Radiologist, Dr B

Radiology Service

A Report by the

Health and Disability Commissioner

(Case 15HDC00685)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Table of contents

Executive summary

1. In 2007 Ms A (10 years old at the time) was diagnosed with high-risk medulloblastoma (a tumour) and subsequently underwent neurosurgery. Following her surgery, Ms A had regular follow-up MRI scans of the brain for surveillance purposes.

2. Ms A had surveillance magnetic resonance imaging (MRI) scans on 2 April 2008, 12 January 2010, 28 July 2010, 25 May 2011, and 19 May 2012, all of which showed no evidence of residual or recurrent tumour. On 13 August 2014, she underwent a surveillance MRI scan, which was reported by radiologist Dr B at the MRI facility of the radiology service — with DHB1 contracting MRI services to this service.

3. In reporting the 13 August 2014 MRI scan, Dr B noted that there was no suspicion of a remaining or new tumour. However, subsequent scanning in 2015 identified that Dr B had failed to identify a lesion present on the August 2014 scan. In 2016, Ms A was referred for hospice care, and she subsequently passed away.

4. Right 4(1) of the Code requires that every consumer has the right to have services provided with reasonable care and skill. The standard of care applicable in the present case is the care and skill that an ordinarily careful radiologist would exercise under similar circumstances. Most radiologists would have seen the lesion and reported accordingly. Dr B failed to provide services to Ms A with reasonable care and skill and, accordingly, breached Right 4(1) of the Code.

5. This case identified some areas for potential improvement in the radiology service's collaborative working relationships with radiologists and the regional DHB.

Complaint and investigation

6. The Commissioner received a complaint from Ms A.

7. The following issue was identified for investigation:

   Whether Dr B provided Ms A with care of an appropriate standard.

8. The investigation was extended to include:

   Whether the radiology service provided Ms A with care of an appropriate standard.

9. The key parties referred to in the report are:

Ms A (dec)	Complainant/consumer
Mr A	Complainant/Ms A's father
Dr B	Diagnostic and interventional radiologist
District Health Board (DHB)	Provider

The radiology service	Provider

Also mentioned in this report:

Dr C	Paediatric oncologist
Dr D	Radiologist
Mr E	General manager

10. Information was also reviewed from:

DHB2
DHB3

11. Independent advice was obtained from a general radiologist with a diagnostic and interventional vocational scope of practice, Dr Andrew Kingzett-Taylor (**Appendix A**).

Information gathered during investigation

Introduction

12. This report relates to the care provided to Ms A by general radiologist Dr B and the radiology service in August 2014. Ms A had a history of medulloblastoma[1] and, in August 2014, she underwent a surveillance MRI scan, which was reported by Dr B.

13. In reporting the August 2014 MRI scan, Dr B noted that there was no suspicion of a remaining or new tumour. However, subsequent scanning in 2015 identified that Dr B had failed to identify a lesion present on the August 2014 scan.

Background

14. In 2007 Ms A (10 years old at the time) was diagnosed with high-risk medulloblastoma and subsequently underwent neurosurgery. Following her surgery, Ms A had regular follow-up MRI scans of the brain for surveillance purposes through DHB1.[2]

15. Ms A had surveillance magnetic resonance imaging (MRI) scans on 2 April 2008, 12 January 2010, 28 July 2010, 25 May 2011, and 19 May 2012, all of which showed no evidence of residual or recurrent tumour.

[1] The American Brain Tumour Association describes a medulloblastoma as a rapidly growing tumour of the cerebellum (the lower, rear portion of the brain). This area (also called the "posterior fossa") controls balance, posture, and complex motor functions such as fine hand movements, speech, and swallowing. Tumours located in the cerebellum are referred to as "infratentorial", ie, the tumour is located below the "tentorium" (the thick membrane that separates the larger, cerebral hemispheres of the brain from the cerebellum). See: http://www.abta.org/secure/medulloblastoma-brochure.pdf
[2] Originally scans were undertaken six-monthly, and then annually from 2011.

Referral form, November 2012

16. On 14 November 2012, Ms A saw a registrar for a DHB2 neurosurgeon, at a neurological clinic at Hospital 1. Following discussion with the registrar, the neurosurgeon recommended that the next MRI be in two years' time. The neurosurgeon completed a referral form for an MRI stating:

> "Posterior fossa medulloblastoma removed in 2007. Had chemo/radio. Surveillance MRI in 2 [years please]."

MRI scan, 1 August 2013

17. On 1 July 2013, paediatric oncologist Dr C reviewed Ms A at a DHB1 clinic and, superseding the neurosurgeon's earlier recommendation, recommended that she continue to have MRI scans of her brain on an annual basis.

18. On 8 July 2013, a consultant paediatrician at Hospital 1 completed a referral form in accordance with Dr C's recommendation for a surveillance MRI of the brain, stating:

> "High risk medulloblastoma — subtotal resection [DHB2] 25/5/07
>
> Craniospinal XRT [and chemotherapy] as per SJMB96 protocol.[3] Completed [December] 2007. Bilat[eral] sensorineural hearing loss, [primary] ovarian dysfunction, [growth hormone] deficiency …"

19. On 1 August 2013, Ms A's MRI was undertaken at the radiology service's MRI facility.[4] Radiologist Dr D reported that a comparison had been made with the 19 May 2012 scan, and that the post-surgical changes in the posterior fossa were unchanged in comparison with the previous scan.

20. The "indication" section of Dr D's report, which is based on the consultant paediatrician's supplied information in the referral form, reads:

> "High risk medulloblastoma. Subtotal resection 2007. Radial chemotherapy as per protocol. Bilateral sensorineural hearing loss. Primary ovarian dysfunction. Growth hormone deficiency. Annual screening MRI."

21. Dr D recorded his impression that there was no MRI evidence of recurrence of the medulloblastoma.

22. On 5 August 2013, the consultant paediatrician wrote directly to Ms A advising her of the result of the 1 August 2013 MRI, and completed a further DHB1 referral form for an MRI, containing almost the same information from her earlier referral:

> "High risk medulloblastoma. Subtotal resection 2007. Chemo[therapy] [and] Radiotherapy. [Bilateral] sensorineural hearing loss. [Primary] ovarian dysfunction. Growth hormone deficiency. Due surveillance MRI August 2014 Thanks."

[3] A specific chemotherapy regimen.
[4] MRI is based at Site 2.

MRI scan, 13 August 2014

23. On 13 August 2014, a surveillance MRI scan, performed at the radiology service, was read and reported on by general radiologist Dr B.

24. Dr B stated that the clinical information he was provided with prior to reporting on the 13 August 2014 MRI was that in the referral from almost two years earlier, dated 14 November 2012: "Posterior fossa medulloblastoma removed in 2007. Had chemo/radio. Surveillance MRI in 2 yrs [please]." He said that "high risk" was not mentioned in the referral.

25. DHB1 said that radiologists are reliant on the information provided in the request form from the referring clinician, but the radiologists also have access to all previous MRI examinations and reports that have been completed at the radiology service.

26. Dr B told HDC that he compared the MRI of 13 August 2014 with the previous MRI scan of August 2013, in which Dr D found no evidence of recurrence.

27. Dr B also stated:

> "Reading the referrals and [Dr D's] report, it is clear that they are referring to a high risk medulloblastoma in 2007 when it was first diagnosed and not categorising it as such in 2014."

28. Dr B's lawyer stated:

> "[Dr B] instructs that the medical community considers many cancers *'cured'* when they cannot be detected five years after diagnosis. While he acknowledges that recurrence after five years is still possible, and surveillance must be undertaken, this again relates to risk."

29. The information in the "indication" section of Dr B's 13 August 2014 report states:

> "Posterior fossa medulloblastoma removed in 2007. Had chemo and RT. Surveillance MRI."

30. Dr B's findings were reported as:

> "Comparison MRI 1/8 2013.
>
> Findings are identical. There is no suspicion of remaining tumour. No suspicious contrast[5] enhancement is noted. Configuration of remaining post-operative cavity around the fourth ventricle is unchanged. There is no meningeal or ependymal enhancement. No other brain lesion is suspected."

[5] In radiology, the difference between the image densities of two areas is the contrast between them; this is a function of the number of X-ray photons transmitted or the strength of the signals emitted by the two regions and the response of the recording medium.

31. The impression is recorded as:

> "No remaining or new tumour is suspected. There is no interval change."

November 2014

32. On 10 November 2014, Dr C saw Ms A at a paediatric oncology clinic. His resulting clinic letter was copied to Ms A's GP. The letter concludes with Dr C's suggestion that annual surveillance MRIs discontinue, noting that the most recent MRI on 13 August 2014 had been reported as stable with no concerns or recurrence.

33. On 26 November 2014, a neurosurgical registrar saw Ms A. The registrar's clinic letter includes that when the MRI scan performed on 13 August 2014 was compared to the previous MRI of 1 August 2013, there was no interval change and no remaining or new tumour seen. The registrar explained the reassuring results to Ms A.

2015

34. In early 2015, Ms A started experiencing headaches and became unsteady on her feet. On 21 April 2015, Ms A presented to the emergency department at Hospital 1. That day, a physician arranged an MRI scan.

35. The physician's referral form states:

> "17 [year old] [history] of resected medulloblastoma 2007 [with] Radiation [and chemotherapy] Presents [with] headaches and ataxia.[6] MRI to assess for recurrence please … Today if [possible] …"

36. Ms A underwent a brain MRI that day, which revealed a progressive subependymal[7] tumour.

MRI report, 21 April 2015

37. The MRI was reported by a radiologist who, as part of his report, reviewed the previous MRI of August 2014.

38. The indication section of his report stated:

> "Previous medulloblastoma resected in 2007, with subsequent radiation and chemotherapy. Presents with headaches and ataxia. Comparison is made with the previous MRI, most recently August 2014."

39. The radiologist found that there was a mass present, which had progressed. He stated:

> "This is much more extensive than it was in August 2014. The mass now measures 55 x 40 mm in maximum axial dimensions. The extension into the third ventricle was not seen previously.

[6] Ataxia is an inability to coordinate muscle activity during voluntary movement; most often it results from disorders of the cerebellum or the posterior columns of the spinal cord; it may involve the limbs, head, or trunk.
[7] Situated under the ependymal.

…

The posterior fossa shows evidence of previous surgery with removal of the inferior vermis. No evidence of recurrence of this tumour is seen."

40. The radiologist's impression was:

"There is a progressive sub ependymal tumour extending from the anterior horn of the right lateral ventricle down to involve the third ventricle. This is associated with acute hydrocephalus.[8] The appearance is more likely to represent cerebral lymphoma,[9] or subependymoma than recurrence of the medulloblastoma, but the latter is in the differential diagnosis.

Lesion neurosurgical referral is advised. A shunt is likely to be necessary in the short term."

41. On 21 April 2015, the physician wrote to Dr C advising him that Ms A was being transferred to neurosurgical services at Hospital 2, owing to the MRI findings.

Hospital 2 neurological services

42. The next day, 22 April 2015, Ms A had surgery performed by a DHB2 neurosurgeon. This involved an endoscopic septum pellucidotomy,[10] a biopsy of the tumour, and shunt placement. The biopsy confirmed recurrent medulloblastoma.

43. The tumour was found to be inoperable. Ms A's family told HDC that they were later informed by the neurosurgeons that the tumour was identifiable on Ms A's previous MRI scan of 13 August 2014.

44. On 14 May 2015, Ms A saw a medical oncologist at DHB1 to discuss her management plan and consideration of chemotherapy and radiotherapy through her local oncology service.

45. Ms A was referred for hospice care, and sadly, she died.

Further information

Dr B's employment arrangement

46. Dr B is an employee of both DHB1 and the radiology service.

47. At the time he read the 13 August 2014 MRI in question, Dr B was an employee of the radiology service.

DHB1 MRI arrangement

[8] Hydrocephalus is a condition marked by an excessive accumulation of cerebrospinal fluid resulting in dilation of the cerebral ventricles and raised intracranial pressure.
[9] Primary cerebral lymphoma is a cancer that starts in the lymph tissues of the brain or spinal cord. It is also known as brain lymphoma or central nervous system lymphoma.
[10] The septa pellucida is the thin double partition extending vertically from the lower surface of the corpus callosum to the fornix and neighbouring parts, separating the lateral ventricles of the brain, and enclosing the fifth ventricle.

48. DHB1 told HDC:

> "[DHB1] contracts all MRI services to [the radiology service]. Three half days each week, radiologists from [DHB1] work for the radiology service MRI services. [DHB1] has a contract with [the radiology service] so that radiologist time for these 12 hours per week is paid to [DHB1]. The radiologists report on all MRI imaging, not specifically [DHB1] patients. The remainder of the time, [the radiology service] employed radiologists [to] cover the reporting of the examinations undertaken. [The radiology service] send[s] MRI images and reports from [DHB1] referred patients to the [DHB1] Picture Archive Communication System (PACS)."

49. In this case, DHB1 referred Ms A to the radiology service under the contractual arrangement in place.

50. Dr B's lawyer stated:

> "Radiologists who were employed by these organisations in 2014 did not delineate the work based on the provider but on the priorities of the patients. This means that patients who may have been seen in [DHB1] for a brain MRI may be prioritised over those seen at [the radiology service] for a plain film during the [radiology service] plain film reporting session if required. Therefore, when the Radiologist opened their screen at the start of a day of work, they see not a division between images from [DHB1] and [the radiology service] but a number of patients requiring their exams to be read from both institutions."

Staffing

51. Dr B told HDC that there are no sub-specialised neuro-radiologists in the region, although the radiologists do have special areas of interest. He said that in difficult cases radiologists can seek a second opinion from a sub-specialist in another hospital, and that often this is done in neurology cases involving newborns and infants.

52. DHB1 told HDC that there are no dedicated sub-specialised neuro-radiologists employed at either DHB1 or the radiology service, but the radiology service does allow for a second reading to be obtained from a neuro-radiologist if requested. Dr B said that he had no knowledge of the radiology service having access to a neuro-radiologist.

53. Dr B said that second readings are not standard practice, and are impractical because there is only one radiologist per MRI session, and the radiology service, in keeping with DHB1, does not observe such non-standard practice. Dr B also submitted that he has always queried difficult films and X-rays with peers, and that the practice is not relevant to perception errors.

54. The radiology service stated that double readings (from another radiologist) or self-second readings are always available, and the radiologists can access these if necessary.

55. Dr B told HDC that there is chronic permanent understaffing at Hospital 1 owing to the longstanding nationwide shortage of radiologists and shortage of funding, and that double reading — even self-second reading — is virtually unattainable. He said that he and his full-time colleagues have an increasingly heavy workload with shorter reading and reporting times.

56. DHB1 said that double reading of MRIs is not required in New Zealand. Dr B agreed.

57. The radiology service told HDC that double reading or self-second reading was available on the days in question, and that it is correct that second readings are not mandatory best practice at the radiology service, nor in New Zealand, but all of its radiologists know that such a service is available to them for difficult cases or in cases where they have any queries.

58. Dr B's lawyer stated:

> "Presumably what [the radiology service] is saying, is that if a radiologist has a concern about a film, they can seek a further opinion. [Dr B] instructs he already does this. There is no double reading at [the radiology service]."

Roster

59. Dr B said that the radiology roster for the week 11–15 August 2014 shows that there were five radiologists on leave from Hospital 1 that week, which often has a flow-on effect on the number of radiologists available at the radiology service.

60. Dr B told HDC that the business arrangements between the radiology service and DHB1 did not affect the need for radiologists to complete the outstanding and enormously significant workload, and that Hospital 1 was very understaffed that week, and the consequences of the overwork-related fatigue carried into the radiology service's session.

61. Dr B submitted that on 12 August 2014 when he was supposed to be reporting plain films for the radiology service, he was reporting MRIs and ultrasounds, some from the previous day, to ensure that patients' needs were met.

62. Dr B submitted that during the above-mentioned week, the radiologist workforce at the radiology service consisted of three part-timers, who also happened to be working for DHB1, and one full-time locum doctor. The MRI sessions were shared among the radiology service radiologists at a rate of eight sessions per week. There were also two or three sessions per week covered by a hospital radiologist. During the week of the events, when so many hospital-employed radiologists were away, the list of unreported cases in the hospital was over 1,000.

63. Dr B told HDC that several of the MRI sessions would not have had a reporting radiologist either, because he/she was away or because a radiologist rostered for DHB1 decided to help to reduce the huge backlog of hospital cases. Because of the increased demand that week, the MRI scanner was run far outside ordinary office hours, some days from 6.00am to 11.00pm. For example, Dr B said that on

12 August 2014 there were two MRIs taken shortly after 6.00am, and there was a similar early start time for three MRIs taken on 13 August 2014.

64. Dr B told HDC that on 13 August 2014 he was rostered on alone (at the MRI site that morning) reading MRIs from the previous day, and those taken earlier that morning. He said that he read nine in total in half a day.

65. When Dr B started reporting MRIs on Thursday (14 August), he recalls there being more than one page of unreported MRI cases on the screen, meaning that there were more than 50 unreported cases, instead of the usual 5–10 cases at the beginning of a session.

66. Dr B said: "[T]he only conclusion I can reach from looking at this roster is that I and the other radiologists were working under a very high and unmanageable workload at the time." He noted that image reading is only one of the multiple tasks a consultant radiologist has to perform on a daily basis, including a large number of multidisciplinary meetings, "[t]ogether with innumerable routine interruptions by phone calls, urgent emails, non-scheduled case reviews, and accidents and emergencies among others".

67. Dr B also submitted in relation to conditions for radiologists:

> "There is no single method which can capture all the elements which comprise, influence, and disrupt the daily work commitment of a consultant radiologist."[11]

68. The radiology service told HDC that its radiologists hold dual appointments and, if one area is short staffed, then there is a flow-on effect to the other, which can cause stress on radiologists having to cover both practices and provide on-call services.

69. The radiology service stated that it had one radiologist on duty per session (at the MRI facility) for MRI reporting on 13 and 14 August 2014, and that it is normal procedure to have one radiologist per session at the MRI facility. The radiology service said that radiologists who are based at the MRI facility focus on MRI reporting only, and are not pressured to read a threshold minimum of examinations, as they are aware that some studies require more time than others. The radiology service stated that at their main site there were two radiologists on duty per session.

70. The radiology service's roster for the week 11–15 August 2014[12] shows that the radiology service had a full complement of radiologists during that week, both at its main practice, and at the MRI facility. Dr B was rostered on twice at the MRI facility during that week. This rostered position means that Dr B was reporting only MRI scans, not any other general work, unless there was an emergency or urgent report request.

71. The radiology service told HDC that it had no way of knowing the exact number of unreported MRI cases waiting on 14 August, but stated that there would not have been

[11] Dr B referenced: Royal College of Radiologists. 2012. Retrieved from: https://www.rcr.ac.uk/system/files/publication/field_publication files/BFCR(12)12_workload_0.pdf
[12] Copy provided to HDC.

50, and there is no expectation of the radiology service radiologists having to report all unreported cases in their sessions.

72. The radiology service stated that its records show that of the four DHB1 radiologist staffed sessions available, all four sessions were filled. The radiology service said that it paid DHB1 for four sessions as per its contract for the week ending 15 August. On 13 August, two MRI sessions were available, and both were filled — by a DHB1 radiologist in the afternoon, and by Dr B in the morning. The radiology service said that Dr B reported eight MRI cases in his session of 13 August, and four cases at his 14 August session. In the week 11–15 August, one radiologist was away from 11–13 August.

73. The radiology service's general manager, Mr E, said that he does not believe that the radiology service was understaffed, especially for reporting MRI scans.

74. The radiology service told HDC that it had a policy of having two radiologists per session (for their main site) and if for any reason that could not happen, then radiologist sessions that had only one radiologist had the back-up of a radiologist providing cover by teleradiology (offsite reporting of plain film and ultrasound). Mr E said that he believes the radiology service has more than enough radiologist resource to cover any staff shortage, and still provides two radiologists per session.

75. The radiology service stated that the roster information and the DHB1 billing schedule show that the radiology service had sufficient radiologist manpower to cover both its MRI sessions and the busier main facility.

Further information — Dr B

76. Dr B advised HDC: "In retrospect the new, smaller lesion — which is the one I missed — was present on the 2014 scan." He said that he would like to reiterate his sincere apology.

77. Dr B stated:

> "Following [Ms A's] request, I checked the images again to see that, in fact, there is a presence of a tumour as described in the May 2015 follow-up. I cannot offer any explanation to my patient or to myself of how I could have missed such a finding. My disappointment in myself [is] even greater in this case as this is an oncology case in a very young person. [Ms A] has every right to expect me — as her clinician — to perform without error. It is, however, of no consolation for my patient to say that I endeavour to take every possible step to ensure that my reports are accurate."

78. Dr B said that the new lesion, unlike most medulloblastomas, did not enhance after contrast administration. He stated that the fact that it had been six years since the initial presentation and treatment, and that the periodicity of surveillance scans had dropped from six months to 12 months, two years prior to the 2014 scan, indicated that the referring clinicians considered that the risk for recurrence had decreased. Dr B

said that nearly all malignant tumours that recur do so within the first five years and, after that, the risk is considered significantly lower.[13]

79. Dr B's lawyer stated:

> "In 2007 [Ms A] had a high risk medulloblastoma. [Dr B] does not dispute the grade level of medulloblastomas as they are histopathologically aggressive types of malignancies but he instructs that what varies the risk level is based on a number of factors."

80. Dr B (referencing the American Brain Tumor Association, 2015)[14] submitted that, as at 2014, "the diagnostic classifications show [Ms A's] medulloblastoma is of average risk". Dr B told HDC that Ms A was 10 years of age at diagnosis, there was some residual tumour post-surgery of which the volumetric dimensions were not specified, and there was no evidence of distant spread at diagnosis.

81. Dr B also stated:

> "Having said that with regard to risk in medulloblastomas, my mistake is not one of misdiagnosis as to the risk type of [Ms A's] medulloblastoma, my mistake is one of failure of perception, that is, not having seen the new lesion on the 2014 scan. Knowing the risk level would not have explained why I did not see the new lesion."

82. Dr B submitted, to contextualise the issue, that medical journals have noted that early detection of relapse was believed to improve survival in children with recurrent medulloblastoma. However, the prognostic and outcome factors of these patients consistently found in clinical studies show that no evidence of long-term benefit can be obtained from any form of treatment.[15]

83. Dr B also stated:

> "Not one single day goes by that I do not think about [Ms A], especially when I read paediatric oncology cases. I have always been extra careful with my paediatric oncology cases, because it is such a cruel injustice that a child should have cancer. Previously, I used to take similar challenging cases that kept being left behind. Since becoming aware of my error, I have endeavoured to be even more careful, systematically checking each slice multiple times, re-reading my reports, and trying to obtain as much clinical information as possible for the interpretation. [Ms A] is present in my prayers and I sincerely hope that I never make that mistake again."

[13] Dr B said that according to a number of recent large sample studies published, few patients with medulloblastoma will relapse ⩾ 5 years post-diagnosis, and typically the relapse occurs at the primary tumour site. However, paediatric medulloblastoma patients are at risk for developing secondary tumours in other locations, many of which are malignant gliomas (*Neuro-Oncology* 15(1):97–103, 2013). The same publication reiterates the findings in the international literature that recurrent medulloblastoma is highly lethal in previously irradiated patients regardless of salvage therapy modality when practicable (*Neuro-Oncology* 2010; 12(3):297–303).

[14] See: http://www.abta.org/secure/medulloblastoma-brochure.pdf

[15] Dr B referenced *Neuro-Oncology* 2010; 12(3): 297–303 and *British Journal of Cancer* 1998; 77(8): 1321–6.

Error rates

84. Dr B stated that error rates are high in radiology. He said that research[16] indicates that the overall rate of errors in radiologists' reports is around 30%, and the rate of significant errors is 3–5%. Dr B said that the error rate is attributed to the sheer mass of data that radiologists have to deal with on a daily basis, chronic understaffing, and the pressure to reduce the backlog.

85. Dr B told HDC that the rate of significant errors at Hospital 1 is very close to these numbers, and he and his colleagues hold monthly peer-review meetings to discuss and learn from their errors. Dr B said that the error rate could be decreased slightly with double reading, but the probability of mistakes remains present.

86. Dr B submitted:

> "Of radiological errors, perception errors are common (60–80% of the errors)[17] and this occurs 'when the radiologist fails to identify the abnormality in the first place, but it is recognised as having been visible in retrospect. It is noted in this paper that the reported rate of perceptual error is relatively consistent across the modalities, circumstances and locations, and seems to be a constant product of the complexity of radiologists' work'.
> …
>
> The Medical Council of New Zealand states that: 'It is an inevitable part of professional practice that all doctors will make mistakes and that these mistakes will result in adverse outcomes for the patient'."[18]

87. Dr B also stated:

> "Failure of perception errors happen to every radiologist. I am very aware of this as I host the monthly Peer Review meeting, where the radiologists get together to view errors in reports, to discuss and learn."

88. It was submitted by Dr B's lawyer on his on behalf:

> "Failures of perception do not automatically equate with negligence or a failure to reach a reasonable standard of care in a particular case. It is accepted that experienced competent radiologists such as [Dr B] can make a perception error while still using a reasonable standard of care, following all of the proper procedures and techniques, as occurred here. Such failures of perception are a non-modifiable factor deemed to be inherent to radiological practice even among the best trained specialists."

89. Dr B said that he now endeavours to be more careful, double checking his own scans, and trying to obtain as much clinical information as possible for the interpretation.

---

[16] *World Journal of Radiology*, 28 October 2010; 2(10): 377–383.
[17] Dr B cited: Brady, Adrian P. Error and Discrepancy in Radiology: Inevitable or Avoidable? *Insights into Imaging* 2017; 8.1: 171–182.
[18] Dr B references: Lillis S. Errors in Medical Practice. Chapter 21 in St George I M (Editor). *Cole's Medical Practice in New Zealand* (12th Edition) 2013. Medical Council of New Zealand, Wellington.

Subsequent events

90. The radiology service said that currently the radiologists and management are investigating whether there is a need for additional sub-specialty resourcing to assist the current general radiologists in areas of radiology reporting that are not commonly seen in the region.

91. The radiology service told HDC that the radiologists have been encouraged to seek further assistance or comment from their colleagues should they feel the need to have a second opinion or review of a report they feel requires further investigation.

92. The radiology service stated that it currently operates two MRI machines. Since March 2017, it has had the use of six radiologists (3.8 FTE)[19] who cover all its services, and three sessions are provided by the hospital imaging department.

Responses to provisional opinion

93. Feedback from Ms A's family and the providers has been incorporated into the "information gathered" section of the report where appropriate. Ms A's family acknowledge Dr B's comments at paragraph 83.

94. The radiology service had no further comments to make regarding the provisional report.

95. Dr B's response to the provisional report acknowledged, with sadness, Ms A's passing.

96. Dr B's response included reiterating the following points:

- In respect of the likelihood of early detection of the relapse altering the treatment plan, he noted: "Regardless of therapeutic effort, medulloblastoma recurrence survival rates are very low."[20]
- Whether or not double readings are available is irrelevant in cases of failure of perception, which are not issues of interpretation and are a known risk (3–5%).
- He was subjected to under-resourcing pressures on 13 August 2014, and he felt that this had not been fully taken into account.
- In relation to collegial anonymised peer review of imagery as part of the independent radiology advice, it was submitted that "'something' would be more easily seen by radiologists looking at imagery knowing that there was something wrong".
- The steps he took in reading the imagery were consistent with a reasonable standard of care.

[19] Full-time equivalent.
[20] Dr B cited: Parker RJ and Findlay JL, "Chemotherapy for Childhood Medulloblastoma and Primitive Neuroectodermal Tumours", *Oncologists* 1996; 1(6): 381–93.

Opinion: preliminary matters

97. From the outset, I extend my condolences to Ms A's family.

98. For the avoidance of doubt, my role does not extend to determining causation in relation to such adverse outcomes, and comments I make should not be interpreted as such. My role is to assess the quality of care provided to Ms A, in light of the information that was known at the time the care was provided.

99. In addition, as I have acknowledged previously in other cases, 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 images originally. Independent advisors are aware of this context when providing advice to my office.

Opinion: Dr B — breach

100. Dr B is an experienced radiologist who at the time of these events was employed by the radiology service. On 13 August 2014, a surveillance MRI scan performed on Ms A at the radiology service was read and reported on by Dr B, who recorded his impression as: "[N]o remaining or new tumour is suspected. There is no interval change."

101. In 2015, when Ms A started experiencing headaches and became unsteady on her feet, she underwent an MRI scan, which revealed a progressive subependymal tumour. The radiologist who reported on the MRI, noted that there was a mass present, which had progressed.

102. My radiologist advisor, Dr Kingzett-Taylor, advised that the appropriate standard of care would include making efforts to retrieve and compare the MRI with previous imaging to assess for subtle interval changes. Dr Kingzett-Taylor stated that it would be necessary to distinguish tumour recurrence from post-treatment appearances. I note that Dr B's August 2014 report refers to him making a comparison with the MRI of July 2013. Dr Kingzett-Taylor stated that it would be expected that most radiologists who regularly report MRI head studies would have detected the lesion on the MRI performed in August 2014.

103. Dr B accepts that the lesion commented on by the radiologist in 2015 was present and visible on the 13 August 2014 scan, and that he had missed seeing it. Dr B said that his mistake was one of a failure of perception. Dr Kingzett-Taylor noted that errors of perception are known to occur in a small but consistent number of radiology interpretations.

104. I do not accept that the fact that errors of perception (such that a radiologist misses an apparent abnormality that would have been detected by most of his or her peers in similar circumstances) occur in a small but persistent number of radiology

interpretations is determinative in assessing whether the standard of care has been met in a particular case.

105. Dr B stated that the clinical information he was provided with prior to reporting on the August 2014 MRI was the information in the referral of 14 November 2012, which did not include the words "high risk". I do not accept that this is a relevant factor, as a more recent referral for the August 2014 MRI (which included reference to the risk) was made in August 2013, although it is unclear why Dr B did not view the most recent referral. In any event, Dr D's report from the 1 August 2013 MRI, which Dr B had access to and reviewed as part of preparing his report, refers to "high risk medulloblastoma". Dr B also stated that awareness of the risk level would not have explained why he did not see the new lesion.

106. Dr Kingzett-Taylor advised me that "other than the failure to perceive the lesion, there is no evidence of a departure from the standard of care", and that there were clinical features that mitigated Dr B's failure to detect the lesion, including:

- The recurrence is in the supratentorial[21] brain rather than the posterior fossa, which was the location of the original tumour.
- There was no significant enhancement and so review of the post contrast images may have falsely reassured Dr B.
- The fact that the subependymal morphology conforms to the outline of the frontal horn might have misled the eye.

107. Dr Kingzett-Taylor advised that in light of these features of the lesion, he would quantify this as a mild departure from the accepted standard of care, taking into account the complexity of the imaging and the potential confounding factors.

108. However, Dr Kingzett-Taylor also advised that the lesion should have been detected on the August 2014 MRI, and that the interval change in a high-risk patient should have prompted a neurosurgical review.

109. I note Dr B's statement that at the time of these events there was chronic permanent understaffing at Hospital 1, which meant that a double reading of MRIs was not possible, and that between 11–15 August 2014 there were five radiologists on leave from Hospital 1 that week, which affected the number of radiologists available at the radiology service.

110. The radiology service told HDC that its radiologists hold dual appointments and, if one area is short staffed, then there is a flow-on effect to the other, which can cause stress on radiologists having to cover both practices and provide on-call services. However, the radiology service said that double reading or self-second readings are always available to radiologists.

[21] Relating to, occurring in, affecting, or being the tissues overlying the tentorium cerebelli (see footnote 1).

111. The radiology service also reviewed the radiologist roster for the week of 11–15 August 2014, and told HDC that during that week the radiology service had a full complement of radiologists, and that Dr B was rostered on twice at the MRI facility during that week. The radiology service acknowledged that it had one radiologist on duty per session for MRI reporting on 13 and 14 August 2014, and that it is normal procedure to have one radiologist per session at the MRI facility. Dr B was reporting only MRI scans, not any other general work, unless there was an emergency or urgent report request. The General Manager of the radiology service, Mr E, said that he does not believe that the radiology service was understaffed, especially reporting MRI scans.

112. The radiology service had a policy of having two radiologists per session (at its main site — distinct from the MRI site), and if for whatever reason that could not happen then radiologist sessions that had only one radiologist had the back-up of being supported by a radiologist providing cover by teleradiology (offsite reporting of plain film and ultrasound). Mr E said that he believes the radiology service has more than enough radiologist resource to cover any staff shortage and still provides two radiologists per session.

113. This patient had a history of medulloblastoma. MRI scans were undertaken for surveillance purposes. The tumour did re-appear in a manner consistent with what might be anticipated, and was captured on the MRI images. Dr B missed detecting a lesion that would have been apparent to most radiologists who regularly report on MRI head studies. I accept that the error made in the present case was inadvertent; however, as Dr B himself has noted: "I cannot offer any explanation to my patient or to myself of how I could have missed such a finding."

114. Right 4(1) of the Code requires that every consumer has the right to have services provided with reasonable care and skill. The standard of care applicable in the present case is the care and skill that an ordinarily careful radiologist would exercise under similar circumstances. Most radiologists would have seen the lesion and reported accordingly. I remain of the view that Dr B failed to provide services to Ms A with reasonable care and skill and, accordingly, breached Right 4(1) of the Code. I note that Dr B has accepted his error and apologised for this.

Opinion: The radiology service — other comment

115. At the time of these events, Dr B was an employee of the radiology service. 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), employing authorities are vicariously liable for any act or omission by an employee. However, a defence is available to an employing authority under section 72(5) of the Act, if it can prove that it took such steps as were reasonably practicable to prevent the act or omission.

116. Dr B said that double reading or even second self-reading is virtually unattainable because of the very heavy workload of the radiologists, and that at the time of these

events he and the other radiologists were working under a very high and unmanageable workload because there were five radiologists on leave at Hospital 1.

117. As mentioned earlier, the radiology service told HDC that its radiologists hold dual appointments and, if one area is short staffed, then there is a flow-on effect to the other, which can cause stress on radiologists having to cover both practices and provide on-call services. The radiology service said that double reading or self-second readings are always available to radiologists, and that radiologists are encouraged to seek further assistance from colleagues should they feel the need to have a second opinion or a review of a report. The radiology service acknowledged that second readings are not mandatory best practice at the radiology service or in New Zealand.

118. In this respect, Dr B said that second readings are not standard practice, are impractical because there is only one radiologist per MRI session, and that the practice is not relevant to perception errors.

119. The radiology service reviewed the radiologist roster for the week 11–15 August 2014, and told HDC that its records show that the radiology service had a full complement of radiologists, and that Dr B was reporting only MRI scans, not any other general work. Mr E said that he does not believe that the radiology service was understaffed, especially reporting MRI scans. The radiology service acknowledged that it had one radiologist on duty per session (at the MRI facility) for MRI reporting on 13 August 2014, and that it is normal procedure to have one radiologist per session at the MRI facility.

120. The radiology service had a policy of having two radiologists per session (for the main site), and if for any reason that could not happen then radiologist sessions that had only one radiologist had back-up support of a radiologist providing cover by teleradiology (offsite reporting of plain film and ultrasound). Mr E believes that the radiology service has more than enough radiologist resource to cover any staff shortage, and said that the radiology service still provides two radiologists per session.

121. Radiology clinics have a responsibility for ensuring that consumers receive an appropriate standard of care. Accordingly, it is incumbent upon radiology service providers to have in place adequate systems and procedures to support staff, reduce workplace stressors, and create a focused working environment where the risk of perception error is managed effectively.

122. Having considered the circumstances of this case, I am satisfied that the radiology service took such steps as were reasonably practicable to prevent the omission that occurred in this case, and that Dr B's failure to detect the lesion on 13 August 2014 was an individual clinical issue.

123. However, this case has identified areas for potential improvement, and I note that during this investigation the radiology service advised that it is investigating whether there is a need for additional sub-specialty resourcing to assist the current general radiologists in areas that are not commonly seen in the region.

Recommendation

124. I recommend that the radiology service, as part of its own investigation into whether there is a need for additional sub-specialty resourcing to assist general radiologists, obtain an independent review of its rostering structure, radiologist staffing levels, and the availability of double-reading, and work collaboratively with DHB1 in relation to radiologists holding dual appointments, so that if one area is short staffed, there is reduced negative flow-on effect causing stress on those radiologists having to cover both practices and provide on-call services. The radiology service should report back to HDC with the outcome within three months of the date of this report.

Follow-up actions

125. 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 B's name.

126. A copy of this report with details identifying the parties removed, except the expert who advised on this case, will be sent to DHB1, the Royal Australian and New Zealand College of Radiologists, and the Health Quality and Safety Commission, and will be placed on the Health and Disability Commissioner's website, www.hdc.org.nz, for educational purposes.

Appendix A: Independent advice to the Commissioner

The following expert advice was obtained from a diagnostic and interventional radiologist, Andrew Kingzett-Taylor.

"I am a diagnostic radiologist working full-time for the Pacific Radiology Group. I became a fellow of the Royal Australian and New Zealand College of Radiologists in 1996.

I received further subspecialty musculoskeletal radiology training in San Francisco in 1998–9 and have worked since for Pacific Radiology Group or its predecessors in both New Zealand and Australia. I regularly report MR head studies but am not considered and do not consider myself a subspecialist neuro radiologist.

I am registered as a diagnostic radiologist in both Australia and New Zealand.

I am a member of the:

— American Roentgen Ray Society

— American Institute of Ultrasound in Medicine

— Australasian Musculoskeletal Imaging Group

— Australian and New Zealand Society of Nuclear Medicine

— European Society of Skeletal Radiology

I participate fully in the RANZCR CPD programme

CONFLICTS:

I have no conflicts of interest to declare.

INFORMATION REVIEWED

I have reviewed the following items:

- Letter from HDC dated 18 September 2015
- CD containing MRI imaging of [Ms A's] brain from 2013 and 2014
- Copy of the referral forms from 2012 and 2013

REVIEW

HDC letter 18 September 2015 includes following request:

The Commissioner is seeking your findings from the enclosed magnetic resonance imaging (MRI) scan, originally reported on 13 August 2014

Report follows:

MR HEAD 13th August 2014

INDICATION:

Surveillance. High risk medulloblastoma. Subtotal resection with chemotherapy and irradiation. Bilateral sensorineural hearing loss. Growth hormone deficiency.

COMPARISON: MRI 1st August, 2013 FINDINGS

There has been a significant interval change.
The right frontal horn is now effaced by a rind of soft tissue which extends posteriorly to the foramen of Munro and bulges across midline. The lesion is hyperintense on T2/FLAIR and demonstrates diffusion restriction on DWI. There is no or negligible enhancement following gadolinium.

A tramline track of increased T2 signal (normal diffusion) right frontal lobe and increased signal within the vermis and at the posterior margins of the fourth ventricle are stable compared to 2013 and compatible with post-treatment gliosis.

Otherwise normal posterior cranial fossa and skull base. Normal subarachnoid spaces.

Normal signal void within the major visualized intracranial vessels.

Mastoid air cells and paranasal sinuses are clear.

IMPRESSION:

New soft tissue effacing the right frontal horn is likely to reflect subependymal recurrence of medulloblastoma."

Dr Kinzett-Taylor provided the following further advice:

"INFORMATION REVIEWED

I have reviewed the following items:

- Letter from HDC dated 18 September 2015
- MR studies from 2013 and 2014
- Requisition forms from 2012 and 2013

Subsequent to my original review of the MR study and report supplied to HDC, I received:

- Further letter from HDC dated 21 October 2015
- Copy of letter of complaint from [Ms A]
- Copy of [Dr B's] report of 13 August 2014
- Copy of Response from [Dr B].

REVIEW

HDC letter 21 October 2015 includes the following request:

Please advise:

a) What is the standard of care/accepted practice?

b) If there has been a departure from the standard of care or accepted practice, how significant a departure do you consider it to be?

c) How would it be viewed by your peers?

What is the standard of care/accepted practice?

This MRI study was performed to assess for recurrent medulloblastoma which was considered high risk by the clinicians.

It is noted that this was a 'routine surveillance scan' with a requisition form dated the previous year.

Standard of care should include all efforts to retrieve and compare with previous imaging to assess for subtle interval changes as it will be necessary to distinguish tumour recurrence from post-treatment appearances.

Imaging sequences to detect recurrence and assist discrimination from post treatment changes should include diffusion weighted, inversion recovery and post Gadolinium sequences (as performed in this instance).

Surveillance imaging of the spine is not always performed as recurrence is typically intracranial and spine imaging is considered low yield.

It would be expected that any significant unexpected findings should be communicated directly to one of the clinical team.

If there has been a departure from the standard of care or accepted practice, how significant a departure do you consider it to be?

It is expected that most radiologists who regularly report MRI head studies would have detected the lesion on the MR performed in August 2014. However there may have been some differences in the interpretation of the finding amongst general radiologists.

There is no reference to the right frontal horn lesion on the report and thus there has been a failure of perception, acknowledged by the radiologist himself in his response to HDC.

Other than the failure to perceive the lesion, there is no evidence of a departure from the standard of care.

The MRI images are of reasonable quality, include appropriate sequences and the report indicates that attempts were made to compare with the previous examination, assess the location of the previous tumour and whether or not there was pathologic enhancement.

Errors of perception are known to occur in a small but consistent number of radiology interpretations, perhaps about 3–5%. The clinical significance of these errors will vary widely.

Perceptual errors are well known and researched and thought to be multifactorial in origin with contributors including psychophysiological factors not unique to radiology and common to visual perceptual tasks in general (e.g. fatigue,

distraction, lesion conspicuity) and those more specific to radiology including recognition error (fixating in the territory of the lesion yet failing to detect the lesion) and satisfaction of search error (diversion of the radiologist's attention from a tumour by an eye-catching but unrelated finding).

In this case, it is possible there are some features which may have conspired against the lesion's perception/detection:

1. The recurrence is in the supratentorial brain rather than the infratentorial ('posterior fossa') location of the original tumour. I note that the report refers specifically to the fourth ventricle and I presume particular attention was given to this region during the radiologist's interpretation. However unfortunately medulloblastoma recurrence may also occur as supratentorial subependymal tumour as in this case.

2. Absence of significant enhancement. Enhancement is more common than not in recurrent tumour and review of the post-contrast images in this case may have falsely reassured the radiologist.

3. The subependymal morphology conforming to the outline of the frontal horn might have misled the eye.

How would it be viewed by your peers?

Most radiologists reviewing this study and the report generated at the time would agree that it is a 'missed case' and that the lesion should have been detected on the August 2014 MR study.

There probably would not have been consensus on what the lesion represented amongst general radiologists but the interval change in a high risk patient would have prompted a neurosurgical review.

However, in my experience, all practising radiologists will be aware of the potential for these same unfortunate errors of perception to occur in their own practice. Most, probably all, radiologists will admit to having experienced 'failures of perception' in their own work with varying degrees of clinical significance.

CONCLUSION

The failure to detect the lesion on the August 2014 MRI appears to constitute a failure of perception. As noted above, it is possible that some features of the lesion (location, morphology, enhancement) may have contributed to this error.

'Perceptual errors' are a well known and researched cause of radiologist error and are thought to occur in about 3–5% of radiology reports although their clinical relevance will vary widely.

Most, probably all, practising radiologists will acknowledge that 'perceptual errors' have occurred in their work.

To learn from these cases, it is important that they are reviewed and discussed at collegial 'discrepancy or missed case meetings' and it is noted that the reporting radiologist makes reference to such a meeting in his response.

As part of this process, attempts will typically be made to assess if there could be any contributory factors, for example work environment (workload, display of images, potential for distraction in reporting room) and depending upon the frequency of such events, whether there is the need for second reporting of selected cases.

Andrew Kingzett-Taylor"

Dr Kingzett-Taylor subsequently advised HDC verbally that he had presented the case anonymised to other radiology colleagues, who had all detected something, but had different diagnoses.

Dr Kingzett-Taylor provided the following further advice:

"I have reviewed the following items:

- Letter from HDC dated 18 September 2015
- MR studies from 2013 and 2014
- Requisition forms from 2012 and 2013

Subsequent to my original review of the MR study and report supplied to HDC, I received:

- Further letter from HDC dated 21 October 2015
- Copy of letter of complaint from [Ms A]
- Copy of [Dr B's] report of 13 August 2014
- Copy of Response from [Dr B].

I have received further letter from HDC dated December 2nd 2015 with additional queries.

RESPONSE TO LETTER OF DECEMBER 2nd 2015

HDC letter 2 December 2015 includes the following request

- *You state that 'most radiologists who regularly report MRI head studies would have detected the lesion' but there may have been some differences in the interpretation of the finding amongst general radiologists. Given the radiologist in this case was a general radiologist what would be the acceptable range of error?*

I would expect a general radiologist reviewing this case to have detected the frontal lobe lesion, particularly given the change in appearance from the preceding study.

Had it been detected, it would have been acceptable for a general radiologist to suggest a variety of differential diagnoses as long as it was recognised that an interval change in a patient who is being monitored for 'high risk medulloblastoma' requires neurosurgical (and consequently probably neuroradiological) review.

It would not have been acceptable to dismiss the finding as inconsequential.

- *As there is no reference to the right frontal horn lesion on the report, you consider there has been a failure of perception. Given the known rate of perception errors is 3–5%, do you think the reporting of the radiologist in this case was below accepted standards for a general radiologist? If so, how would you quantify the difference between the accepted standard and the standard provided?*

Given that the scan was performed in a patient identified as 'high risk medulloblastoma', I consider that the failure to detect this lesion constitutes a departure from the accepted standard for a general radiologist reporting MRI head studies.

However, as outlined in my original report, several features of the lesion may have contributed to the failure of perception. These include the morphology of the lesion, poor conspicuity on several sequences including post-contrast images and location in the supratentorial brain.

Thus I would quantify this as a MILD departure from the accepted standard of care.

CONCLUSION:

In my opinion, taking into account the complexity of the imaging and several potential confounders, the failure to detect the right frontal lobe lesion constitutes a mild departure from the accepted standard of care."

Dr Kingzett-Taylor provided further advice:

"MY QUALIFICATIONS
I am a diagnostic radiologist working full-time for the Pacific Radiology Group. I became a fellow of the Royal Australian and New Zealand College of Radiologists in 1996.

I received further subspecialty musculoskeletal radiology training in San Francisco in 1998–9 and have worked since for Pacific Radiology Group or its predecessors in both New Zealand and Australia. I report MR head and MR acoustic neuroma studies *but am not considered and do not consider myself a subspecialist neuroradiologist.*

I am registered as a diagnostic radiologist in both Australia and New Zealand.

I am a member of the

American Roentgen Ray Society
American Institute of Ultrasound in Medicine
Australasian Musculoskeletal Imaging Group
Australian and New Zealand Society of Nuclear Medicine
European Society of Skeletal Radiology.

I participate fully in the RANZCR CPD programme.

CONFLICTS:
I have advised HDC that I will not comment on the correspondence from [the radiology service] or [DHB1].
INFORMATION REVIEWED
My original review of the MR studies which had been performed in 2014 and 2013 was preceded by receipt of:

Letter from HDC dated 18 September 2015
MR studies from 2013 and 2014
Requisition forms from 2012 and 2013

Subsequent to my original review of the MR study and report supplied to HDC, I received:

Further letter from HDC dated 21 October 2015
Copy of letter of complaint from [Ms A]
Copy of [Dr B's] report of 13 August 2014
Copy of Response from [Dr B].

I then received a further letter from HDC dated December 2nd 2015. I replied on December 9th, 2015.

I have now received a letter from HDC dated August 29 2017. Included with the letter were:

Requisition forms dated 2013 and 2014
Copy of [Dr B's] report of 13 August 2014
Copy of letters from [the radiology service] and [DHB1]
Copy of letters from [Dr B's] counsel

SUPPLEMENTARY COMMENTS

QUALIFICATIONS
In a submission, [Dr B] queries whether I should be considered 'an expert'. I consider myself to be, and prefer the term, 'independent advisor'. With respect to neuroradiological cases, I am considered a general radiologist. HDC may consider a general radiologist is best able to assess the care provided by another general radiologist. I have made it explicit in all my written and verbal communications that I do not consider myself, and am not considered a neuroradiologist.

CLINICAL INFORMATION PROVIDED

I was not provided with the 2014 clinical requisition details when the 2014 examination was submitted for initial blind review. I was provided with copies of requisition forms dated 2012 and 2013 which I understood to be the only ones available (I made a verbal enquiry to check). I made specific reference to the requisition forms in my report and reproduced the 2013 clinical details in my interpretation. The 2013 clinical details *as provided by the clinician* refer to 'high risk medulloblastoma'. It is acknowledged that the 2014 requisition details do not refer to 'high risk'. The clinical details provided in 2014 refer to follow [up] of medulloblastoma treated with chemotherapy and radiotherapy.

Whether or not the clinician had used the term 'high risk' appropriately, the imaging in 2014 was ordered for ongoing surveillance of [a] patient who had been treated for a cerebral malignancy.

STANDARD OF CARE

I have not altered my opinion on the standard of care provided in this case. I understand the term standard of care to refer to the standard I consider that my peers would expect of a general radiologist reporting this study.

It is acknowledged that perceptual error is a common part of radiology practice and some errors are 'inevitable'. Experienced, conscientious and competent radiologists can and do make random perceptual errors. Radiologist errors may occur for many reasons, both human- and system-derived. In my opinion, a perceptual error is not, ipso facto, a departure from the standard of care, but nor is it, ipso facto, *within* the standard of care.

It is necessary to consider the circumstances pertaining to the individual case. In forming my opinion on this particular case, I considered

1. Clinical context (surveillance of a patient with a history of medulloblastoma)
2. My assessment of the 'difficulty' of the interpretation for a general radiologist (including location, morphology and conspicuity of the lesion on various MR sequences, the pre-existing cerebral changes, the number of images demonstrating the lesion and the availability of prior imaging permitting assessment of interval change).

I am not able to consider whether any other human and system-derived factors (for example fatigue, interruptions or distractions on the day, workload) may have contributed to the perceptual error in this case either because they cannot be known, are very subjective or because I do not consider myself able/qualified to do so. In this regard, several of the articles included in my appendix provide useful contextual information. I commend in particular the articles by Pitman (a member of the Australian and New Zealand College of Radiologists), Brady, Waite and Caldwell (published in Annals of Health Law).

SUMMARY

I have not altered my opinion that there has been a departure from the standard of care. I will retain my previous view that it is probably best characterized as mild.

To consider the context in which these perceptual errors occur and how they might be minimized, I commend the articles included in the appendix.

Andrew Kingzett Taylor

APPENDIX

'In retrospect, it may be very difficult to understand why a radiologist did not see a particular abnormality. Even experienced and competent radiologists sometimes miss obvious abnormalities, without realizing it at the time. This makes it extremely difficult for anyone, even an expert radiologist, to state with certainty that he or she would not have missed the abnormality under the same set of circumstances.'

'There is an absolutely unavoidable "human factor" at work in the review of films; some abnormalities may be missed, even the obvious ones; the mere fact that a radiologist misses an abnormality on a radiograph does not mean that he or she has committed malpractice; and not all radiographic misses are excusable. Therefore, the focus of attention should be on issues such as proof of competence, habits of practice, use of proper techniques and other factors that can normally be controlled by a radiologist when taking reasonable precautions.'

Caldwell C, Seamone ER. Excusable neglect in malpractice suits against radiologists: a proposed jury instruction to recognize the human condition. Ann Health Law. 2007;16:43–77

'Discrepancies between radiology reports and subsequent patient outcomes are not inevitably errors. Radiologist reporting performance cannot be perfect, and some errors are inevitable. Error or discrepancy in radiology reporting does not equate to negligence. Radiologist errors occur for many reasons, both human and system derived. Strategies exist to minimise error causes and to learn from errors made.'

Brady AP. Error and discrepancy in radiology: inevitable or avoidable? Insights into imaging. 2016 Dec 7:1-2.

'It is impossible to avoid all perceptual type errors, but there are ways of minimising them. Awareness of areas prone to recurrent perceptual errors, combined with careful attention to reporting technique, may help to reduce frequency of such events.'

Owens, E. J., N. R. [Ms A], and D. C. Howlett. 'Perceptual type error in everyday practice.' Clinical radiology 71.6 (2016): 593–601.

'With respect to radiological investigations, the use of the term "**error**" is often unsuitable; it is more appropriate to concentrate on "**discrepancies**" between a report and a retrospective review of a film or outcome.'

Brady, Adrian, et al. 'Discrepancy and error in radiology: concepts, causes and consequences.' The Ulster medical journal 81.1 (2012): 3.

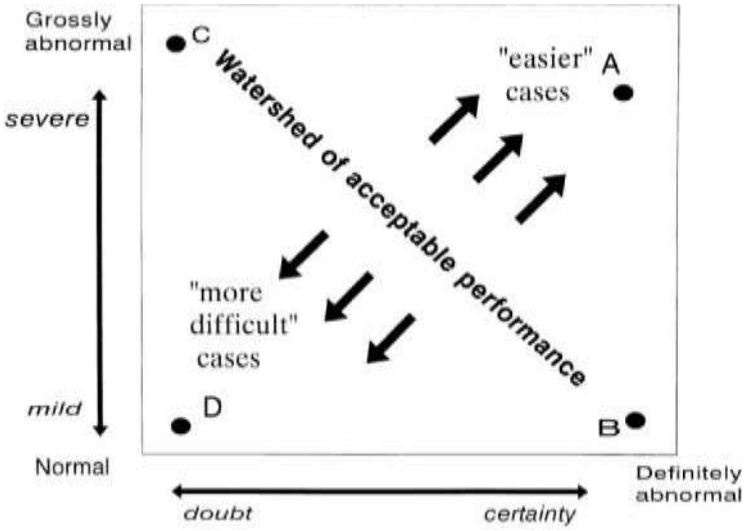

Figure 1. A proposed relationship between severity and certainty in recognizing abnormalities. "Errors" occur when "easy" cases (*e.g.* A) are wrongly interpreted; different readings of "difficult" cases (*e.g.* D) represent acceptable "observer variation". See text for more details.

Robinson, P. J. 'Radiology's Achilles' heel: error and variation in the interpretation of the Roentgen image.' The British journal of radiology 70.839 (1997): 1085–1098.

Roddie, Mary E. 'Approach to Characterising Radiological Errors.' Pitfalls in Diagnostic Radiology. Springer Berlin Heidelberg, 2015. 133–142.

'Failures of abnormality detection in film reading (i.e., perceptual errors) are subject to psychophysiological factors of human visual perception. Perceptual errors, in general, are related to multiple psychophysiological factors, including level of observer alertness, observer fatigue, duration of the observation task, any distracting factors, conspicuity of the abnormality, and many others.'

Pinto, Antonio, et al. 'The concept of error and malpractice in radiology.' Seminars in Ultrasound, CT and MRI. Vol. 33. No. 4. WB Saunders, 2012.

Pinto, Antonio, et al. 'Learning from diagnostic errors: a good way to improve education in radiology.' European journal of radiology 78.3 (2011): 372–376.

'Perceptual errors can be confidently expected to occur in a proportion of observations made by any human observer, including professionally trained observers (such as a diagnostic radiologist) even when operating under ideal conditions. Perceptual errors occur at all levels of professional training and seniority. They also tend to be sporadic, so that the same observer who made a perceptual error on one occasion is unlikely to make the same perceptual error if presented with the same test on a different occasion.

Even assuming that the disputed films were given to a peer radiologist for a 'non-informed, non-suspicious' reading, this would not provide an adequate assessment of peer performance on those films. Perceptual error is random, and, as has been detailed, is present in 20–40% of readings.

This paper seeks to raise the Fellowship's awareness of perceptual error in diagnostic radiology and recommends the following professional position for further Fellowship discussion and debate and potentially adoption of the following:

— that errors of perception area acknowledged as an integral part of diagnostic radiology, and allowance is made for their inevitability
— that the culture of open disclosure in diagnostic radiology be encouraged and promulgated by the profession'

Pitman, A. G. 'Perceptual error and the culture of open disclosure in Australian radiology.' Journal of Medical Imaging and Radiation Oncology 50.3 (2006): 206–211.

'Radiologists use visual detection, pattern recognition, memory, and cognitive reasoning to synthesize final interpretations of radiologic studies. This synthesis is performed in an environment in which there are numerous extrinsic distractors increasing workloads and fatigue. Given the ultimately human task of perception, some degree of error is likely inevitable even with experienced observers. However, an understanding of the causes of interpretive errors can help in the development of tools to mitigate errors and improve patient safety.'

Waite, Stephen, et al. 'Interpretive Error in Radiology.' American Journal of Roentgenology 208.4 (2017): 739–749.

'Because perceptual error is the most common type of error, it follows that to substantially reduce the overall prevalence of radiologic error, the underlying psychophysical processes involved in perception must be better understood. To find an abnormality via visual search, one must move his or her eyes around the image to concentrate the central visual field on each of many areas of interest. The radiologist's visual search pattern can be guided by habit, practice, or — ideally — clinical knowledge of the anatomic locations, disease patterns, and types of abnormalities being searched for, and all of these appear to be critical factors. Visual search may also be augmented by detection of an area of interest in the peripheral vision in many cases, and there is evidence that peripheral vision makes a considerable contribution to a radiologist's search, with an interplay observed between foveal and peripheral vision noted as the observer scans an image. Certainly, a fraction of perceptual errors in the practice of radiology reflects flaws or biases in the search patterns used by radiologists (e.g., whether they do not look in the area of a lesion or do not fixate on a lesion long enough to notice its relevant features); thus, they may be amenable to training and cognitive debiasing. Clearly, some lesions are made subtle by their surroundings or are overlooked because of their location; these errors may be amenable to technologic innovations, such as image processing or computer-aided detection.'

Bruno, Michael A., Eric A. Walker, and Hani H. Abujudeh. 'Understanding and confronting our mistakes: the epidemiology of error in radiology and strategies for error reduction.' Radiographics 35.6 (2015): 1668–1676.

Berlin, Leonard, and Ronald W. Hendrix. 'Perceptual errors and negligence.' AJR. American Journal of Roentgenology 170.4 (1998): 863–867.

Berlin, Leonard. 'Malpractice issues in radiology. Perceptual errors.' AJR. American Journal of Roentgenology 167.3 (1996): 587–590.

Brook, Olga R., et al. 'Quality Initiatives: Anatomy and Pathophysiology of Errors Occurring in Clinical Radiology Practice 1.' Radiographics 30.5 (2010): 1401–1410.

FitzGerald, Richard. 'Radiological error: analysis, standard setting, targeted instruction and team working.' European Radiology 15.8 (2005): 1760–1767."