APPENDIX 1

Healthy Hearing Program Summary

Healthy Hearing Mission Statement

The Healthy Hearing program aims to improve health outcomes for Queensland children through the earliest possible detection and management of permanent childhood hearing loss. Newborn hearing screening is the first stage of a comprehensive approach to communication development which includes further assessment and early intervention. The program aims to systematically monitor its performance and be alert and responsive to emerging evidence in this field.

Background

The Healthy Hearing Program aims to detect permanent hearing loss (PHL) through newborn hearing screening for all Queensland babies before they reach three months of age, as well as ensuring appropriate diagnosis and early intervention for babies found to have a hearing loss. International evidence suggests that early detection of a hearing loss and commencement of early intervention through hearing aid provision and communication habilitation by the age of 6 months may be critical for speech and language development and can reduce the need for ongoing special education.

Children can have their hearing augmented by hearing aids from birth and/or with cochlear implants at around 12 months (although some children are implanted earlier). Access to sound as soon as possible is crucial to a child's communication development.

Over 60,000 babies are born in Queensland each year. Approximately 1 to 2 per 1000 babies born will have a bilateral moderate or greater hearing loss. The program also detects hearing loss in infants with milder degrees of loss or unilateral losses and offers referral for these children.

Some children pass the hearing screen at birth, but have risk factors for progressive or delayed onset hearing loss. These children are identified at the time of screening and offered follow-up audiology assessment before 12 months of age. It is important for parents and medical staff to monitor a child's hearing, as a pass at screening at birth is not a pass for life. Hearing can change over time.

Objectives

The objectives of the Healthy Hearing Program include:

- Optimise early detection of PHL in neonates by providing newborn hearing screening before 3 months of age.

- Provide diagnostic audiology assessment to relevant neonates by 6 months of age.
- Ensure equitable access to the Healthy Hearing Program for all neonates irrespective of social, economic, cultural or geographic circumstances.
- Ensure the Healthy Hearing Program is standardised and provided using multidisciplinary, evidence based screening, diagnostic, treatment and habilitation protocols.

Healthy Hearing Benchmarks

The Healthy Hearing Program has established the following targets:

Screening Rates	All babies born in Queensland birthing facilities (public/private) offered a hearing screen. 95% of eligible babies will have their screen completed by 3 months of corrected age.
Referral Rates	<4% of babies screened referred for diagnostic audiological testing; • Babies with a bilateral Refer result offered assessment by Audiology within 2 weeks. • Babies with unilateral Refer result offered assessment by Audiology within 6 weeks. (Diagnostic assessment for above babies will be completed by 6 months corrected age.) 95% of babies referred for diagnostic audiological testing attend Audiology. <4% of babies screened, identified with risk factors for progressive hearing loss; • Babies identified with risk factors will be reviewed by their 1st birthday.
Intervention	Average age for intervention/fitting of hearing aids will be 6 months corrected age. Average age for intervention/fitting of cochlear implants will be 12 months correct age.

A comprehensive set of national quality standards and performance indicators for newborn hearing screening is being developed and Queensland will comply with those when they are finalised.

Hearing Screening Protocol

Hearing screening ideally takes place prior to the baby's discharge from hospital, to optimise 'capture rates'. A brochure titled "*Your baby's free hearing screen*" is provided to parents and written consent is obtained from the parent/s prior to the screen. A nurse trained in hearing screening carries out the screen when the baby is quiet or asleep.

The screening process uses Automated Auditory Brainstem Response (AABR) equipment. The equipment used by Queensland Health is the Natus ALGO 3

(trolley mounted) and the ALGO 3i (hand held). The screen is non-invasive and easy to perform. Several sensor pads are placed on the baby's head and soft clicking sounds are played into the baby's ear through earphones. The sensor pads record the baby's responses to the sounds.

The baby must be more than 34 weeks gestation to be screened. If a baby receives a 'refer result' on either or both ears a second screen of both ears is conducted at a later time to confirm the result. If the baby receives a 'refer result' on either or both ears on the second screen the baby is referred for diagnostic audiology assessment.

Statewide Diagnostic Audiology Protocols have been developed and are used throughout the state when a child referred from the Healthy Hearing Program is assessed.

A diagram of the hearing screening protocol is attached at Appendix 1.

For more information Healthy Hearing Screening Protocols and Guidelines visit:
http://www.health.qld.gov.au/healthyhearing/pages/protocols.asp

Recording the Results

The screening equipment automatically records the results of each screen and the data is imported into a statewide database for tracking and further analysis at a district or state level. Any risk factors for progressive or delayed onset hearing loss, are identified. These risk factors, along with screening results are also recorded in the baby's medical chart and Personal Health Record.

Newborn Screening Hospitals

Public Birthing Hospitals			
Royal Brisbane & Women's Hospital	Mt Isa Hospital	Charters Towers Hospital	Moranbah Hospital
Townsville Hospital	Redlands Hospital	Hervey Bay Hospital	Dysart Hospital
Mater Mother's Hospital	Toowoomba Hospital	Gladstone Hospital	Chinchilla Hospital
Logan Hospital	Rockhampton Hospital	Gympie Hospital	Dalby Hospital
Cairns Hospital	Warwick Hospital	Caboolture Hospital	Roma Hospital
Nambour Hospital	Innisfail Hospital	Mackay Hospital.	St George Hospital
Ipswich Hospital	Tully Hospital	Ayr Hospital	Kingaroy Hospital
Gold Coast Hospital	Bundaberg Hospital	Longreach Hospital	Goondiwindi Hospital
Redcliffe Hospital	Stanthorpe Hospital	Charleville Hospital	Stanthorpe Hospital
Thursday Island Hospital	Biloela Hospital	Cunnamulla Hospital	Atherton Hospital
Ingham Hospital	Theodore Hospital	Proserpine Hospital	Mareeba Hospital

Private Hospitals		
Mater Private, South Brisbane	St Andrews Private, Ipswich	Pindara Private
Mater Private,Townsville	Cairns Private	John Flynn Private
Wesley Private,Townsville	Mater Private, Redland	Nambour Selangor Private
North West Private	Mater Private, Mackay	Mater Private, Rockhampton
Wesley Private, Brisbane	Mater Private, Gladstone	St Vincent's, Toowoomba
Sunshine Coast Private	Sunnybank Private	

Babies Born Outside Birthing Hospitals

The Healthy Hearing program receives Client Directory data for all babies born in every Queensland public hospital each day. This data allows babies to be identified who are not born at a birthing hospital, and these babies are referred on the closest screening hospital to arrange the screen with the parent/s. The Healthy Hearing program also works closely with homebirth providers to ensure they

encourage parents to contact their local screening site to arrange a hearing screen.

Hearing Screen Declined by Parents

A parent's decision to decline the hearing screen is respected. However, it is appropriate to ascertain reasons for declining, and to correct any misunderstandings regarding the hearing screening process and/or risks to the baby. It is also important that parents be fully informed of the potential implications should their baby have an undetected hearing loss.

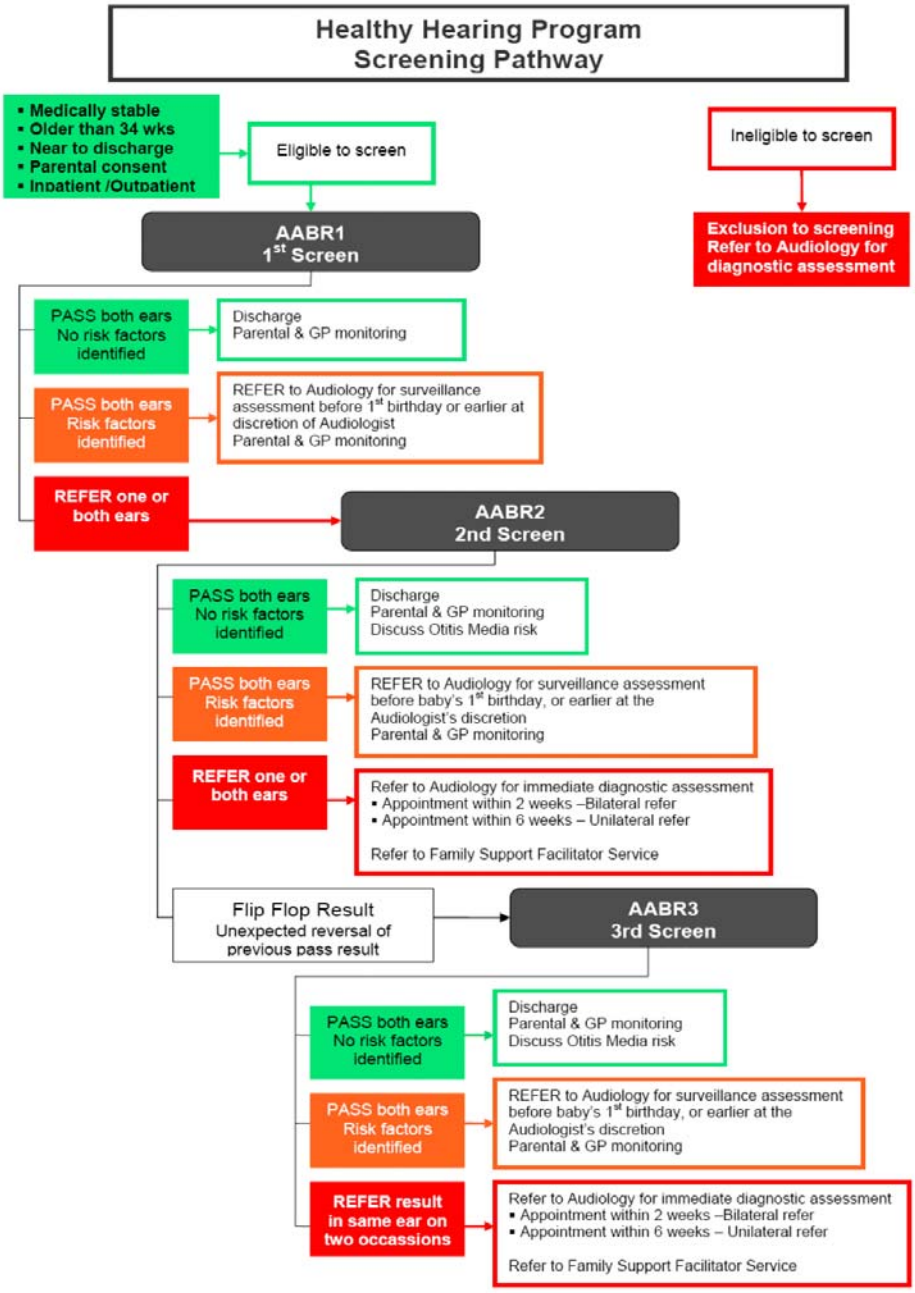
If a screen is declined, a letter is sent to the baby's medical practitioner advising of this, and advising of any risk factors for a progressive/delayed onset hearing loss (Appendix 2).

Medical practitioners and other health staff involved with the infant can advise parents that they may return for the screen before the baby is 3 months of age on an outpatient basis should they change their mind. Babies may be able to be screened up to 6 months. After that time an audiology appointment would be required. Hospital contact phone number and details should be provided on the 'Your baby's free hearing screen' brochure.

Support for Parents

The Queensland Hearing Loss Family Support Facilitators Service (QHLFSF) is a state-wide service established to provide family-centred support and counselling to families of children diagnosed with a PHL. This service assists parents access a wide range of different professionals and services available to children with a PHL. The service is available to all children diagnosed with a PHL from birth through to completion of Grade 1. This includes children who access either public or private medical and habilitation services. QHLFSF Contact Information: Phone: (07) 3250 8555

Appendix 1


Healthy Hearing Program
Screening Pathway
▪ Medically stable
▪ Older than 34 wks
▪ Near to discharge
▪ Parental consent
▪ Inpatient /Outpatient
Eligible to screen
Ineligible to screen
Exclusion to screening
Refer to Audiology for diagnostic assessment
AABR1
1st Screen
PASS both ears
No risk factors identified
Discharge
Parental & GP monitoring
PASS both ears
Risk factors identified
REFER to Audiology for surveillance assessment before 1st birthday or earlier at discretion of Audiologist
Parental & GP monitoring
REFER one or both ears
AABR2
2nd Screen
PASS both ears
No risk factors identified
Discharge
Parental & GP monitoring
Discuss Otitis Media risk
PASS both ears
Risk factors identified
REFER to Audiology for surveillance assessment before baby's 1st birthday, or earlier at the Audiologist's discretion
Parental & GP monitoring
REFER one or both ears
Refer to Audiology for immediate diagnostic assessment
▪ Appointment within 2 weeks –Bilateral refer
▪ Appointment within 6 weeks – Unilateral refer
Refer to Family Support Facilitator Service
Flip Flop Result
Unexpected reversal of previous pass result
AABR3
3rd Screen
PASS both ears
No risk factors identified
Discharge
Parental & GP monitoring
Discuss Otitis Media risk
PASS both ears
Risk factors identified
REFER to Audiology for surveillance assessment before baby's 1st birthday, or earlier at the Audiologist's discretion
Parental & GP monitoring
REFER result in same ear on two occassions
Refer to Audiology for immediate diagnostic assessment
▪ Appointment within 2 weeks –Bilateral refer
▪ Appointment within 6 weeks – Unilateral refer
Refer to Family Support Facilitator Service

Hearing loss risk factors include:

- Syndromes associated with hearing loss (eg. Downs, FAS) (See protocols for a complete list)
- Prolonged ventilation ≥ 5 days (IPPV / CPAP)
- Bacterial meningitis (confirmed / suspected)
- Low birth weight ≤ 1500 grams Weight
- Severe asphyxia at birth (convulsions / HIE / PPHN)
- Craniofacial anomalies eg. cleft palates (**excluding** cleft lips and skin tags)
- Hyperbilirubinemia levels ≥450µmol/l (Term) or ≥340µmol/l (Preterm) Max SBR level
- Proven / suspected congenital infection of the baby (Toxoplasmosis, Rubella, CMV, Herpes, Syphilis)
- Professional concern

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Healthy Hearing
Hearing Loss Management Summary

Facility: .....

(Affix patient identification label here)

URN:

Family name:

Given names:

Date of birth: Sex: ☐ M ☐ F

	Bold investigations are for *all children*	Ordered ✓	Date	Result	Name
	Family history (3 generation)	☐			
	Family audiograms (parents, siblings)	☐			
Blood Tests	**Full blood count**	☐			
	U&Es	☐			
	Thyroid function	☐			
	CMV, rubella, toxoplasmosis, syphilis	☐			
	CMV PCR from newborn screening card (DBS)	☐			
	Connexin 26	☐			
	Chromosomes	☐			
Urine Exam	**Protein**	☐			
	Microscopy	☐			
	CMV PCR (if DBS +ve)	☐			
	Metabolic screen	☐			
Radiology	MRI inner ear and IAMs; brain	☐			
	CT of petrous temporal bones	☐			
	Renal ultrasound	☐			
	ECG	☐			
Referrals	**Audiology**	☐			
	ENT	☐			
	Paediatrician	☐			
	Genetics	☐			
	Ophthalmologist	☐			
	QHLFSS	☐			
	Australian Hearing	☐			
	Cochlear Implant Team	☐			
	Early Intervention	☐			
	Other	☐			

Hearing status

Date: ____ / ____ / _____

Left:	Right:
Type:	Type:
Degree:	Degree:
Aetiological diagnosis:	

DO NOT WRITE IN THIS BINDING MARGIN

HEARING LOSS MANAGEMENT SUMMARY

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Appendix 3

MEDICAL GUIDELINES FOR THE ASSESSMENT OF CHILDREN WITH PERMANENT HEARING LOSS –Summary

History – prenatal, birth, post-natal, family history - don't forget 3 generation family tree!
Audiology results
Examination
Audiology, Family audiology testing (mother, father, siblings)
QHLFSF
Australian Hearing – all children ASAP
ENT – all children ASAP
Paediatrician - all children ASAP then approx 4 – 6 mo, 12mo, 18mo, 24mo of age
Genetics – all children 6-12 months
Ophthalmologist
• all children @ approx 6mo
• if not walking @ 18mo and aetiology unknown, review for Usher's Syndrome
• if no known aetiology by 6 years ERG to assess for Usher's Syndrome

Blood tests
All children –

- FBC
- U&Es
- thyroid function
- CMV, rubella, and toxoplasmosis IgG and IgM, syphilis serology
- CMV from Newborn Screening Card

Chromosomes if developmental delay or dysmorphic features
Connexin 26 common mutation screen unless clear diagnosis of syndrome ass. with a HL
Expanded genetic testing by Genetic Health Queensland as needed

Urine
All children – protein, microscopy
Consider CMV PCR
Urine metabolic screen if developmental delay or failure to thrive

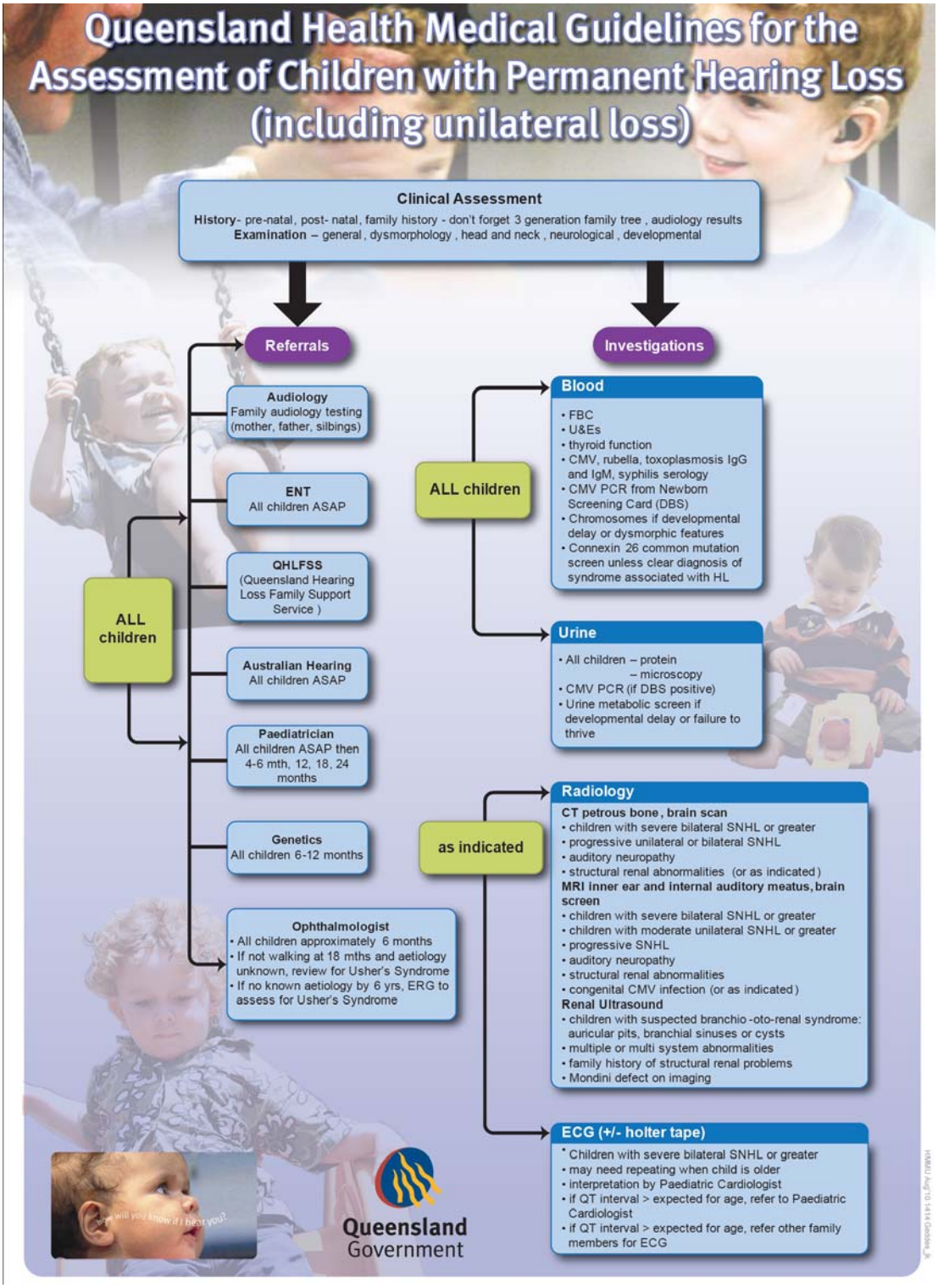
Radiology
CT petrous temporal bone, brain screen
• children with severe bilateral SNHL or greater
• progressive unilateral or bilateral SNHL
• auditory neuropathy
• structural renal abnormalities (Or as indicated)

MRI inner ear and internal auditory meatus, brain screen
• children with severe bilateral SNHL or greater
• progressive unilateral or bilateral SNHL
• auditory neuropathy
• structural renal abnormalities (Or as indicated)

Renal Ultrasound
• children with suspected branchio-oto-renal syndrome: pre-auricular pits, branchial sinuses or cysts
• multiple or multi system abnormalities
• family history of structural renal problems
• Mondini defect on imaging

ECG with holter tape
• children with severe bilateral SNHL or greater
• may need repeating when child is older
• interpretation by Paediatric Cardiologist
• if QT interval > expected for age, refer to Paediatric Cardiologist
• if QT interval > expected for age, refer other family members for ECG's

Appendix 4


Queensland Health Medical Guidelines for the Assessment of Children with Permanent Hearing Loss (including unilateral loss)
Clinical Assessment
History- pre-natal, post- natal, family history - don't forget 3 generation family tree , audiology results
Examination – general , dysmorphology , head and neck , neurological , developmental
Referrals
Investigations
ALL children
Audiology
Family audiology testing (mother, father, silbings)
ENT
All children ASAP
QHLFSS
(Queensland Hearing Loss Family Support Service)
Australian Hearing
All children ASAP
Paediatrician
All children ASAP then 4-6 mth, 12, 18, 24 months
Genetics
All children 6-12 months
Ophthalmologist
• All children approximately 6 months
• If not walking at 18 mths and aetiology unknown, review for Usher's Syndrome
• If no known aetiology by 6 yrs, ERG to assess for Usher's Syndrome
ALL children
Blood
• FBC
• U&Es
• thyroid function
• CMV, rubella, toxoplasmosis IgG and IgM, syphilis serology
• CMV PCR from Newborn Screening Card (DBS)
• Chromosomes if developmental delay or dysmorphic features
• Connexin 26 common mutation screen unless clear diagnosis of syndrome associated with HL
Urine
• All children – protein – microscopy
• CMV PCR (if DBS positive)
• Urine metabolic screen if developmental delay or failure to thrive
as indicated
Radiology
CT petrous bone , brain scan
• children with severe bilateral SNHL or greater
• progressive unilateral or bilateral SNHL
• auditory neuropathy
• structural renal abnormalities (or as indicated)
MRI inner ear and internal auditory meatus, brain screen
• children with severe bilateral SNHL or greater
• children with moderate unilateral SNHL or greater
• progressive SNHL
• auditory neuropathy
• structural renal abnormalities
• congenital CMV infection (or as indicated)
Renal Ultrasound
• children with suspected branchio -oto-renal syndrome: auricular pits, branchial sinuses or cysts
• multiple or multi system abnormalities
• family history of structural renal problems
• Mondini defect on imaging
ECG (+/- holter tape)
• Children with severe bilateral SNHL or greater
• may need repeating when child is older
• interpretation by Paediatric Cardiologist
• if QT interval > expected for age, refer to Paediatric Cardiologist
• if QT interval > expected for age, refer other family members for ECG
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Appendix 5
Parent handbook for Personal Health Record

Appendix 6
Investigation pages for the Personal Health Record

To be added