of the bowel that occurs with changing position is expected and indeed useful in CTC, as a real lesion will not disappear; and rotation of the cecum is not an issue particularly when reviewed as expected in multiple planes.

Morphology?

This mass has a lobulated margin and larger polypoid tumours may have this morphology, unlike the more common circumferential 'apple-core' constricting mass. Large polypoid tumours with surface folds like this case cause trapping of the tagging agent, and this does not mean that the tagging is adherent to fecal residue. The overall morphology is also essentially unchanged between the two positions, in keeping with a real soft tissue mass.

Is it of soft tissue density?

Yes. This is the crucial discriminator in this case — fecal material is heterogenous, a mix of solid and gas and liquid. It is not conceivable that a lump of fecal residue this size would be so homogenous. Also against the mass representing fecal residue, is the fact that the remainder of the colon is well prepared.

I have included some representative references for these main discriminating factors at the end of the review.

SPECIFIC QUESTIONS:

The adequacy of [Dr D's] assessment and reporting: Adequate.

— [Dr D] found the abnormality and was unsure how to interpret it. He appropriately sought a second opinion. This is standard practice.

I am unable to ascertain whether he still had any doubt or concern about the validity of the second opinion from these documents. If he did have ongoing doubt, then he should have sought further review, but at the end of the day he did seek help and followed that advice.

I note that the second review was not documented in the report; and this is common practice, though depending on the degree of the second read, some radiologists will

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then co-sign the report as a second reader, or be listed in the report as providing a focused review.

The second opinion process was clearly documented on the administrative records, which is very good practice.

The adequacy of [Dr C's] assessment, and knowledge of caecal rotation based on knowledge relevant in 2015?

— Unfortunately [Dr C's] interpretation was incorrect, and it is my opinion that this is less than standard practice for a CTC accredited practitioner. The large size of the tumour is uncommon for CTC but does happen, and if the usual criteria described above are followed then correct interpretation will be achieved.

— Bowel rotation is not a feasible concern. The lesion remains visible no matter what the rotation of the bowel/cecum. This actually adds weight to the likelihood of the abnormality being a real lesion.

— Overall I believe this is a significant departure from standard of care because although it is acceptable to raise a differential diagnosis of tumour vs fecal residue, it was not considered acceptable to completely dismiss the possibility of tumour given the characteristics of this CTC. The result of no further investigation incurred moderate to severe disapproval from the peers.

FURTHER INVESTIGATIONS:

Regarding further investigations, this all relates to the degree of satisfaction that the radiologist has with the diagnosis or finding. Standard practice is to proceed with further tests if there is ongoing reasonable doubt. I can only presume that both radiologists were comfortable with the second opinion result, and therefore it is a moot point in this case. If there had been significant concern from either radiologist then a further review/test would have occurred.

CONCLUSION:

My opinion is that there has been an unfortunate error of interpretation, followed by a lack of further investigation, comprising a suboptimal standard of care.

The lesion was identified but not interpreted accurately — i.e. it was thought to be residual fecal content. This in itself is within normal range of radiologist differential diagnosis, but given the large size and consistent nature of the abnormality on prone and supine views, none of the peer group would leave this study without further investigation. This lack of further investigation was met with moderate to severe disapproval by the peers.

Therefore I consider this to be a significant departure of the standard of care in this case.

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This primarily applies to the second reader, [Dr C], as his opinion was the main reason for the final report. The first reader did not know how to completely assess the lesion but had insight into this and took appropriate action by obtaining a second opinion.

If there was any doubt as to the validity of that second opinion, or if the second reader also was unsure, further investigation should have been performed. The documents provide no reason to think that there was any further uncertainty after the second opinion.

Subsequently, the documents explain that both radiologists have revised their practice in this regard, with a lower threshold for further investigation. They describe appropriate, standard options for future practice, including: if reviewed at the time of CTC scan then a further view may have helped, and/or iv contrast could be given. Alternatively the images could be reviewed more widely, with more than one other radiologist, or the patient could have been recalled for another study with more/different preparation, or referral made for colonoscopy.

It is important to note that mistakes in observation or interpretation are not uncommon in the practice of clinical radiology, and errors such as this do not necessarily raise issues of general radiological competence.

RECOMMENDATIONS FOR IMPROVEMENT:

Overall the technical quality, imaging processes and record keeping are well in order. My only technical suggestion for improvement would be that thinner slices (e.g. 2mm) are kept on PACS (imaging archive) for all CTC, to enable subsequent remote review on a 3D workstation if required.

The radiologist's skills could be updated if necessary by attending a CTC course. I believe that they will never miss a tumour of this type again.

It would be important to know whether this is an isolated incident or whether there is a pattern of suboptimal reporting of CTC. I suggest that the last 50 CTC cases reported by [Dr C] be audited to ensure they are in line with standard practice.

The images have already been reviewed at a departmental audit meeting which is good practice. A further suggestion is that these images could form part of a 'CTC library or Reference Cases' which could be reviewed by CTC radiologists coming through the practice so they can all be more familiar with this type of presentation.

Dr Helen Moore 29/6/18

REFERENCES:

Eur J Radiol. 2013 Aug;82(8):1177–86. Evaluation of colonic lesions and pitfalls in CT colonography: a systematic approach based on morphology, attenuation and mobility. Mang T[1], Gryspeerdt S, Schima W, Lefere P.

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Radiol Clin North Am. 2013 Jan; 51(1): 69–88. CT Colonography: Pitfalls in Interpretation P Pickhardt, MD and David H. Kim, MD

Clin Radiol. 2010 Jun;65(6):474–80 CT colonography standards.

Burling D; International Collaboration for CT colonography Standards.

Please see below a copy of two slides from a CTC Interpretation lecture by Dr H Moore (author) in 2014, 2015, summarizing main criteria for real lesions vs artefact/pitfall, given as part of a Philips CTC Accreditation course."

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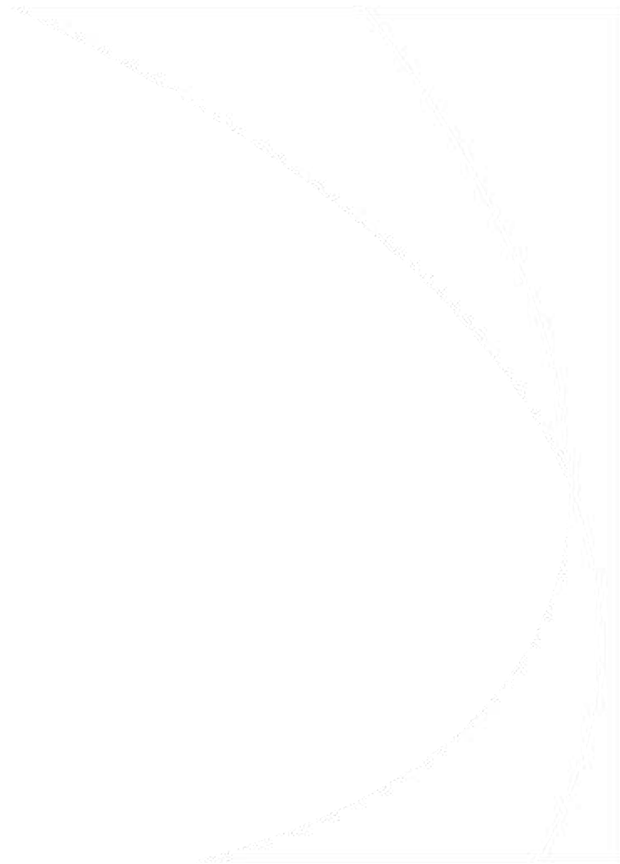

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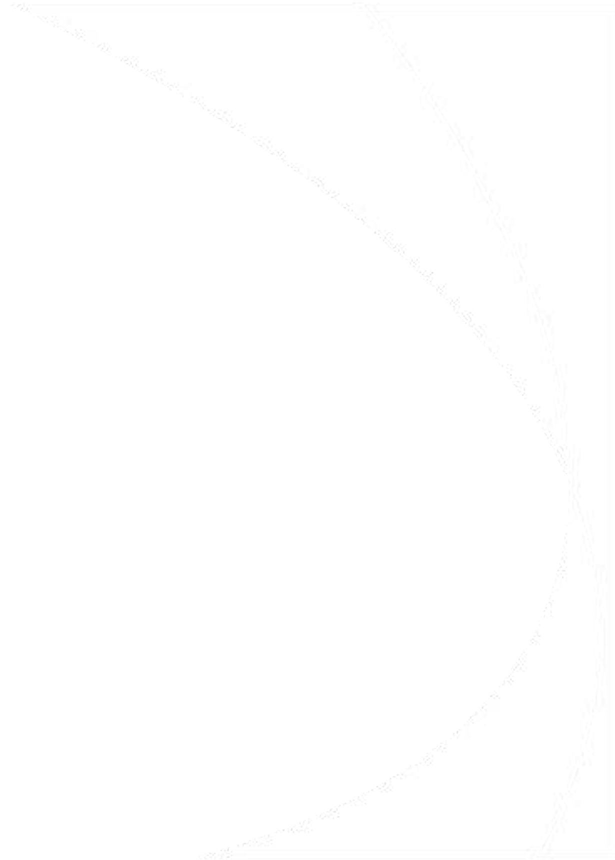

Further advice 25 May 2019

"This email is to respond to the letter from [Dr C] regarding issues raised in the HDC Report.

From this letter I believe he has fully taken on board the diagnostic issues with the case, and certainly has learned appropriately from this (I do not mean to sound condescending) and will never miss a tumour of this type again.

He raises concern about the first reader–second reader situation. He is correct that the final CTC report was issued by [Dr D], with no further input by himself. This situation of being asked about a finding and not being included on the final report is a common happening in radiology. As I said in the HDC Report, there are various ways of documentation, and in many cases none, and the second reader usually does not take over the case. However in this case it was documented and the opinion given of fecal residue. This was accepted and how the case was reported. I am unable to comment on whether there was further doubt, but it would seem not. It is up to the 2nd opinion person to qualify their answer — in many cases we are pretty sure something is ok, but depending on the case, may need to confirm that with another investigation or follow up. Sometimes we are right or wrong, and certainly errors unfortunately happen to us all. We can only do our best to minimise them, using the steps I outlined in the Report. I can understand [Dr C's] frustration in regard to this, but at the end of the day he provided the documented

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'senior counsel' of how to interpret the lesion. I also have no doubt that [Dr D] will never misinterpret a mass of this appearance again.

The reason for the 50 case review was to ensure there was no pattern of error in relation to CTC in general. I do not know [Dr C's] practice personally hence that is a safety measure suggestion — and is not specifically related to this type of tumour, which may well not be seen even in 50 cases. The audit should be of the most historical cases, not the most recent, so it is possible to get long term follow up for maximal outcome accuracy. As I specified previously, errors such as this do not necessarily raise issues of general radiological competence.

I hope this helps. Please let me know if any further clarification is required.

Best regards,

Helen Moore"

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