Mr B, Audiologist

Southern District Health Board

A Report by the

Deputy Health and Disability Commissioner

(Case 11HDC00846)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

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Executive summary

1. Master A was two years old when he was first seen by audiologist Mr B, in May 2000. Mr B advised Master A's family that Master A had normal hearing.

2. Mr B saw Master A a further four times between 2003 and 2010. Each time Mr B diagnosed Master A with hearing within the normal range but at the lower end of the scale.

3. In April 2011, when under the care of another audiologist, Ms K, Master A was diagnosed with moderate to profound hearing loss.

Findings

4. Mr B failed to provide Master A with testing and diagnostic services of an appropriate standard and, accordingly, breached Right 4(1)[1] of the Code of Health and Disability Services Consumers' Rights 1994 (the Code). His documentation did not meet expected standards and, accordingly, Mr B breached Right 4(2)[2] of the Code.

5. Southern District Health Board was held vicariously liable for Mr B's breach of Right 4(1) the Code.

Complaint and investigation

6. The Commissioner received a complaint from Mrs A about the services provided to her son, Master A, by audiologist Mr B and Southern District Health Board. The following issues were identified for investigation:

   - *The adequacy of the service provided to Master A by audiologist Mr B between February 2000 and April 2010.*
   - *The adequacy of the service provided to Master A by Southern District Health Board[3] between February 2000 and April 2010.*

7. An investigation was commenced on 22 March 2012. This report is the opinion of Theo Baker, Deputy Commissioner, and is made in accordance with the power delegated to her by the Commissioner.

[1] Right 4(1) states: "Every consumer has the right to have services provided with reasonable care and skill."
[2] Right 4(2) states: "Every consumer has the right to have services provided that comply with legal, professional, ethical, and other relevant standards."
[3] Southern District Health Board was established on 30 April 2010. The Health Sector Transfers (Southern DHB) Order 2010 provides in clause 5 that all the liabilities of the former Otago DHB were transferred to the Southern DHB as at that date.

8. The parties directly involved in the investigation were:

Master A	Consumer
Mrs A	Complainant
Mr B	Audiologist/provider
Southern District Health Board	Provider

Also mentioned in this report:

Dr C	General practitioner
Dr E	Consultant otolaryngologist
Ms D	Clinical psychology intern
Ms F	Psychologist
Dr G	Paediatric registrar
Ms H	Speech language therapist
Mr I	Audiologist, private clinic
Mr J	Audiologist, DHB2
Ms K	Audiologist
Ms L	Ministry of Education adviser on deaf children
Ms M	Audiologist, DHB3
Dr N	Audiologist

9. Independent expert advice was obtained from audiologist Ms Lisa Burr (**Appendix A**).

Information gathered during investigation

Background

10. Master A was born in May 1998. In January 2000, his GP, Dr C, noted concerns about Master A's hearing. Dr C wrote to the Audiology Department at the hospital to arrange a hearing assessment for Master A. Dr C noted that at nearly two years of age, Master A was saying only "mum" and "dad", and also was not responding to people who spoke to him, unless he was facing the speaker.

11. In February 2000, Dr C wrote to the Ear Nose and Throat (ENT) Department at the hospital with a view to Master A being assessed for an adenoidectomy. Dr C noted that Master A was having problems with his speech and had been attending speech and language therapy. Dr C noted that Master A had obstructive symptoms from enlarged tonsils and adenoids.

12. Master A was seen at the hospital by consultant otolaryngologist Dr E, who referred Master A to audiologist Mr B for a paediatric hearing assessment.

Audiologists

13. Audiologists are not regulated under the Health Practitioners Competence Assurance Act 2003, and therefore they are not legally required to have an annual practising certificate or to undertake any competency programmes.

14. The New Zealand Audiological Society (NZAS) represents audiologists and provides a code of ethics, biannual peer review, clinical competence certification, clinical protocols and standards, and a complaint process for its voluntary members.

Mr B

15. Mr B completed a Masters in Physics in the early eighties. A few years later he obtained a position as an audiology trainee with then Otago Hospital Board.

16. Mr B applied to the Otago Hospital Board to undertake a Diploma of Audiology at Melbourne University. The Otago Hospital Board agreed to support Mr B during this course of study, including paying his salary, rent, university fees and air fares.

17. On his return to New Zealand after successfully completing the Diploma, Mr B joined the NZAS as an associate member. In order to become a full member he required formal supervision. According to Mr B, the hospital's charge audiologist at that time considered that the NZAS's arrangements for granting full membership were substandard and that a more rigorous programme was required and, accordingly, declined to act as Mr B's supervisor.

18. The following year, Mr B was appointed sole charge audiologist at the hospital.

19. Mr B's associate membership lapsed a few years later as a consequence of various changes made to the NZAS in 1992. In order to become a full member he was required to complete a Certificate of Clinical Competence (CCC). To achieve this, Mr B was required to have clinical supervision with a full member of NZAS.

20. Mr B explained that he attempted to arrange this first with an audiologist in another centre. This was on the basis that his employer paid for the supervisor's expenses, which Mr B said was "not acceptable to the Board at the time". An attempt was then made to set up supervision with an audiologist in yet another centre, but this was not able to be arranged because of Mr B's personal circumstances.

21. Mr B continued to work as a sole charge audiologist until 2010.

31 May 2000 appointment

22. On 31 May 2000, Mr B saw Master A. There were no clinical notes made or history recorded at this appointment.

23. Mr B carried out conditioned orientation reflex testing (COR) using two loudspeakers, with one on each side of Master A, who was sitting on his mother's lap. Mr B said that the intention was to elicit a head turn, which would then be rewarded by the

presentation of a puppet near the loudspeaker. Mr B also performed tympanometry (a test of middle ear function).[4]

24. Mr B said that he was able to get binaural results at 30dB (decibel) stimuli, which is at the lower end of the range. He said that ideally he would have liked to elicit results using 20dB, but the quality of the rooms was such that stimuli at that level were, in most cases, inaudible even to the technician. He said that there was nothing in the ENT referral or his results to indicate anything untoward. Mr B did not recommend any follow-up.

25. Following this assessment, Dr E wrote back to Dr C on 7 June 2000. Dr E advised: "[Master A's] tympanic membranes[5] appeared normal and a hearing assessment has shown him to have normal hearing."

Surgery

26. In May 2001, Master A was put on the waiting list for an adeno-tonsillectomy. He had been examined by an otolaryngologist who found that Master A's tonsils were infected. The otolaryngologist noted that, on examination by microscope, Master A's ears were normal.

27. On 3 August 2001, Master A had an adeno-tonsillectomy. He was discharged back into his GP's care on 16 October 2001.

Public health nurse's concerns

28. On 17 September 2003, a public health nurse wrote to Mr B. She said that she had seen Master A as part of the national screening programme, and that Master A had allowed her to put the headphones on his ears but constantly said that he could not hear any sounds.

8 December 2003 appointment

29. On 8 December 2003, Mr B saw Master A again. Mr B performed tympanometry and attempted pure tone audiometry (a test of hearing sensitivity where the child presses a button when a sound is heard).

30. Mr B suggested that the probe fit on the audiometry testing may not have been optimal and that he suspected that Master A must have been restless because the stimulus stability for both ears was not great. Mr B said that, at that stage, he was not using insert headphones for conventional pure tone audiometry because of the cost of the initial outlay and the consumables.

31. Mr B wrote to the public health nurse on 15 December 2003 and reported that Master A would not permit audiometry[6] but would carry on a conversation when pressed. Mr

[4] Tympanometry is an objective test of middle-ear function. It is not a hearing test, but rather a measure of energy transmission through the middle ear. The results of this test should always be viewed in conjunction with pure tone audiometry. Tympanometry permits a distinction between sensorineural and conductive hearing loss.
[5] The eardrum.

B said that Master A's mother expressed little concern as to Master A's hearing acuity, and said she would bring him back for retesting when she thought he was able to cope with it.

32. Despite the concerns raised by the public health nurse and the finding that Master A had no Transient Evoked Otoacoustic Emissions (TEOAEs) (inner ear cell response test) responses,[7] Mr B did not recommend any further follow-up appointments.

Referral to psychologist

33. In December 2004, Master A was seen at the Paediatric Department by clinical psychology intern Ms D, and psychologist Ms F. On 8 December 2004, they reported to paediatric registrar Dr G that Master A had presented at school with aggressive behaviour, learning problems, and verbal processing difficulties.

34. They noted that Master A's teachers had been concerned for some time that Master A had a hearing impairment. They were aware that Master A's hearing had been assessed when he was two years old and found to be normal. However, Ms D and Ms F recommended that "it [was] of primary importance that further attempts be made to determine [Master A's] hearing ability". A further referral was made to Mr B.

23 February 2005 appointment

35. On 23 February 2005, Mr B saw Master A for a third time. On 9 March 2005, Mr B reported to Dr G that the audiogram[8] showed "bilateral hearing acuity within the normal range, with no significant asymmetry between the ears". Mr B noted that Master A was slightly restless during the testing when the lower frequencies were reached and that the "bilateral type A tympanograms [were] consistent with normal ear function". He commented that overall the results appeared to confirm the behavioural audiometry results of May 2000.

Special Education Service

36. On 13 April 2005 and 26 May 2005, Master A was assessed by speech language therapist Ms H, of the Special Education Service's School Focus Team. In a report dated 23 June 2005, Ms H noted that Master A had been known to the Ministry of Education's Special Education Service since he was two years old. She said that programmes had been provided to his teachers and Education Support Worker to help Master A with his speech and language. These programmes were monitored every two weeks.

37. Ms H noted that Master A's school reported in his Individual Education Plan that, since starting school, Master A talked very little to adults or other children. The

[6] An audiometry examination tests the ability to hear sounds.
[7] Transient otoacoustic emissions (TOAEs) or transient evoked otoacoustic emissions (TEOAEs) are sounds emitted in response to acoustic stimuli of very short duration; they are usually clicks but can be tone-bursts.
[8] An audiogram is a graphic record of hearing ability for various sound frequencies.

school was concerned that Master A might have a hearing difficulty, because he did not follow whole class instructions and needed to be addressed individually.

38. Ms H said that a Clinical Evaluation of Language Fundamentals — pre-school (normed to Master A's age of 6.11 years) had been administered on 26 May 2005. Ms H said:

> "I feel that there is a receptive language delay but full validity of the assessment is not able to be established until hearing difficulties are fully ruled out."

39. Ms H concluded:

> "The fact that [Master A] is not following group instructions and taking some time and volume to respond to his name may be part of a language problem, he may not cue in auditory information around about him. However because of the pattern of his phonological delay and the appearance of lip reading as well as the ability to imitate a voiced consonant while putting mouth in position but not producing any sound for the unvoiced consonant I feel that further exploration of [Master A's] hearing (such as an 'ABR' [Auditory Brain Response]) that can be done would be of benefit in establishing the best course of therapy and teaching techniques to use with [Master A]."[9]

40. Ms H re-referred Master A to the Audiology Department and included a copy of her assessment report. Ms H noted in her letter of referral to Mr B that "[Master A's] avid watching of people's mouths … is something that I have not seen before except when a child is hearing impaired".

14 February 2006 appointment

41. On 14 February 2006, Mr B saw Master A again. On 3 April 2006 Mr B reported to Ms H that the audiogram showed "bilateral hearing acuity at the lower end of the normal range, with minimal asymmetry between the ears". He also reported that the Auditory Brainstem Response (ABR) results were within the usual limits. Mr B reported that Master A's latest audiogram was consistent with the overall pattern of results.

Mr I, audiologist

42. In July 2009, Dr C referred Master A to audiologist Mr I, at a private clinic. In a letter to Dr C, Mr I noted that "pure tone as well as speech audiometry could not be performed in a reliable manner". He suggested that Master A should be referred to the Audiology Department at another district health board (DHB2) to perform a frequency specific ABR, which is a non-behavioural hearing test, and that Master A should be assessed by the Auditory Processing Disorder team.

[9] An Auditory Brainstem Response test (ABR) evaluates how well the sounds travel along the hearing nerve pathways to the brainstem. It can be used to determine the integrity of the auditory pathway, or to estimate hearing thresholds in newborns, older children and adults who cannot perform reliably on a behavioural hearing test.

DHB2 assessment

43. On 25 September 2009 Master A was seen by Mr J, the charge audiologist at DHB2. In a letter dated 24 November 2009 to Mr B, Mr J reported that Master A's parents had purchased a hearing aid for Master A.

44. Mr J said that Distortion Product Otoacoustic Emissions testing (DPOE)[10] was attempted, but there was some equipment failure. ABR was attempted, but Master A became upset at having to close his eyes and relax for the test, and therefore unreliable results were obtained.

45. However, Mr J noted that the tests raised some concern about the status of Master A's auditory nerve, and that his listening behaviour appeared similar to that of a child with hearing difficulties.

15 February 2010 appointment

46. On 15 February 2010, Mr B saw Master A following a referral from DHB2. This was Mr B's fifth assessment of Master A. Mr B conducted an audiogram with some difficulty. Both DPOAEs and TEOAEs were tested.

47. In April 2010, Mr B reported to Dr C that after running tests, including Otoacoustic Emission Response and ABR testing, he noted that "the overall pattern of results appear[ed] consistent with bilateral hearing acuity no worse than at the bottom of the normal range, with perhaps the left ear slightly poorer".

48. Mr B noted that Master A's parents and the school believed the hearing aid helped him, and that he was more responsive when using the hearing aid. Mr B said that he thought this "may be simply a feature of the improved signal to noise ratio that he is now experiencing and that the same result may be obtained through the use of a sound field system for him, without the possible dangers of over amplification with a hearing aid".

49. Mr B suggested tactics to optimise Master A's performance, such as breaking instructions into manageable portions, but did not recommend any follow-up of Master A.

Second opinion

50. On 26 November 2010, a Ministry of Education adviser on deaf children, Ms L, wrote to Ms M, the audiologist at another district health board (DHB3), asking for a diagnostic assessment and another opinion about Master A's hearing. Ms L wrote that Master A continued to struggle with developing expressive and receptive language,

[10] Distortion Product Otoacoustic Emissions testing (DPOAE) responses are generated when the cochlea is stimulated simultaneously by two pure tones. The audiologist will position an earplug in the outer ear that houses the measuring microphone and sound emitting speakers for the DPOAE measurements. Recording microphones pick up the small sounds coming back from the inner ear, and the computer averages and processes the responses, displaying the results on the computer screen for the patient and audiologist.

despite the involvement of the Special Education Service and the hospital over many years. She said that Master A's school wanted to clarify his hearing status.

51. Ms L said that she had contacted the hospital to clarify with Mr B whether he had excluded auditory neuropathy[11] from the ABR studies. Mr B responded that he had not tested to exclude auditory neuropathy because that was not part of the referral he had received.

52. On 6 December 2010, Ms M advised Ms L that she was unable to accept the referral for Master A as he was out of their District Health Board area.

53. On 28 January 2011, Ms L wrote to Dr E (consultant otolaryngologist). She asked that Master A's hearing be tested because his family had struggled for many years, without a clear diagnosis.

Profound hearing loss established

54. In April 2011, Ms K, a visiting audiologist with Southern District Health Board (SDHB), tested Master A as part of her review of the service (discussed below). She completed a Pure Tone Audiogram, which showed moderate to severe sensorineural hearing loss on the right and a moderate, sloping to profound, sensorineural loss on the left. She noted that the DPOAE were absent in both ears. She performed the ABR assessment and noted that although Master A had difficulty relaxing, there did not appear to be any ABR evident in the recording. She said that this was consistent with the degree of hearing loss shown in the audiogram.

55. Ms K noted that the testing showed that Master A had significant sensorineural hearing loss, and said that he should be fitted with hearing aids customised for his ears.

56. On 19 August 2011, Ms K applied to the Ministry of Education for Master A to receive ORRS funding.[12] She noted that the diagnosis of Master A's hearing loss had been delayed, which "resulted from the view that [Master A] was unco-operative for behavioural testing". However, she had found him to be consistent and reliable in his responses.

57. Ms K said that the late diagnosis at the age of 12 had had a major impact on Master A's speech, language and literacy development, as well as his cognitive and social development. She said she would recommend to the family that Master A be referred to the Southern Cochlear Implant programme.

Review of Audiology Service

58. In April 2010, Otago District Health Board and Southland District Health Board were merged. The two Boards became one entity, Southern District Health Board (SDHB).

[11] Auditory neuropathy is a variety of hearing loss in which the outer hair cells within the cochlea are present and functional, but sound information is not transmitted to the auditory nerve and brain properly.

[12] The Ongoing and Reviewable Resourcing Schemes (ORRS) provide resources for a very small group of school students throughout New Zealand who have the highest need for special education.

In July 2010, SDHB arranged for an external review of the Audiology Service in its region, including the hospital. This was partly in response to complaints received by SDHB and concerns raised by the person appointed to implement the neonatal hearing screening programme.[13]

59. SDHB appointed an audiologist, Dr N, to conduct the review. This review identified two main issues: the facility and equipment required upgrading, and there were no personnel with acceptable credentials to carry out the screening programme requirements and aspects of the audiology service provisions such as fitting hearing aids. Additionally, there was no one with appropriate credentials to supervise the tasks of the audiometrist.[14]

60. Dr N said that the room that the hospital was using for Visual Reinforcement Audiometry (VRA)[15] testing did not meet the requirements for sound testing because it was too noisy. She found that it was "completely unacceptable" to use the room for infant testing.

61. Dr N stated that the appointment booking system could be more streamlined to allow the receptionist more time to spend on hearing aid administrative support. This would enable the clinicians to have more patient time. She thought that it was an inefficient use of time for clinicians to type their own reports.

62. Dr N noted that the audiometrist was untrained, and that the ENT service was using a nurse to perform air conduction audiograms. She said that the ENT service should ensure that a trained audiometrist/audiologist performed diagnostic audiograms, and that "it is highly likely that inaccurate audiograms are being made as a result of this practice".

63. Dr N was also critical of the system of storing patients' audiograms separately from their correspondence. She said that this was "unusual", and noted that files did not record all parts of audiology assessments, such as otoacoustic emission (OAE) results.

64. SDHB stated that the issues had arisen "principally … because our incumbent audiologist [Mr B] was not a member (nor eligible to become a member) of the New Zealand Audiological Society".

Peer review of Mr B

65. In October 2010, Mr B was peer reviewed by Ms K, who is a member of NZAS. Ms K said that she did not believe that it was safe for Mr B to perform VRA. She said that

[13] The national newborn hearing screening programme is in place in all district health boards. It is jointly led by the Ministries of Health and Education to ensure that babies with a detected hearing loss receive support from the newborn period through to school entry.
[14] An audiometrist is a health care technician trained in the use of audiometry equipment.
[15] Visual Reinforcement Audiometry (VRA) testing takes place in a sound-treated room. The child sits between two calibrated loudspeakers or using earphones. When a sound such as a tone at a specific frequency, speech, or music is presented, the child's eye-shift or head-turn response toward the sound source is rewarded by activation of a lighted mechanical toy mounted near the loudspeaker. The child's attention is then distracted back to the midline so that additional sounds can be presented.

the rooms and equipment being used were part of the problem, but a further issue was Mr B's belief that his long experience meant that he could tell whether there was a response or not from a child without other evidence.

66. Ms K said that the "cross-check principle is basic to good clinical practice", and noted that cross-checking had not been a consistent part of Mr B's practice.[16]

67. Ms K said that Mr B had frequently identified ABR responses in what were essentially random noisy recordings. She said that this was "very dangerous" as Mr B was "drawing unwarranted conclusions from these recordings, usually from children who are not able to be co-operative in other ways".

68. Ms K said that the working environment in the Audiology Department was cramped, dark, stuffy and shabby, with disproportionately large office space. She recommended purchasing additional equipment to assist with hearing assessments.

Restructure

69. In September 2010, SDHB developed a "Service Reconfiguration Consultation" document. In October 2010, SDHB said that as a consequence of this consultation two positions were to be disestablished in December 2010, including Mr B's position.

Review of Master A's treatment

70. In September 2011, Ms K reviewed Master A's treatment by Mr B. Ms K found that Mr B did not adhere to best clinical practice, as a cross-check on the behavioural assessments should have been included.

SDHB's responses to the complaint

71. On 29 September 2011, SDHB responded to the complaint lodged by Mrs A. SDHB said that it believed it had taken all practicable and reasonable steps to remedy a deficit once it became aware of it. SDHB said that it acted "swiftly" when restructuring was found to be necessary to remedy the deficits. It said it "deeply regret[ted] and sincerely apologise[d] for the inadequate assessments carried out and any subsequent disadvantage suffered".

72. On 21 December 2011, SDHB confirmed that in May 2011 Ms K had reviewed all children on the case load of the Adviser on Deaf Children (AODC) because the AODC had the links with a wide range of professionals from schools, therapists, and audiologists, and was able to identify children at risk of hearing loss.

73. SDHB said that it had not reviewed all patients that Mr B had assessed because many would now be adult and would already have had any possible hearing deficit recognised. It believed that those at greatest risk were pre-school children who had not gone through the national screening process.

[16] A cross-check is another test that supports the behavioural results obtained to prove that those results are true results, for example, a speech test, otoacoustic emissions test, or acoustic reflex testing.

74. On 11 April 2012, the Chief Executive Officer, SDHB, responded further and advised that a meeting was held on 13 January 2012 to discuss options for informing patients and families of the identified risks, and to formulate a plan for offering re-testing of the children identified.

75. SDHB wrote to the parents of 1532 children who had been identified as being under five years old when they were tested by Mr B between 2007 and 2010. Twenty-one of the 144 who responded did not want any follow-up as they had no concerns. One hundred and twenty-three parents requested that their child be re-tested. One child was found to have a significant hearing loss, and five children required further audiology testing for specific diagnoses.

76. On 4 December 2012, the Chief Executive Officer responded further. She stated that SDHB was unable to find any documented evidence of an objective process to assess Mr B's clinical competence prior to Ms K's review in October 2010. Before that time, performance appraisals were done by managers, and informal feedback would have been obtained from the clinicians in the Otorhinolaryngology service.

77. The Chief Executive Officer stated:

> "We recognise that as an organisation we share the responsibility to ensure [Mr B] met any professional requirements to undertake his role and to ensure patient safety."

78. SDHB said that its managers appeared unaware that Mr B's competence was below standard, and no areas of concern were noted. It said that there were no concerns raised by other health professionals.

79. SDHB confirmed that performance reviews of Mr B were not carried out in 2004, 2005, 2008 and 2009, and stated that it was unable to advise the reason for this because the managers responsible were no longer employed by SDHB.

Mr B's response to the complaint

80. On 10 April 2012, Mr B provided a timeline of his consultations with Master A. He acknowledged that Master A's parents had been told that the moderate to severe sensorineural hearing loss now diagnosed would have been present since birth. However, he said that the ABR tests that he performed over the years did not indicate the presence of such a loss. He said that if he had felt that to be the case then he would have arranged for further testing, and it appeared to him that he had elicited consistent results on at least four of the five occasions he saw Master A.

81. Mr B said that Dr C did not push him to do any further testing of Master A.

82. Mr B noted that no clinical support for him was possible through the NZAS as he was not a member.

83. He said that after June 1996, following the redundancy of the Audiology receptionist, he and the audiology technician had to deal with all appointment making, general reception duties, and report typing, in addition to the normal clinical workload.

84. Mr B said that he had his first performance appraisal in May 2003. At that time he was asked whether he could become a full member of NZAS and obtain a CCC. He spoke to NZAS and was told that the New Zealand Qualifications Authority would not necessarily cross credit his Diploma in Audiology with a Master of Audiology degree, and that the Masters degree was necessary before the process of obtaining a CCC could begin.

85. Mr B said that his workload increased from January 2005 to mid-2006 when the audiology technician left and was not replaced. Additionally, there was a restructure of allied health professionals and, as a result, he no longer fitted into any of the categories for professional leadership/management.

86. Mr B said that he tried to update his skills within budgetary parameters but that it was "an uphill battle". He had also had tried to access the Audiology Standards of Practice from NZAS but could not do so as he was not a member.

Other information

87. Master A's family lodged an ACC Treatment Injury claim. On 11 May 2012, an ACC expert, a specialist otolaryngologist, advised that diagnosis of the hearing loss should have been made in 2003 when Master A failed his five-year-old national screening test. The otolaryngologist noted:

> "Whilst it is accepted that the initial audiological assessments of children with hearing loss may give misleading results, one way or the other, repeated expressions of parental suspicion of impaired hearing, more latterly backed up by concerns from teachers and other involved health professionals, should have raised the clinical index of suspicion of undiagnosed hearing loss to a high level. In addition, no recordable otoacoustic emissions were ever obtained and this is inconsistent with the presence of normal hearing, and the ABR traces obtained do not, to my eye, show a pattern consistent with an ABR response."

88. In July 2012, Mrs A advised HDC that ACC had declined Master A's claim, on the basis that there was no physical injury as a result of the delayed diagnosis.

Response to provisional findings — Mr B

89. Mr B noted a number of points in response to the advice of Ms Burr (my independent expert adviser) and my provisional findings.

90. Mr B noted that criticism has been levelled against him because he did not appear to follow best practice guidelines when using ABR assessment. He stated that up until 2006, his ABR equipment had pre-determined menus and, for example, the click rates and filter cut-off frequencies could not be adjusted. He suspects that the best practice

guidelines he had access to, in the public access area of the NZAS website, were less specific than those referred to by Ms Burr.

91. Mr B stated that he felt that most of the ABR data he elicited over the years was noisy, but that he was encouraged to do the best he could given the circumstances. He stated that the up-skilling he received in 2007 occurred when the hospital purchased a new ABR unit and he was required to attend a training course on SSEP testing and stacked ABRs, but that no specific education was done on wave or peak identification at that time.

92. Mr B stated that notwithstanding this, it appears that he did not do a good enough job of interpreting the ABR tracings, and that is distressing for him, and more particularly for Master A and his family.

93. Mr B stated that he did his best to keep up with current literature, but that this was only through what was available online. He stated that as far as he knows, the ENT Department did not subscribe to any audiological journals despite requests in the 1990s, and that the Medical School library had very few journals. He stated that, in general, online journals were behind a paywall so he could not access these, and he did not have internet access at all until 2002.

Concluding comments

94. Mr B concluded his response by saying that he used to take pride in going "the extra mile" for patients, and he tried to give them the best service that he could. He stated that the work environment was far from ideal. Mr B feels that there is very little chance of him re-entering audiology again.

95. Mr B provided written apologies for forwarding to Mrs A and Master A.

Response to provisional findings — SDHB

96. SDHB had no comments on my provisional findings, but asked that the improvements that have since been made to its Audiology services be considered with respect to any follow-up action by HDC.

97. SDHB noted:

- Improvements were commenced initially as a result of a complaint in June 2010 from the NZAS with respect to incorrect auditory brainstem response testing at SDHB. That complaint raised issues about its service and the qualifications of some of its employees.
- SDHB acted swiftly in response to this, in the first instance by engaging Dr N to undertake a review of the SDHB's Audiology services. This resulted in a number of service improvement initiatives, including:
  - the immediate purchase of Real Ear Measurement and Immittance equipment;
  - the amalgamation of Audiology Service documentation into patients' clinical records;

— the development of a booking schedule to allow for more effective use of Audiologist time;
— the development of triage criteria, with priority given to paediatric patients;
— temporary facility improvements with regard to sound field testing;
— the establishment of a process to provide regular review of children wearing hearing aids;
— the establishment of testing protocols consistent with NZAS Best Practice Guidelines and the Policy and Quality Standards specified by the Newborn Hearing Screening Programme; and
— the employment of one full-time and two part-time NZAS certified audiologists.

- In November 2012, an audit report on the Newborn Screening Programme including audiology for the National Screening Unit noted SDHB's documentation as being "exemplary", and described their ABR recordings as "excellent cases, very efficient and accurate thresholds".
- In June 2013, SDHB commenced refurbishment of its hearing testing facility. The works include two new soundproofed testing rooms, alterations to another room, and additional soundproofing treatment at other sites in the facility.
- Dr N has been engaged to undertake a peer review of the incumbent audiologist and to re-review the Audiology Service structure and protocols, with preliminary inspections of the refurbishments as they proceed.

98. SDHB provided written apologies for forwarding to Mrs A and Master A.

Opinion: Breach — Mr B

99. Mr B first saw Master A on 31 May 2000 when he was two years old, after Master A's parents had reported concerns about his hearing. Between then and 15 February 2010, Mr B tested Master A's hearing on five occasions, and each time concluded that Master A's hearing was normal.

100. My expert advisor, audiologist Lisa Burr, advised me that in her clinical opinion it is highly likely that a significant hearing loss had been present since the consultation in 2003. However, she noted that the results cannot confirm the presence of the hearing loss from any of the dates as, although OAEs and acoustic reflexes are absent in people with a significant hearing loss, they can also be absent for other reasons. Accordingly, this report is focused on whether services of an appropriate standard were provided at each consultation.

101. Ms Burr also advised that it appears that Master A's case was complex. He was tested by two other audiologists (Mr I and Mr J) and a public health nurse, none of whom were able to condition Master A for the hearing test. Ms Burr stated that this suggests

that objective testing should have been performed, to provide information about Master A's hearing.

Standards

102. Ms Burr advised that, as audiology is not a registered profession, it does not have a set of national guidelines that must be followed. She stated that Mr B would have had difficulty obtaining all of the best practice guidelines from the NZAS website as only NZAS members have access to the full website. However, she pointed out that resources were available from the National Screening Unit and NSU websites. Ms Burr also stated that Mr B would have been able to keep up to date with current literature to form the basis of his clinical protocols.

103. In my view, despite these difficulties, when working as an audiologist Mr B had a personal responsibility to ensure that he was informed about current developments and best practice.

Qualifications

104. Mr B completed a Masters in Physics and a Diploma of Audiology. Mr B's associate membership of NZAS lapsed and in order to become a full member he was required to complete a CCC, which required supervision by a full member of NZAS. Supervision was available, but Mr B stated that he was not able to arrange this. As a result, Mr B did not complete the CCC but continued to work as sole charge audiologist until 2010.

Testing

105. Ms Burr identified the following areas of concern with regard to Mr B's testing of Master A's hearing.

Type of testing

106. The type of testing documented as used by Mr B in the first consultation with Master A on 31 May 2000 was COR. Ms Burr advised that COR was disestablished as best practice some time before 2000, and that VRA was the appropriate test to be used at that time. Ms Burr advised that the failure to use VRA testing was a moderate departure from expected standards.

Audiology cross-checks

107. Audiology cross-checks were not performed at any of the consultations Mr B had with Master A. Ms Burr advised that clinical cross-checks are particularly important for paediatric audiology, and the failure to carry out cross-checks was a severe departure from expected standards. In relation to the testing carried out on 23 February 2005, Ms Burr advised that given the strong red flags for hearing loss reported in the clinical psychologists' report, it would have been important to obtain a cross-check of the hearing results that day. Without a cross-check, Ms Burr commented that there were two sets of conflicting results from that assessment (the normal audiogram and absent TOAEs), which could reflect either normal hearing or hearing loss.

Acoustic reflex testing

108. Mr B performed acoustic reflex testing at only one of the five audiology consultations. Ms Burr advised that acoustic reflex testing is important to test the integrity of the auditory nerve pathways, and the failure to perform this testing was a moderate departure from expected standards.

Speech testing

109. Mr B did not carry out speech testing at any of the consultations. Ms Burr advised that age-appropriate speech testing is important to confirm the behavioural results, and also to test the child's ability to detect and/or discriminate speech sounds. The failure to perform this testing was a moderate departure from expected standards.

Auditory Brainstem Response

110. Mr B performed ABR testing on two occasions. Ms Burr advised that the software parameters used on both tests were not in line with current best practice guidelines for ABR testing, which she considered was a severe departure from expected standards.

111. Ms Burr noted that the interpretation of ABR results is subjective, although there are recognised techniques that can be used help decide on the presence or absence of a response.[17] However, Mr B failed to use these techniques when he interpreted Master A's ABR results. Ms Burr disagrees with Mr B's interpretation of both ABR tests.

Follow-up

112. Mr B failed to arrange for follow-up. Ms Burr noted that this was particularly concerning following the consultation on 15 February 2010 because no results were obtained that day that suggested Master A had normal hearing. Ms Burr stated that a strong recommendation for an urgent follow-up should have been made, and the failure to do so was a severe departure from expected standards.

Record-keeping

113. This Office has frequently emphasised the importance of record-keeping.[18] Accurate and complete records are essential to ensure continuity of care. The NZAS website refers to its guiding principles, which include: "10. Recognise the importance of documentation." It also notes that "documentation includes identification of information, relevant history, and results of previous screening, assessment and rehabilitation if available".

114. Standards New Zealand *Health Records* NZS 8153:2002 states that "[t]he health record is an accurate reflection of the interaction between the healthcare provider and the consumer/patient…".[19]

[17] There are two recognised criteria used to decide whether a response is present: the response must be repeatable at the lowest level, and the response must show growth (get bigger and be recognised earlier) as the sound level increases.
[18] See Opinion 10HDC00610.
[19] Clause 1.1.

115. Ms Burr has pointed to a number of areas where Mr B's documentation was inadequate.

31 May 2000

116. On 31 May 2000, Mr B did not make clinical notes or record a clinical history. That information was necessary to determine whether Master A had risk factors for hearing loss, whether his parents were concerned about his hearing, and how his speech development was progressing. Ms Burr stated that the standard of clinical documentation of this consultation was poor and there is no report and no comment on the management plan. The thresholds (the minimal level of hearing) were not marked on the audiogram, and there was no documentation of the transducer used.

8 December 2003

117. On 8 December 2003, Mr B again made no clinical notes and recorded no clinical history. Ms Burr advised that the clinical history should have included the following: risk factors for hearing loss; the parent's view on Master A's hearing; and his receptive and expressive speech development.

9 March 2005

118. On 9 March 2005, Mr B recorded no clinical notes or history. There was no audiogram (graph of hearing). Mr B wrote a clinic letter reporting "bilateral hearing acuity within the normal range with no asymmetry between the ears", but the clinical notes and clinic letter did not state what type of testing was performed to obtain the results summarised in the letter.

3 April 2006

119. On 3 April 2006, Mr B again recorded no clinical notes or history. He wrote a clinical letter explaining the testing performed at that appointment, but although an audiogram was performed, it was not retained in the file. Similarly, on 14 February 2010 the clinical documentation from Mr B included no history or clinical notes. However, there was a thorough clinical reporting letter from this appointment, explaining all of the testing performed.

Conclusions

120. In my view, Mr B's testing of Master A's hearing was suboptimal in several respects. In particular, I am concerned that Mr B did not perform cross-checks at any of the consultations, used incorrect parameters for ABR testing, and failed to arrange for follow-up of Master A.

121. As Mr B was not a member of NZAS, he was not necessarily bound by NZAS standards regarding record-keeping but, as a health professional, he had a professional obligation to maintain adequate records. The key principles are set out in the Standards New Zealand *Health Records*. In my view, Mr B's documentation of Master A's care did not comply with relevant standards.

122. Overall I am of the view that the standard of services provided by Mr B to Master A was not adequate. Mr B did not provide testing and diagnostic services with reasonable care and skill and, accordingly, Mr B breached Right 4(1) of the Code. In

addition, I consider that Mr B's documentation of Master A's care did not comply with relevant standards and, accordingly, Mr B breached Right 4(2) of the Code.

Opinion: Breach — Southern District Health Board

123. Mr B was the sole charge audiologist from the late eighties until 2010. SDHB stated that the issues with the service had arisen "principally … because our incumbent audiologist [Mr B] was not a member of (nor eligible to become a member) of the New Zealand Audiological Society".

124. During the period in question, 2000–2010, the Otago District Health Board and then SDHB were aware that Mr B was unable to be a full member of the NZAS because to do so he was required to complete a CCC, which required external supervision by a full member of NZAS.

125. Mr B had previously made some efforts to arrange supervision. For a number of reasons, including supervisor availability, costs, and Mr B's personal circumstances, this did not occur. Mr B advised that in June 2008, he investigated whether he could complete a Master of Audiology programme in New Zealand and found that it was not possible and, even if he was able to complete the qualification, there was no guarantee that he would be eligible to join NZAS.

126. Mr B said that during the period he worked at the hospital there was very little collegial support. He had no professional mentor, and no organisational or support networks were available to him.

127. SDHB said that Mr B attended NZAS conferences on six occasions between 2000 and 2006, as well as attending upskilling workshops in 2010. SDHB said that it had met its obligations to appraise Mr B regularly and provide up-skilling activities, but acknowledged the lack of peer support or checks on Mr B's performance.

128. The question of external supervision had been revisited on a number of occasions during Mr B's employment. In my view, SDHB did not take adequate steps to ensure that Mr B received supervision and peer support. Given that Mr B was working as a sole charge audiologist and he did not meet the requirements for membership of the NZAS, SDHB should have done more to satisfy itself that Mr B was competent to perform the role for which he was employed.

129. The facilities within which the audiometry service was operating were suboptimal. The facilities and equipment required upgrading, and the room being used for VRA testing did not meet the requirements for sound testing.

130. My expert advisor, audiologist Ms Burr, also advised that it is recommended that ABR testing is reviewed by multiple observers, and it did not seem that peer review of ABR traces was in place at SDHB.

131. In my view, SDHB failed to ensure that Mr B was appropriately supervised, and failed to provide peer support or checks on his performance. Mr B was working as a sole charge audiologist, in a department with suboptimal facilities and equipment. In these circumstances, SDHB did not take reasonable steps to prevent Mr B's breach of the Code. Accordingly, I find SDHB vicariously liable for Mr B's breach of Right 4(1) of the Code.

Recommendations

132. Mr B has provided written apologies to Mrs A and Master A for his breaches of the Code.

133. I recommend that in the event that Mr B resumes work in audiology, he undertake suitable training and arrange for supervision approved by the NZAS.

134. SDHB has provided written apologies to Mrs A and Master A for its breach of the Code.

135. I recommend that SDHB:

- provide HDC with a copy of Dr N's further review of its Audiology Service structure and protocols, and facility refurbishments;
- ensure that appropriate mentoring and support is available to staff within the Audiology Service; and
- report to HDC by **30 September 2013** on these matters.

Follow-up actions

- Mr B and SDHB will be referred to the Director of Proceedings in accordance with section 45(2)(f) of the Health and Disability Commissioner Act 1994 for the purpose of deciding whether any proceedings should be taken.

- A copy of this report with details identifying the parties removed, except the expert who advised on this case and SDHB, will be sent to the Ministry of Health and NZAS and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Addendum

The Director of Proceedings decided to issue HRRT proceedings against Dr B and SDHB. Proceedings are pending.

Appendix A — Independent advice to the Commissioner

The following expert advice was obtained from audiologist Ms Lisa Burr:

"**Introduction**

I have been asked by the Commissioner to provide an opinion regarding Case Number HDC 11/00846. I have read and agree to follow the Commissioner's Guidelines for Independent Advisors.

I am a New Zealand qualified Audiologist with the following qualifications, MAud (Hons) BSc, both from The University of Auckland. I have my New Zealand Audiological Society (NZAS) Clinical Certificate of Competency (CCC), meaning that I have passed a practical and theoretical examination to become a full member of the NZAS society. I have recently taken up a paid role as an NZAS CCC examiner. I am a voluntary member of the NZAS Membership Subcommittee (MSC). This committee is involved with designing the CCC examination process. This committee is also currently focused on reviewing the process of accepting both NZ and overseas audiologists into the NZAS. I currently work for Auckland District Health Board at Starship Children's Hospital, specialising in Paediatric Audiology. I can see no conflict of interest for advising on this case and I have disclosed all affiliations to audiology above.

Audiology is not a registered profession and, unlike other health professions, does not have a set of national guidelines that must be followed. There are three sets of current protocols which are supported by the New Zealand Audiological Society (NZAS) as the Best Practice Guidelines (BPG) used for the current CCC examination. These are: the NZAS Best Practice Guidelines (1) and those clinical protocols of the two current New Zealand universities which train clinical audiologists, The University of Canterbury (2) and The University of Auckland Clinical protocols (3). In the following report I will refer to audiology Best Practice as those supported by any of the three protocols described above. All three protocols are accepted as Best Practice to those in the NZAS community. These protocols also form the basis of the Certificate of Clinical Competency Exam (CCC) for the NZAS of which I am examiner for. Of note: Appendix F was first introduced over a period from 2007–2010 when Universal Newborn Screening was rolled out over the country. The University of Auckland's clinical protocols have changed minimally over the years. I am not familiar with how frequently The University of Canterbury's protocols are updated.

I received supporting documents for HDC Case Number 11/00846. I have reviewed all these documents. This review forms the basis of the following report. The Commissioner has asked the following advice for the basis of this report.

1. Please comment on standard of care provided to [Master A] by [Mr B], between February 2000 and April 2010.

a) Whether appropriate tests were performed at each assessment?

b) Whether the testing was carried out adequately;

c) Whether [Mr B's] overall assessments were reasonable, given the test results elicited;

d) The appropriateness of any follow-up action or advice given by [Mr B] at each assessment;

e) The standard of clinical documentation

2. Is there evidence that the significant hearing loss [Master A] was diagnosed with in 2011 was present when he was assessed in 2000, 2003, 2005, 2006 and 2009. Please explain.

3. What are the professional standards relevant to the service [Mr B] provided [Master A]?

4. On the basis of the information you have reviewed, were there any organisational or environmental factors relevant to the care [Mr B] provided to [Master A]? If so, please explain.

5. Are there any aspects of the care provided by [Mr B] that you consider warrant additional comment?

If, in answering any of the above questions, you believe that [Mr B] did not provided an appropriate standard of care, please indicate the severity of his departure from that standard. To assist you on this last point, I note some experts approach the question by considering whether the providers' peers would view the conduct with mild, moderate or severe disapproval.

As there are several audiology consultations to consider here it might be easiest to consider Questions 1 and 2 by reviewing a timeline of events. Following this timeline a summary of the overall care given by [Mr B] will be discussed and Questions 3–5 will be discussed.

Where I have made assumptions these have been stated in the report. I have assumed that the supporting documents contain all the audiology clinical documentation for [Master A] from 2000–2011. The Commissioner has asked that I report [Mr B's] deviations from current best practice as mild, moderate, severe… Where this is noted I have marked so using the following parentheses {} e.g. {mild}. In the following report where I am referring to a particular document from the supporting documents I have noted the number of that corresponding document in the following parentheses [], e.g. [000125].

Timeline: A Review of the Clinical Audiology Notes

10th February 2000
[Master A] was referred to Audiology by Ear, Nose and Throat (ENT) specialist, [Dr E].

31st May 2000 — Audiology Consultation ([Mr B])
Today [Mr B] has not completed clinical notes or a clinical history. Without this documentation we have no information regarding whether [Master A] has risk factors for hearing loss, whether his parents are concerned, how the speech development is progressing. BPGs would recommend a thorough clinical history (1–3). It is important to note that often audiologists perform a test on behalf of Ear, Nose and Throat (ENT) specialists at a joint appointment. When performing such tests sometimes a thorough history is not required, as the patient is deemed to be the 'ENT specialist's patient'. If this is the case the audiologist is not in charge of the management of the case. This might explain the lack of clinical documentation. I cannot see any ENT notes or reports for the same date of this consultation; therefore it is more likely that this was a standalone audiology appointment in which case a thorough history should have been documented {Moderate}.

The type of testing performed was documented as COR {Moderate}. COR is the acronym for Conditioned Orientation Reflex. COR is a method of behaviourally testing the hearing. This test involves an infant sitting on their parent's knee [and] the child is taught to turn to a lighted toy (4). This testing was first introduced in 1961. In 1969 a similar testing procedure known as Visual Reinforcement Audiometry (VRA) was reported as a better method of testing infants hearing behaviourally. VRA is arguably a better method of testing, as it does not rely as heavily on the ability of an infant to localize sound as COR does (5, 6). Localisation of sound can be impeded by a hearing loss and by the developmental ability of the infant (5). COR was used clinically before my training therefore I do not know when it was first considered that VRA is best practice over COR. It is my understanding that COR was disestablished as best practice a long time ago. VRA was the infant testing procedure reported as current best practice in 2000.

The testing on this date is presented on a single audiogram (graph of hearing) with no comments of what type of transducer (e.g. type of headphone used, or was a speaker used) [00223]. It is best practice to record the type of transducer used (1). It appears [Mr B] has accepted hearing results at levels of 30dB from 500–4000Hz [000192]. [Mr B's] results on this day show mildly elevated hearing results across the main speech frequencies. It is difficult to interpret whether these results are coming from each ear separately (headphones) or from both ears working together (speaker).

[Mr B's] interpreted his results in the supporting documents 'Ideally we would prefer to elicit responses using 20dB stimuli, but the quality of the rooms were such that such stimuli were in most cases inaudible to even the technician…' [00005]. BPGs recommend that the room be appropriately calibrated (1). Calibration is standardized measure used to ensure the machines you use in audiology are producing sounds at the levels they report on the machine. In a room where the speaker is appropriately calibrated the quality of the rooms should not be an excuse for a child not responding. A child might be noisy playing with the toys, which should be controlled by the distracter (audiology

technician) with the child in the room. If this is not appropriately controlled and is able to affect the hearing test results then it should be reported in the notes. The supporting documents report that the room for sound field testing 'does not meet the requirements for sound field testing (being too noisy)' [00092]. This supports [Mr B's] comment reported earlier in this paragraph. The NZAS standards of practice state that it is the responsibility of the audiologist to ensure the audiometers and sound fields are appropriately calibrated (7) {Moderate}. Without appropriate calibration the results obtained from a hearing test are likely to be inaccurate.

An assumption has been made that the figures below the audiogram and also in the notes column [000192] correspond to the tympanometry results. Tympanometry is a measure of middle ear function. This assumption has been made as tympanograms (tympanometry measure) are classified as either an A/B/C. This classification is accompanied by admittance and volume measures, like the figures seen below the audiogram [00223]. [Mr B] has documented the tympanometry results as 'Type A tympanograms'. These results show normal middle ear function in both ears.

No acoustic reflex testing (auditory nerve function test) has been reported to be attempted {Moderate}. Acoustic reflex testing provides information regarding the functioning of the auditory nerve pathways. BPGs recommend obtaining at least a screened acoustic reflex on children this age (1–3) {Moderate}. [Mr B] reports '[Master A] was just 2 years old at this stage and acoustic reflex testing was not done' [00005]. This is a fair comment as young children are often difficult to obtain these results for. Best practice would be to document in the clinical notes when unsuccessful attempts have been made at a test.

The results obtained by [Mr B] today suggest a mild hearing loss in either one or both ears, with normal middle ear function in both ears. The accuracy of these results is likely to be fair to poor. [Mr B] has not used a cross-check of the hearing results {Severe}. The BPG and literature regarding paediatric audiology both stress the importance of using a cross-check when testing paediatrics (1–3, 8–9). The cross-check principle was first introduced into audiology in 1976 by Jerger and Hayes and is a well known principle in paediatric audiology testing (8). A cross-check is another test which supports the behavioural results obtained to prove they are true results. There is no documentation of attempts at monitored live voice (a speech test), otoacoustic emissions (OAEs) (a measure of inner ear cell function) or acoustic reflex (auditory nerve function) testing being performed, any of these tests would have sufficed as a clinical cross-check of the results obtained today.

1. a) [Mr B] performed tympanometry (middle ear check). This is good clinical practice, as it important to know the middle ear status on the day of testing. He did not perform VRA, which the early literature and the BPG stated was the most appropriate test to use on a child of [Master A's] age at this time {Moderate}. Alternatively he used a test that is now considered as 'out of date'. [Mr B] did not perform any speech testing such as MLV {Moderate}. [Mr B] did not perform

acoustic reflex (auditory nerve function test) or otoacoustic emission (OAE) testing (inner ear response) {Moderate}. Both of these tests are often difficult to obtain on young children. The availability of OAE testing equipment may have been the cause of the lack of this testing today.

b) As far as I can tell the testing was carried out adequately. There is nothing in the supporting documents to suggest the testing performed was inadequate. Unfortunately the adequacy of the tests performed on this day can largely be only verified by practical observation so I feel I cannot comment on this for today's testing.

c) The tests that [Mr B] performed were generally reasonable however he has not performed a cross-check to check the reliability of the behavioural testing {Severe}.

d) The supporting documents do not have any mention of the management plan for today. I assume no follow-up has been arranged as no further audiology sessions are seen until the next new referral. The ENT reports that [Master A's] hearing is normal [00137]. There has been no clear evidence of this at this stage. I am unsure as to where the ENT gets this information. If this is [Mr B's] interpretation of the audiogram I would disagree with this interpretation. As no clear idea of [Master A's] hearing status has been shown at this stage [Mr B] should have strongly recommended a follow up to obtain a cross-check of [Master A's] hearing status. It appears no follow up has been recommended {Severe}.

e) The standard of clinical documentation is poor. There is no history, no report and no comment on the management plan. Thresholds (minimal level of hearing) have not been marked on the audiogram (graph of hearing). The transducer used has not been documented.

2. There is no evidence seen in the results obtained by [Mr B] today that would confirm that the significant hearing loss was present on this day. The hearing loss diagnosed in 2011 could potentially have been present on this day as no cross-check was obtained. The results obtained by [Mr B] today may be inaccurate for this reason.

17th September 2003
Referred by Public Health Nurse '…while [Master A] allowed me to put headphones on his ears, he constantly said he could not hear any sounds…' [00222]. Often children with a significant hearing loss are hard to condition. Vision hearing technicians often refer children who are difficult to test. Some of these children have a hearing loss.

8th December 2003 — Audiology Consultation ([Mr B])
No clinical notes or clinical history has been taken today by [Mr B]. BPGs would recommend a thorough clinical history. Such a history should include questions surrounding the following: risk factors for hearing loss, the parents view on the

hearing and the receptive and expressive speech development (1–3, 9). It is hard to comment about what [Master A's] mother thinks about [Master A's] hearing at this appointment, as this is not documented. One red flag noted here is that this is the second health professional that has raised a concern about [Master A's] hearing.

Summary sheet states 'Audio no go' [00192] suggesting that the audiogram could not be obtained today. Often children are hard to condition for an audiology test. When a child cannot be conditioned, it is important to try a different method of audiology testing such as Conditioned Play Audiometry [CPA], where the child is taught to put a block on when the sound has been heard or VRA (as described earlier) (1). If the child cannot be conditioned to a sound stimulus for either type of test then a vibrotactile sound (sound that can be felt) should be used (1). This will help distinguish whether the child is cognitively able to perform the task or whether they cannot hear the sound.

Tympanometry showed Type A tympanograms in both ears (using same assumptions as for the consultation above). Tympanometry results appear to be accurate and well reported. These show normal middle ear function in both ears. No acoustic reflex testing has been reported to be attempted {Moderate}.

Transient Evoked Otoacoustic Emissions (TEOAEs) (inner ear cell response test) were absent in both ears. The results today were interpreted correctly by [Mr B] in his report as being absent [00220]. TEOAEs are a response from the cells of the hearing organ. In order to record normal responses for this test both the middle ear and inner ear must both be functioning normally to near normally. There are a number of reasons for absent TEOAEs. Such reasons being: the presence of a sensorineural hearing loss (10), history of current or pre-existing middle ear conditions (11–12), a suboptimal probe fit or wax presence in the ear canal (13) and a high level of noise during the testing (14). [Mr B] states that '…he suspects [Master A] may have been restless by this stage as the stimulus stability for both ears was not great, giving rise to the suspicion that the probe fit was not optimal' [00005]. He is correct in saying that a suboptimal probe fit can affect the test results for OAE testing (13). He is correct in saying that the result of the left ear may have been affected by the probe fit. A low stability percentage of 46% is noted on this side. When analysing the results obtained on this day, however, those for the right ear show a stimulus stability of 96% suggesting that the fit on this ear was optimal. A stimulus stability of 80% is recommended in the BPGs (3). The OAEs results both show a low noise floor suggesting that [Master A] was reasonably quiet during testing. It is unlikely [Master A] was restless during this testing for this reason. One factor which may have caused the OAEs to be absent would be if [Master A] had a previous history of middle ear problems. For example, TEOAEs can be absent if [Master A] had previously had grommets or if he had scarring on the ear drum (11–12). There is no mention of a history of middle ear problems, however, in the ENT clinical notes. Another reason for the absence of the TEOAEs may have been the presence of significant hearing loss on this day of this testing.

The report commented '[Mrs A] has agreed that we retest [Master A] and will contact us when she feels he is able to cope with that' [00220]. It appears [Mr B] has chosen to discharge [Master A] from audiology, leaving it up to [Mrs A] to choose when to bring him back. It is unclear whether this decision was [Mr B's] choice or [Mrs A's]. Unfortunately there are no NZAS best practice guidelines for audiological management. The management is left to the discretion of the audiologist. [Mr B's] form of management in an NZAS examination would be classed as poor {Severe}. The Auckland District Health Board protocols for management are that if a significant hearing loss has not been ruled out in at least one ear then the child should be brought back urgently (within 4–6 weeks). Also if three unsuccessful attempts at behavioural testing are made (likely to occur over a three month period), then a general anaesthetic Auditory Brainstem Response (ABR) test should be recommended. An ABR is an electrophysiological test that records the auditory systems' nerve activity in order to determine hearing sensitivity. No significant hearing loss has been ruled out from the testing obtained today. [Mr B] reports 'in retrospect it may have been better for all if I pushed the issues, but the decision is one I made following consultation with his mother, and at the time the concern did not appear to be there...' [00005], reflecting that perhaps this management should have been suggested. It does not appear that this testing was recommended to [Mrs A] as this is not documented in the notes or in the report.

1. a) [Mr B] performed tympanometry (middle ear check). This is good clinical practice, as it important to know the middle ear status on the day of testing. He appears to have attempted standard pure tone audiometry (a test of hearing sensitivity using a button when a sound is heard). Results for this testing were not obtained which can occur in paediatric audiology. It may have been appropriate for [Mr B] to further test using other methods such as CPA or VRA (described earlier), specifically using a vibrotactile stimulus. If this was attempted it has not been documented. [Mr B] performed TEOAE testing which was an attempt at obtaining a cross-check, however these were absent. [Mr B] did not perform any speech testing such as adult speech or the Kendall Toy Test (a toy where a child is instructed to point to items when verbally asked) {Moderate}. [Mr B] did not perform acoustic reflex (auditory nerve function test) {Moderate}.

b) As far as I can tell the testing was carried out adequately. One thing that could have been reattempted was the left OAE testing. The stability of this test was only 43% suggesting that the probe fit was suboptimal. Apart from this I do not feel that I can comment on the adequacy of the tests performed on this day, as the rest of the test can largely be only verified by practical observation.

c) The tests that [Mr B] performed were generally reasonable; however he has not obtained a cross-check to check the reliability of the behavioural testing {Moderate}.

d) The supporting documents suggest that [Mr B] is not recommending any follow up for [Master A] today {Severe}. It is concerning that [Master A] does not have TEOAE responses on either ear. It is also concerning that he was not

able to be conditioned today or when the Public Health Nurse tested him. These would all highlight cause for concern with regards to [Master A's] hearing. A strong recommendation of urgent follow up should have been recommended today.

e) The standard of clinical documentation is poor. There is no history in particular with regards to [Master A's] speech development and his mother's view on his hearing. There is a clinical letter from today's appointment. This has been written back to the referrer and the GP has been copied in, this is routine clinical practice.

2. Some of the results obtained on this day would make you suspicious that [Master A] had a significant hearing loss on this day. The results that showed absent responses from the cells of the inner ear (OAEs), in the presence of normal middle ear, could be due to having a significant sensorineural hearing loss such as that of [Master A's] current loss (10). Absent OAEs can be caused by a number of other reasons as described earlier. The data seen in the printouts for today [00221] suggests the ambient noise was low and that the probe fit was good for the right ear. Also there is no documented evidence of [Master A] having a history of middle ear problems in the ENT notes. The most likely reason for the absent OAEs today is the presence of a significant hearing loss; however this cannot be confirmed purely based on the results obtained today.

6th September 2004

[Mr B] reports on this date 'The advisor on deaf children appears to have contacted me about that and we arranged for further testing on 6th September 2004, but there is a note on the file to say that [Master A] did not attend' [00005]. There is no clinical documentation to report that [Master A] did not attend this appointment. There also is no documentation in the supporting documents received that contain such a referral. As Advisors on Deaf Children (AODC) often have a close relationship with audiologist sometimes they informally request audiology for children directly via the audiologist that may have been the case here.

8th December 2004

[Mr B] received a copy of the report from a clinical psychologist intern, [Ms D] (with [Ms F] Senior Clinical Psychologist) [000218 and 00219]. This report states [Master A], '…presents with aggressive behaviour, learning problems and verbal processing difficulties. [Master A's] teachers have been concerned for some time that he has a hearing impairment which is impacting on his ability to learn…he focused on my mouth while I gave verbal instructions…When I asked if he was having trouble hearing he nodded "yes". His teachers have also videoed [Master A] participating in classroom activities such as "Simon says". His performance on these tasks also suggests he may be experiencing problems with hearing. It is of primary importance further attempts be made to determine [Master A's] hearing ability. Without this information it may be inappropriate to make conclusions from the psychological assessment conducted thus far…It is highly likely [Master A] will refuse to have the hearing test, at which time alternative options may need to be investigated.' This report stresses the importance of

needing hearing test results and the importance of trying another test (such as sedation or general anaesthetic ABR), if these results cannot be obtained via the standard method of testing. The underlined words in the passage are red flags for a hearing loss. This along with the previously obtained results might alert an audiologist as cause for concern.

[28 February] 2005 — Audiology Consultation ([Mr B])
For today's consultation, there are no clinical notes or history that has been recorded. There was no audiogram (graph of hearing) with today's date in the supporting documents. [Mr B] has written a clinic letter reporting 'this bilateral hearing acuity within the normal range with no asymmetry between the ears' [00216]. The summary sheet shows results of 15, 15 and 20 in the left ear and at 15, 10 and 15 in the right ear, for frequencies 1000, 2000 and 4000Hz respectively [00192]. These values for a hearing test suggest hearing in the normal range. Neither the clinical notes nor the clinic letter state what type of testing has been performed to obtain these results summarised in the letter. Tympanometry testing showed Type A tympanograms in both ears. These results suggest normal middle ear function in both ears.

TEOAEs (inner ear response) were performed and were absent bilaterally. The stability for the right and left ear recording was 97% and 96% suggesting a good probe fit for each ear. A low level of noise was seen in the recording suggesting that noise is unlikely to contribute to the absence of the OAEs. [Mr B] reports 'Results were only elicited at 1 kHz an above as [Master A] was slightly restless by this stage the lower frequencies were reached…' [00216]. It is unclear whether he is referring to the pure tone audiogram (behavioural testing) or to the OAE testing results. I have made the assumption he is referring to the pure tone audiogram, as he did not obtain normal results in the low frequencies, based on summary sheet [00162]. Quite often audiologists will struggle to obtain a full set of results on a difficult to test child. If he was referring to the TEOAEs then this statement is not supported by the printout of the results obtained. There was a low noise floor and good probe stability in both ears [00217].

Today no cross-check of the results has been obtained. This is not best practice (1–3, 8) {Severe}. Without an accurate cross-check we have two sets of conflicting results; the absent TEOAEs and the normal audiogram. These results reflect a possible hearing loss or possible normal hearing respectively. A third test, such as a speech test, may have confirmed which of the two results should be believed. Given the strong red flags for hearing loss reported in the clinical psychologist's report it would have been important to obtain a cross-check of the hearing results. No speech test was performed or attempted {Moderate}. No acoustic reflex testing has been reported to be attempted {Moderate}.

1. a) [Mr B] performed tympanometry (middle ear check). This is good clinical practice, as it is important to know the middle ear status on the day of testing. He has performed what is assumed as standard pure tone audiometry and reported these results to be in the normal range for both ears. These results conflict with the absent TEOAE results. A third crosscheck would confirm whether [Master

A's] hearing was normal or outside the normal range. [Mr B] did not perform any speech testing such as adult speech or the Kendall Toy Test (a toy where a child is instructed to point to items when verbally asked) {Moderate}. [Mr B] did not perform acoustic reflex (auditory nerve function test) {Moderate}.

b) As far as I can tell the testing was carried out adequately. I do not feel that I can comment on the adequacy on the practical application of the test performed on this day, as these tests can only be verified by practical observation.

c) The tests that [Mr B] performed were generally reasonable however he has not performed a cross-check to check the reliability of the behavioural testing {Severe}. A speech test and acoustic reflex testing should have been performed or at least attempted {Moderate}.

d) The supporting documents suggest that [Mr B] is not recommending any follow up for [Master A] today {Severe}. It is concerning that objective TEOAE (inner ear response) results are not consistent with the normal audiogram obtained with behavioural testing. [Master A] does not have any TEOAE responses on either ear. From the results obtained today we do not know whether to believe the objective or the subjective behavioural results as they conflict. A strong recommendation of at least non-urgent follow up should have been recommended today.

e) The standard of clinical documentation is poor. There is no history and no clinical notes. There is a clinical letter from today's appointment. This has been written back to the referrer and the GP and the Speech Language Therapist (SLT) have been copied in, this is routine clinical practice.

2. Some of the results obtained on this day would make you suspicious that [Master A] had a significant hearing loss on this day. Today's results showed absent responses from the cells of the inner ear (OAEs) in the presence of normal middle ear, similar to that of the previous consultation. As discussed earlier, the most likely the reason for this absence is the presence of a significant hearing loss. Other factors, however, such as wax or a previous middle ear history could have caused the absent result in this case. For this reason we cannot conclude that the hearing loss was definitely present at this appointment. The report from clinical psychologist intern, [Ms D] highlights a significant number of clinical features which accompany a significant hearing loss, note these are underlined above [000218 and 00219]. This is another factor which suggests perhaps a significant loss was present on this day.

23rd June 2005
Referral to Audiology by Speech Language Therapist [Ms H]

'…[Dr G] (and I)…would both be appreciate [sic] of an "ABR" being conducted to absolutely rule out (or otherwise) any hearing difficulties…I believe that [Master A's] difficulties are complex with more than one contributing factor and I would be grateful for any further information…'.

[14 February] 2006
There are no clinical notes or history by [Mr B] for today's testing. A clinical letter has been written explaining the testing performed today. An audiogram (graph of hearing) has been performed, however this was not found in the file. The hearing thresholds obtained by [Mr B] are recorded on the summary sheet being suggestive of essentially hearing in the normal range in both ears [00192]. It is good practice to assess the hearing on the day of the ABR testing, as [Mr B] has done today. It would have been advantageous to know the status of the middle ear today, by performing tympanometry.

Auditory Brainstem Response (ABR) testing relies on the audiologist's subjective opinion to decide whether or not a response is present. The BPGs define the software parameter settings required to perform an ABR however they do not necessarily describe the appropriate technique for selecting a response. There is a significant amount of literature that critiques this skill and sets the basis for how an audiologist is to choose a wave (15–17). One would assume that an audiologist performing ABR testing clinically would be familiar with such literature and would have had practical experience in applying these tests with an experienced supervisor before embarking on performing this testing on their own.

When choosing a response (Wave V) on an ABR trace the audiologist must follow specific rules with regard to determining its presence. Two key criteria generally help to decide if the wave is accepted as a response (15):-

1) the wave must be repeatable at the lowest level accepted as a response
2) the wave must show growth (get bigger and earlier) as you increase the level of sound

Normative data has also been produced to provide latencies where you would expect normal Wave's I, III and V (responses of the ABR) to fall (16).

In clinical practice it is easy to choose a response that is not really there when noise is present in the traces and these rules are not followed. By using these two rules we are generally able to prove the presence of a true response. The literature recommends response judgment by multiple observers (15). At Auckland District Health Board audiology department we have 100% review of the ABR traces by the most experienced audiologist in the department. In other DHBs colleagues may review each others traces. Some of the smaller DHBs often send anonymous traces to an expert from another DHB to review the chart for them. This support service may not have been in place for [Mr B], especially considering he was not a NZAS member [00007].

Responses have been chosen by [Mr B] on the Click Auditory Brainstem Response (ABR) traces and marked with a "V" to denote "Wave V". This is common practice in audiology (1). The click ABR testing is used to assess the integrity of the auditory neural pathways.

In the report these have been interpreted by [Mr B] as, 'absolute and interpeak latencies are within usual limits for a cochlear pathology…being repeatable responses at 30dBnHL click stimuli bilaterally'. For the left ABR click, in my clinical opinion I do not believe there is a clear Wave V at 30dBnHL (normal

level). There may be responses at higher levels however the normal Wave I-III-V morphology is not followed. In a normal hearing eight year old we would expect to see a clear Wave I III and V around the approximate latencies of 1, 3 and 6ms respectively. This is not seen in the 80dBnHL trace for the left ear.

On the Right ear it is harder to determine if a Wave V is present as the waveforms are all shown using different scales. When interpreting ABR traces one must compare them on the same scale. The BPGs report a scale of 0.2μV should be used (1). In my clinical opinion for the right ear click ABR test there is no response present at 30dBnHL (normal level). There is also no clear Wave I-III-V morphology that would typically be seen in a normal hearing child for the 80dBnHL trace. [Mr B] has marked a Wave V as present at 90dBnHL. This Wave V occurs later than the response he has chosen for the 80dBnHL response. This does not follow the rules of ABR analysis, that Wave V becomes larger and early with increasing intensity (15).

It appears [Mr B] is threshold seeking with a click ABR stimulus. This ABR technique for hearing sensitivity testing has been 'out of date' since the introduction of toneburst ABR testing by David Stapells in 2002 (17).

The parameter settings used by [Mr B] compared with those of the BPG can be seen in Table 1 below. Using parameter settings different to that of those in the BPG can have an impact on the resulting waveforms recorded. Noise can be introduced with such deviations. Alternatively the waveform can by mutated or lost altogether (15). During routine clinical ABR testing electrical interference may be encountered. When this is experienced the audiologist might need to adjust some of these parameters, such as the filter settings. If this is done it should be well documented in the notes and reported so in the clinical report when interpreting these results (1). If [Mr B] did adjust the parameter setting for such reasons it was not documented in the clinical notes.

Table 1: Differences in the Parameter settings used by [Mr B] compared with that of the BPGs for testing performed on the [14/2/2006].

Parameter	**BPG**	**[Mr B]**
Rate (stimuli/sec)	17.1	*21*
Filter Settings	100-3000Hz	100-*1500Hz*
Number of Channels	Multichannel (preferably four channels)	*Single Channel*
Number of Averages	>1000	*At times this was less than 1000*
Polarity	Alternating OR Rarefaction and Condensation	*Condensation only*
Scale	0.2μV	Many different scales have been used (0.25, 0.1, 1, 50μV)

Deviations from the BPG are in *italics* in the table

The parameter settings used for the ABR testing today are different to that of those in the BPGs (1). Due to this and the high level of noise in some of the traces

today I cannot conclude anything about [Master A's] hearing based on these ABR results. I can confirm that in my clinical opinion these results obtained are not supportive of normal hearing.

1. a) An audiogram was performed on the day of the ABR testing. This is good clinical practice. No test of middle ear function was performed today {Mild}. If [Master A] had a middle ear problem today this could affect the results of the ABR testing performed. Threshold seeking ABR was performed with a click stimulus. This testing is not in line with BPGs which would recommend frequency specific testing performed using toneburst stimuli (1, 15, and 17) {Moderate}.

b) The testing was not carried out adequately today. The parameter settings were not in line with those of the BPGs. The results are difficult to interpret and inconclusive. There is a chance that these settings were changed because of a high level of noise, however this has not been documented in the clinical notes. The interpretation of the results today was poor. In my clinical opinion I disagree that these results can be interpreted as 'essentially normal cochlear function and no retrocochlear indications'. Rather I would interpret them as 'inconclusive' due to the incorrect settings used and the high level of noise in some of the traces.

c) The tests that [Mr B] performed were reasonable however he did not interpret the results correctly {Severe}.

d) The supporting documents suggest that [Mr B] is not recommending any follow up for [Master A] today {Severe}. It is concerning that no results have been obtained to suggest normal hearing today. It is also concerning that [Mr B] is not going to follow up [Master A]. A strong recommendation of at least non-urgent follow up should have been recommended today. The incorrect interpretation of the ABR results has led to a poor management decision.

e) The standard of clinical documentation is poor. There is no clinical history or notes. There is a clinical letter from today's appointment. The parameter settings of the ABR testing are well documented, as in line with BPGs (1).

2. The ABR results obtained on this day, in my clinical opinion are not indicative of a normal ABR. The results of the ABR today are inconclusive due to the settings used and the noise in the traces. At this date we have not obtained any further information to conclude a significant hearing loss nor have we gained any further information to suggest that [Master A's] hearing is normal.

1st July 2009
Mr I (Private Audiologist) from [a private clinic] has requested non-behavioural testing for [Master A]. Mr I also had difficulty testing [Master A] suggesting that he is a difficult child to test. The fact that [Master A] has gone to see another audiologist suggests someone is concerned enough about [Master A's] hearing to get a second opinion. Mr I recommends a frequency-specific ABR and also APD testing.

[25 September] 2009
[Master A] sees another audiologist, Mr J, (Charge Audiologist) at [DHB2]. [Mr J] performed what appears to be a sleep ABR '[Master A] became very upset at having to close his eyes and relax for this test' [00199]. Of note all of [Master A's] acoustic reflexes absent in the presence of normal middle ear function in both ears. This along with the previous absent OAE results causes suspicion of a significant hearing loss in both ears. A significant hearing loss is not confirmed from these results either.

Feb 15th 2010 — Audiology Consultation ([Mr B])
No clinical notes or history was obtained today. This is not in line with the BPGs (1–3). A thorough clinical report has been written though which explains all testing performed. Today's testing was very thorough and [Mr B] performed many different test batteries. It is likely that the testing performed on this day would have taken at least a couple of hours. [Mr B] appears to be trying to get as much information as possible today.

[Mr B] had trouble collecting a full audiogram from this patient and obtained some limited results. He reports that he obtained results that are suggestive of normal to near normal hearing in the left ear today. He reported '[Master A] then stopped responding, even when I returned to these frequencies'. There is a chance he stopped responding as he lost interest in the task. The best way to confirm that in fact he lost interest in the task would have been to use a vibrotactile stimulus (that can be felt). There is no mention of this is the clinical notes or on the audiogram. No speech testing was performed or documented as attempted {Moderate}.

Both Distortion Product OAEs (DPOAEs) and Transiently Evoked OAEs (TEOAEs) were tested today. These both test the inner ear function. [Mr B] reports these results showed '…suggestion that some right high frequencies are present' [00201].

Tympanometry showed Type A tympanograms in both ears consistent with normal middle ear function. Today acoustic reflexes have been tested these were absent and elevated in both ears. Acoustic reflex testing provides information regarding the functioning of the auditory nerve pathways. [Mr B] correctly interprets and reports the acoustic reflexes to be 'Reflexes absent at the limits of the machine L' [00201]. Today's results are concerning as these are elevated and absent. Such results are obtained in the presence of a conductive or sensorineural hearing loss, a middle ear dysfunction, a history of middle ear problems or if the facial nerve is not functioning properly (9). This along with the absent OAEs is consistent with a significant sensorineural hearing loss. We must keep in mind however that both reflexes and OAEs can be absent elevated due to a history of middle ear problems. It does not appear there is a record of middle ear problems for [Master A] in the supporting documents.

[Mr B] has reported that he has asked [Master A] to repeat numbers verbatim [00169 and 00201]. [Mr B] appeared to perform a crude informal version of the

Digit Span test. This test is used as a cognitive screen to test auditory memory when testing for auditory processing disorder (APD). When doing such tests these should be compared and reported to NZ normative data. This does not appear to have been done here {Mild}. [Mr B] was perhaps trying to assess a small part of the auditory processing within the long battery of tests he performed on this day.

ABR testing was performed with [Mr B] reporting the hearing as '…consistent with bilateral hearing acuity no worse than at the bottom of the normal range, with perhaps the left ear slightly poorer.' [00201].

As discussed earlier ABR is a subjective test and relies on the interpretation of waveforms recorded from the electrical activity of nerve pathways of the auditory system. As discussed earlier, there are typical rules that should be followed when analysing ABR waveforms to avoid picking waves that are not there. The ABR performed on this date was difficult to interpret by looking at the traces alone. A number of the clinical software parameters for this testing were different to that of those reported in the best practice guidelines (1–3). See the *Table 2* below for the comparisons.

Using parameter settings different to that of those in the BPG can have an impact on the resulting waveforms recorded. Noise can be introduced with such deviations; alternatively the waveform can by mutated or lost altogether (15). Unfortunately the settings used for the testing today make it difficult to interpret these results. During routine clinical practice of ABR testing electrical interference may be encountered. When this is experienced the audiologist might need to adjust some of these parameters, such as the filter settings. If this is done it should be well documented in the notes and reported so in the clinical report when interpreting these results (1). If [Mr B] did adjust the parameter setting for such reasons it was not documented in the clinical notes.

When assessing [Mr B's] ABR traces it is evident there is a high level of noise. This makes it difficult to determine whether there is a true response from within the noise. Tables 3 and 4, below, show each of the responses (Wave V) picked by [Mr B]. The next column shows whether, in my clinical opinion and using the rules described earlier, it is agreed upon. This can be seen for both the Click traces for the left and right ear (*Table 3*) and then again for the 1000Hz Toneburst traces for the left and right ear (*Table 4*). ABR data collections with averages lower than 1000 (as per BPG recommendation have been shown with a '^').

Table 2: Differences in the Parameter settings used by [Mr B] compared with that of the BPGs for testing performed on the 15/02/2010.

Parameter	**BPG**	**[Mr B]**
Rate (stimuli/sec)	39.1(toneburst) 17.1(click)	*27.7 (toneburst)* *21.7 (click)*
Filter Settings	100-3000Hz (click) 30-3000Hz (toneburst)	*100-1500Hz (click)* *30-1500Hz (toneburst)*

Number of Channels	Multichannel (preferred 4)	*Single Channel*
Number of Averages	>1000	*At times this was less than 1000*
Polarity	Alternating OR Rarefaction and Condensation (Click) Rarefaction (toneburst)	*Rarefaction only*(click) Rarefaction (toneburst)
Scale	0.2μV	0.2μV

Deviations from the BPG are in *italics* in the table

Table 3: Click ABR Trace Analysis [00175-00180]

Document Page	Trace level	Response Present? Agree or Disagree	Reasoning
176	50nHL^ 40nHL^ 30nHL^	Disagree Disagree Disagree	High level of noise in all the traces No repeatability shown No clear growth shown (too unclear to see due to the noise levels)
178	60nHL^ 50nHL^^	Disagree Disagree	No growth shown No repeatability seen
179	40nHL^^	Disagree	No repeatability or growth shown

^Averages close to or less than 1000 averages (BPG)

Table 4: 1000Hz Toneburst Stimulus [00181-00186]

Document Page	Trace level	Response Present? Agree or Disagree	Reasoning
181 (L ear)	80nHL 70nHL^ 60nHL^	Disagree Disagree Disagree	Wave V too early (Kelly 1996) Repeatability not seen High level of noise in the traces Growth not seen
182 (L ear)	50nHL^^ 30nHL	Disagree Disagree	Repeatability not seen High level of noisy in the traces
185 (R ear)	70nHL^^ 60nHL 50nHL 30nHL	Disagree Disagree Disagree Disagree	High level of noise in the traces Repeatability not seen

^Averages close to or less than 1000 averages (BPG)

In my clinical opinion, using the rules described earlier, I would disagree with all of the Wave V responses that [Mr B] has chosen for this testing today. He has used parameter settings different to those of the BPGs. [Mr B] has also picked responses in all of the traces in spite of a high level of noise. It would be more appropriate to interpret these results as 'inconclusive' due to the high level of noise. None of the waves picked are repeatable and most of them do not show a clear growth pattern.

In the presence of such results one might use the following techniques to obtain clearer, easier to interpret and more repeatable responses: the use of a notch filter, or opted for a sedation or GA ABR to obtain better results (15). These methods have not been attempted or suggested in the clinical documentation.

Both the execution of this testing and the interpretation of the results performed by [Mr B] on this date are different from that of the BPG and that reported in the literature (1–3, 15, 18). This shows a lack of understanding of appropriate evoked potential (ABR) testing technique. Even if the appropriate settings were used the traces should have been reported as inconclusive, due to the high level of noise. There is no evidence of normal hearing in these results {Severe}.

The objective test results would disagree with the statement that today's results appear 'consistent with bilateral hearing acuity no worse than at the bottom of the normal range, with perhaps the left ear slightly poorer'. The objective results might agree with [Mr B's] statement that the left ear is perhaps slightly poorer, as the acoustic reflex results and OAE results are marginally better in the right ear.

1. a) [Mr B] has performed a thorough battery of tests today including a middle ear check, audiometry, toneburst and click ABRs, DPOAEs and TEOAEs, acoustic reflex testing, what appears to be an informal APD test. All of the tests performed were appropriate tests to execute, excluding the informal APD test that was performed. This is not in line with BPGs {Mild}.

b) The testing was not carried out adequately today. The parameter settings on the ABR were not in line with those of the BPGs, meaning the results are difficult to interpret. There is a chance that these settings were changed due to a high level of noise, however this has not been documented in the clinical notes. The interpretation of the results today was poor. In my clinical opinion I disagree that these results obtained can be interpreted as 'consistent with bilateral hearing acuity no worse than at the bottom of the normal range, with perhaps the left ear slightly poorer' {Severe}. Rather I would interpret them as inconclusive due to the incorrect settings used and the high level of noise in some of the traces.

c) The tests that [Mr B] performed was reasonable however did not interpret the results correctly {Severe}. [Mr B] advises [Master A] of the potential dangers of using a hearing aid that has not been fit to him specifically. He also recommended the use of a sound field system as an alternative. Bearing in mind [Mr B's] incorrect interpretation of the results, this advice is adequate. [Mr B] also

provided [Master A] with information regarding listening strategies, this advice was also adequate.

d) The supporting documents suggest that [Mr B] is not recommending any follow up for [Master A] today {Severe}. It is concerning that no results have been obtained to suggest normal hearing today and [Mr B] is not going to follow up [Master A]. The poor interpretation of the ABR results has meant that he is not going to bring back [Master A] today. A strong recommendation of an urgent follow up should have been recommended today. The incorrect interpretation of the results today has affected his management decision.

e) The standard of clinical documentation from [Mr B] showed no history and no clinical notes. This is not in line with best practice. There is, however, a thorough clinical letter from today's appointment. This letter explains all of the testing performed today.

2. The likelihood of the significant hearing loss being present at this appointment is very high. Both acoustic reflexes and OAEs are absent. The results of these two diagnostic tests both support the presence of a hearing loss. It cannot be concluded that a hearing loss is definitely present on this day. Both results can be absent for other reasons, as described earlier. All of the documentation from other parties, AODC, psychologist up till today's appointment is consistent with features seen in a child with a significant hearing loss.

26th November 2010
[Ms L], Adviser of Deaf Children (AODC), refers [Master A] to [DHB3] for further diagnostic testing: '…ask [Mr B] if he had tested to exclude Auditory Neuropathy from the ABR studies. I wasn't able to speak with [Mr B] directly but his response was that he had not tested to exclude AN as this was not part of the referral he had received.' [00194]. This comment shows [Mr B] is not following BPG as it is common practice to exclude auditory neuropathy for any child who has been referred for concerns with hearing {Moderate}. Auditory neuropathy is a condition where the auditory nerve does not function normally. We must keep in mind that this comment is hearsay.

6th December 2010
Referral to [DHB3] for further testing is declined as they refuse to pay for their time spent on him as 'He's out of our DHB' [00164].

28th January 2011
The supporting documents show a letter from [Ms L] (AODC) [00163]. It is unclear who this letter is directed to. It may be for [Dr E], ENT consultant, as it is addressed to '[first name of Dr E]' and there is an ENT stamp on it.

15th and 16th April 2011
A moderate to profound sensorineural hearing loss was diagnosed. Hearing aids are ordered. A sensorineural hearing loss is a loss that is caused from some part of the auditory pathway anywhere from the inner ear all the way up to the brain

pathways. A moderate to profound hearing loss is a significant hearing loss that means that even when people yell only some speech sounds can be heard. Most people with this degree of hearing loss require hearing aids or a cochlear implant (an electric device implanted into the inner ear to help people hear) in order to communicate with people on a day-to-day basis.

Further Advice for Questions 3–5

3. What are the professional standards relevant to the service [Mr B] provided [Master A]?

Throughout the timeline specific professional standards of care have been referred to as the BPG (Best Practice Guidelines) within the text. As the NZAS tends to accept more than one protocol for best practice I referred to all three protocols, all of which are accepted by the NZAS CCC examination panel. I have discussed this in more detail at the beginning of the report.

Other standards of the NZAS can be found on public section of the NZAS website (7). These standards have also been referred to in the timeline above. The standards of practice which are relevant to this case have been described with respect to [Master A's] care below. The professional standards and the professional best practice guidelines have been discussed throughout the timeline with regard to the specific actions over the time course of [Master A's] audiology testing.

4. On the basis of the information you have reviewed, were there any organisational or environmental factors relevant to the care [Mr B] provided to [Master A]? If so, please explain.

It appears from the supporting documents that [Master A] was a difficult case, as he was difficult to condition. He was tested by two other audiologists (Mr I and Mr J) and a public health nurse. None of these three professionals were able to condition [Master A] for the hearing test. This suggests that objective testing results would be the best test results to provide information regarding the hearing status.

It is important to note the difficulty that non-NZAS members might encounter in trying to obtain the three protocols generally accepted in the NZAS as Best Practice. To obtain each of these protocols you must be affiliated to either the NZAS or each of the universities that train audiologists. Both universities each report that non-NZAS members do not have access to the protocols unless they supervise their university programme students. Therefore it is important to note that [Mr B] would not have had access to any of the three protocols. In 2008, the UNHSEIP (newborn hearing screening programme) introduced protocols within a document found on the National Screening Unit's (NSU) website. Before this time [Mr B] might have relied on current literature to form the Best Practice Guidelines he used, as it appears that Southern DHB had no clinical protocols [00009].

5. Are there any aspects of the care provided by [Mr B] that you consider warrant additional comment?

Please see the summary below.

Summary of Audiology testing by [Mr B]

There is a common pattern of no clinical history or notes have been taken throughout the course of consultations [Mr B] performed on [Master A]. This is not best practice as it is important to highlight risk factors for hearing loss and red flags as cause for concern {Moderate}.

Audiology cross-checks have not been performed at any of the consultations [Mr B] had with [Master A] {Severe}. A clinical cross-check is particularly important for paediatric audiology (8, 9). This is another test that supports the behavioural results obtained to help prove that they are true. Without a cross-check you are solely relying on the behavioral results you have obtained with the child, this is not best practice (1–3). Children with a significant hearing loss are often very visual and they can pick up on subtle cues from the person testing, if not carried out with care. Even at times when carried out with care they are able to 'cheat' by using their other senses to know when to respond. This is why the cross-check is critical to help prove that the results you obtain are true and correct.

Out of the five audiology consultations performed by [Mr B] acoustic reflex testing was performed for only one. BPG recommends this be routinely performed (1–3). Acoustic reflex testing is important to test the integrity of the auditory nerve pathways (test for auditory neuropathy) {Moderate}. Auditory neuropathy is where the cochlea is functional however sound is not properly transmitted to the brain properly due to a problem with the nerve pathways of the auditory system (9). Speech testing was not performed at any of the consultations. This is not best practice {Moderate}. Age appropriate speech testing is important to confirm the behavioural results. This also tests the child's ability to detect and/or discriminate speech sounds.

Auditory Brainstem Response (ABR) testing was performed on two occasions by [Mr B]. The software parameters used on both tests is not in line with current best practice guidelines for ABR testing {Severe}. The interpretation of these results is subjective although techniques can be used help decide on the presence or absence of a response (15, 17). These techniques were not used when [Mr B] interpreted his ABR results. I would disagree with the interpretation of his results for both ABR tests. In larger DHBs we are lucky enough to have other staff that we frequently ask the opinion of when we record ABR traces. The supporting documents suggest that [Mr B] did not have another audiologist working with him. Many DHB audiologists rely on sending their traces to an expert in the profession to help interpret noisy or difficult traces. [Mr B] may be unlikely to have a link with such an expert, as most ABR experts in New Zealand, to my knowledge, are NZAS members. The performance appraisal of June 2002 states that [Mr B] had increased his OAEs skills and interpretation that year [00030].

This suggests that before this time he may not have had support for understanding this type of testing. He also states under the question 'Do you have needs which have not been met?', 'Continued education needs not being met. No access to journals/internet etc…' [00030]. [Mr B] would have needed to heavily rely on access to current journals to form his clinical protocols. As discussed earlier, access to the New Zealand best practice guideline would have been difficult for him, as he was not an NZAS member.

The performance appraisal from 2007 states [Mr B] has 'Updated some skills re ABR/SSEP testing … received confirmation that previous skill and technique were up to scratch — which in sole charge position is very difficult to verify' [00046]. This statement suggests that [Mr B] is content with the ABR testing he performed in both 2006 and 2010. It is clear from the review of the ABR results that his testing technique and interpretation of both ABRs were not consistent with those of the BPGs. This suggests the up skilling was not satisfactory. It also points out [Mr B's] lack of clinical support as he has no other audiologist in his department.

In my clinical opinion it is highly likely that a significant hearing loss has been present since the consultation at 2003. The results in the supporting documents, however, cannot confirm the presence of the hearing loss from any of the dates. OAEs and acoustic reflexes are absent in people with a significant hearing loss but they can also be absent for other reasons. Although the results are consistent with a significant hearing loss we cannot say beyond reasonable doubt that the hearing loss was definitely present at any of the consultations from 2000, 2003, 2005, 2006 and 2010. I can confirm that at none of the appointments was a significant hearing loss ruled out based on the information provided in the supporting documents.

If you require any further information regarding this case, please do not hesitate to contact me and I would be happy to provide further advice.

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