

ANHSC 2015 conference

# Remote professional training & support

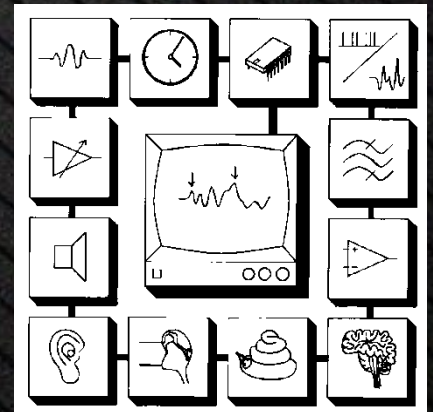
Guy Lightfoot

ERA Training & Consultancy

Email: [admin@eratraining.co.uk](mailto:admin@eratraining.co.uk)

[www.eratraining.co.uk](http://www.eratraining.co.uk)

[www.abrpeerreview.co.uk](http://www.abrpeerreview.co.uk)



# Background

- Davis & Bamford report 1997
  - Made the case for universal newborn screening (OAE)
- Preparation of protocols
  - 1999 diagnostic ABR based on click ABR
- National programme roll-out 2001 – 2006
- 3-day ABR training course on ABR for all staff
- Development of suite of protocols (now “guidance”)
  - Early Assessment overview
  - AC & BC frequency specific ABR & ASSR testing
  - ANSD & CM testing
  - Others, inc Tymp & VRA
  - Available at [www.abrpeerreview.co.uk/resources.html](http://www.abrpeerreview.co.uk/resources.html)

# Background

- National database (eSP)
- Screen Includes:
  - Bilateral PCHI of moderate or greater degree ( $\geq 40$ dB averaged 0.5 to 4kHz)
  - ANSD in NICU/SCBU babies
- Screen Excludes
  - Unilateral PCHI (but will be detected)
  - Mild bilateral PCHI (some may be detected)
  - ANSD in well babies
- Referred babies should be assessed within 4 weeks
- Assessment to be completed by 8 weeks

# Prevalence

PCHI Bilateral – 1.3 per 1000 births

- 1.1 Congenital

- 0.2 Acquired

PCHI Unilateral: - 0.8 per 1000

Progressive – inc CMV

1.65 per 1000 by age 9 yr

ANSD ~ 0.1 per 1000

# Severity (NHSP data at 2011)

Moderate(40-69dB)	51%
Severe (70-94dB)	28%
Profound ( $\geq 95$ dB)	21%

# Newborn Hearing screen performance (example)

Prevalence: 2/1000  
Screened: 10000

	Normal	PCHI	
Pass	9681	2	9691
Refer	299	18	309
	9980	20	10000

Sensitivity : 90.0%  
Specificity: 97.0%  
Referral rate: 3.2%  
PPV: 5.7%  
NNT: 17.6

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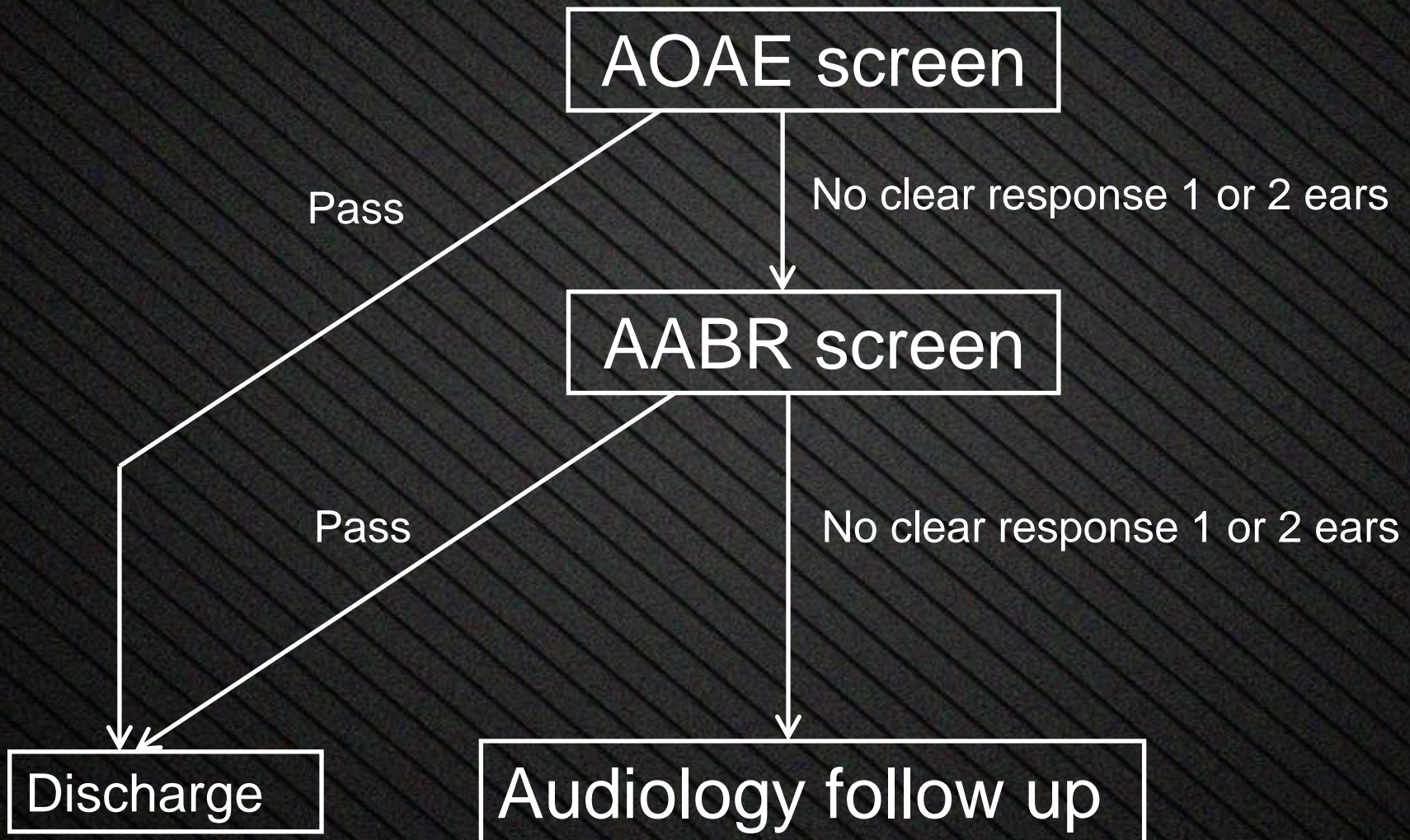
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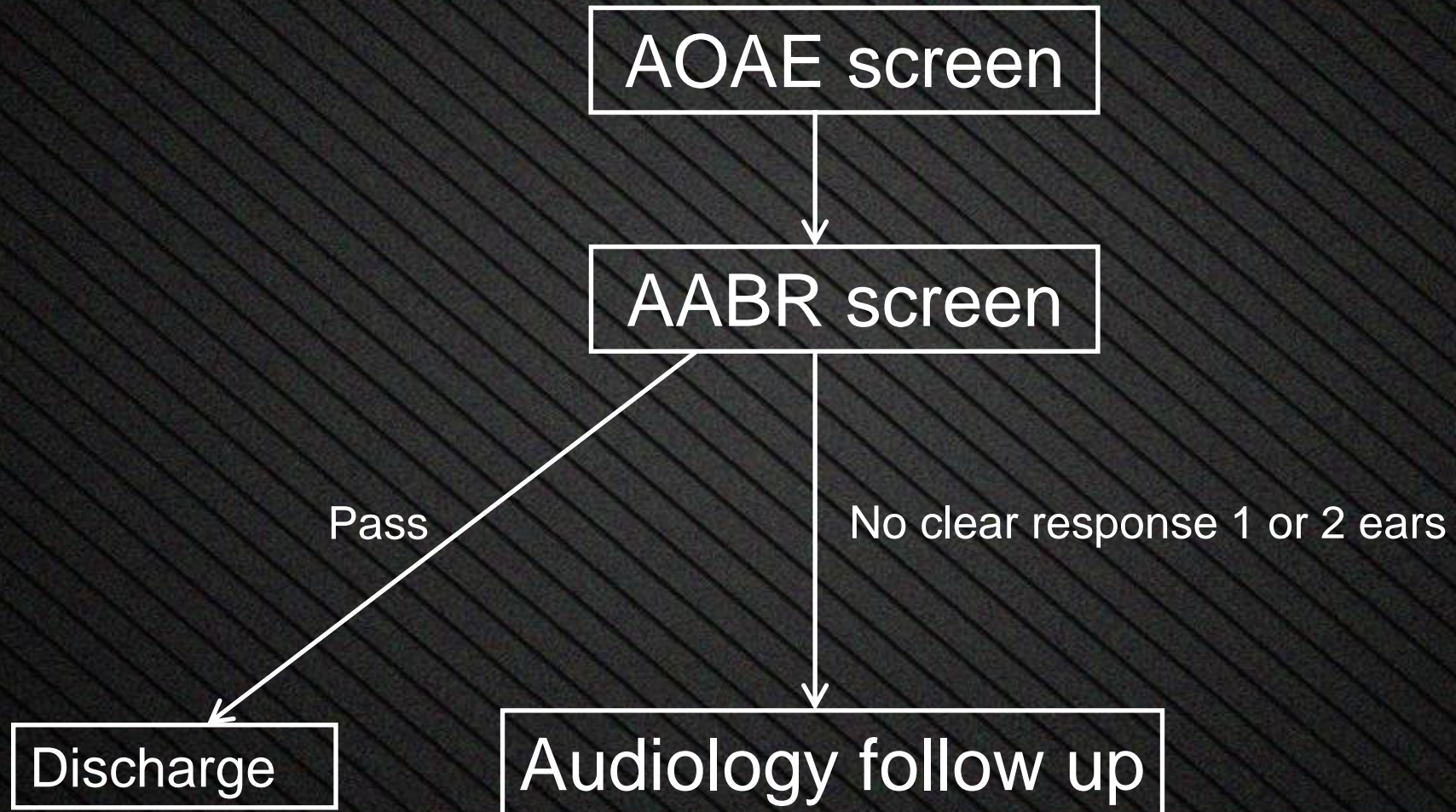
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# NHSP- well baby simplified



# NHSP - NICU/SCBU baby simplified



# NHSP Standards

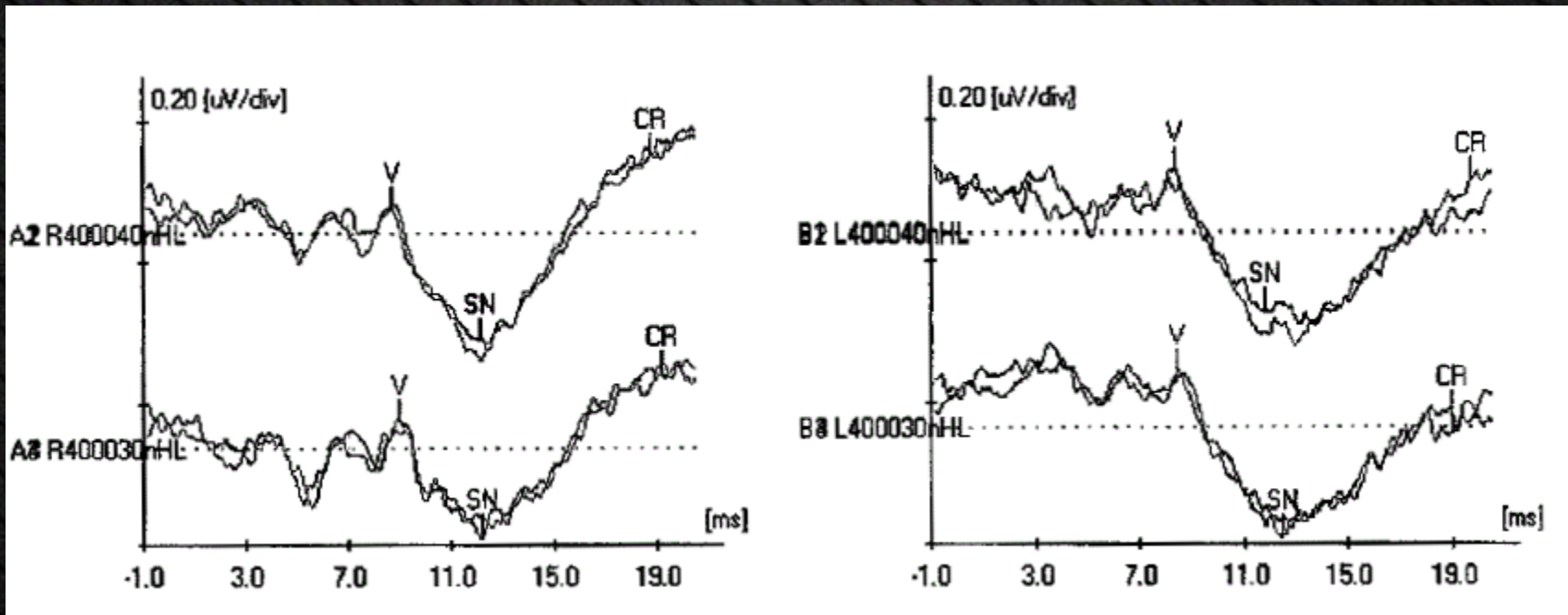
Coverage	$\geq 95\%$
Diag follow-up within 4wk	$\geq 90\%$
Ref rate (bilateral)	$\leq 3\%$
Yield (bilateral)	Mean $\approx 1/1000$

# The need for protocols

- Without prescriptive guidance:
  - Variable (sometimes dangerous) practice
  - Inconsistent standards of diagnosis & management
  - Poor recognition of tester's own limitations
  - Practice is “stuck in the past”
  - Testers (& their employers) may be legally vulnerable
- NHSP guidance documents have been developed:
  - Using current scientific evidence & best practice
  - Based on high but clinically realistic standards
  - Drafts open to consultation
  - Subject to periodic review as new evidence emerges
  - Supported by experts to give testers clinical / practical advice

# Example of a discharge ABR

“Clear Responses” at discharge level & 10dB above in both ears at 4kHz



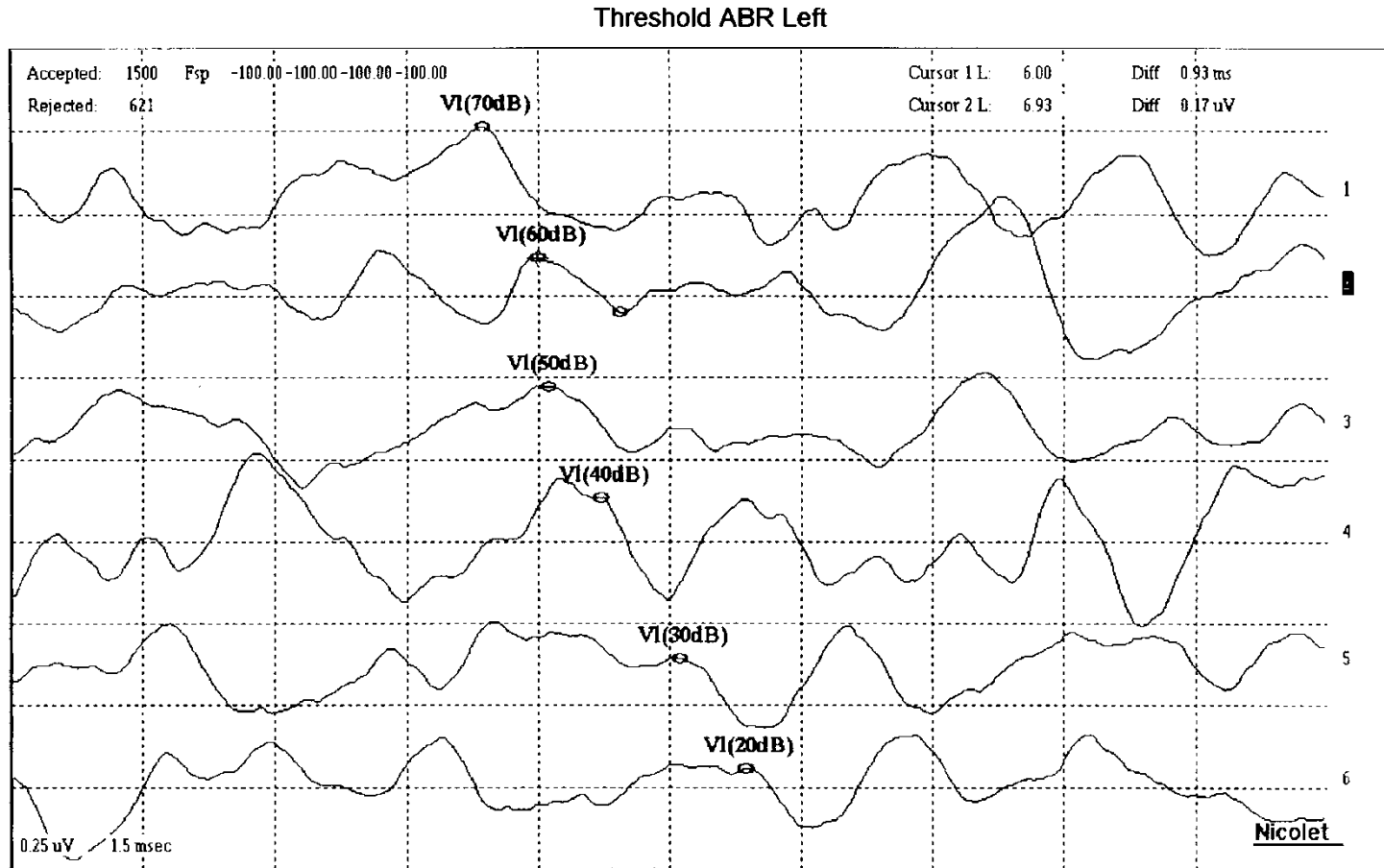
# ABR Quality issues

- Despite comprehensive prescriptive guidance, several “serious untoward incidents” still occurred
- Out of court settlements typically £1.5M (AU\$2.8M)
- Series of QA audits were initiated from 2009
- Audits have revealed:
  - National guidance sometimes ignored or misunderstood
  - Errors of test parameters
  - Errors of waveform interpretation
  - Errors of test strategy
  - Errors of reporting
  - Errors of case management



# Simulated example from legal case

“Hearing within normal limits”



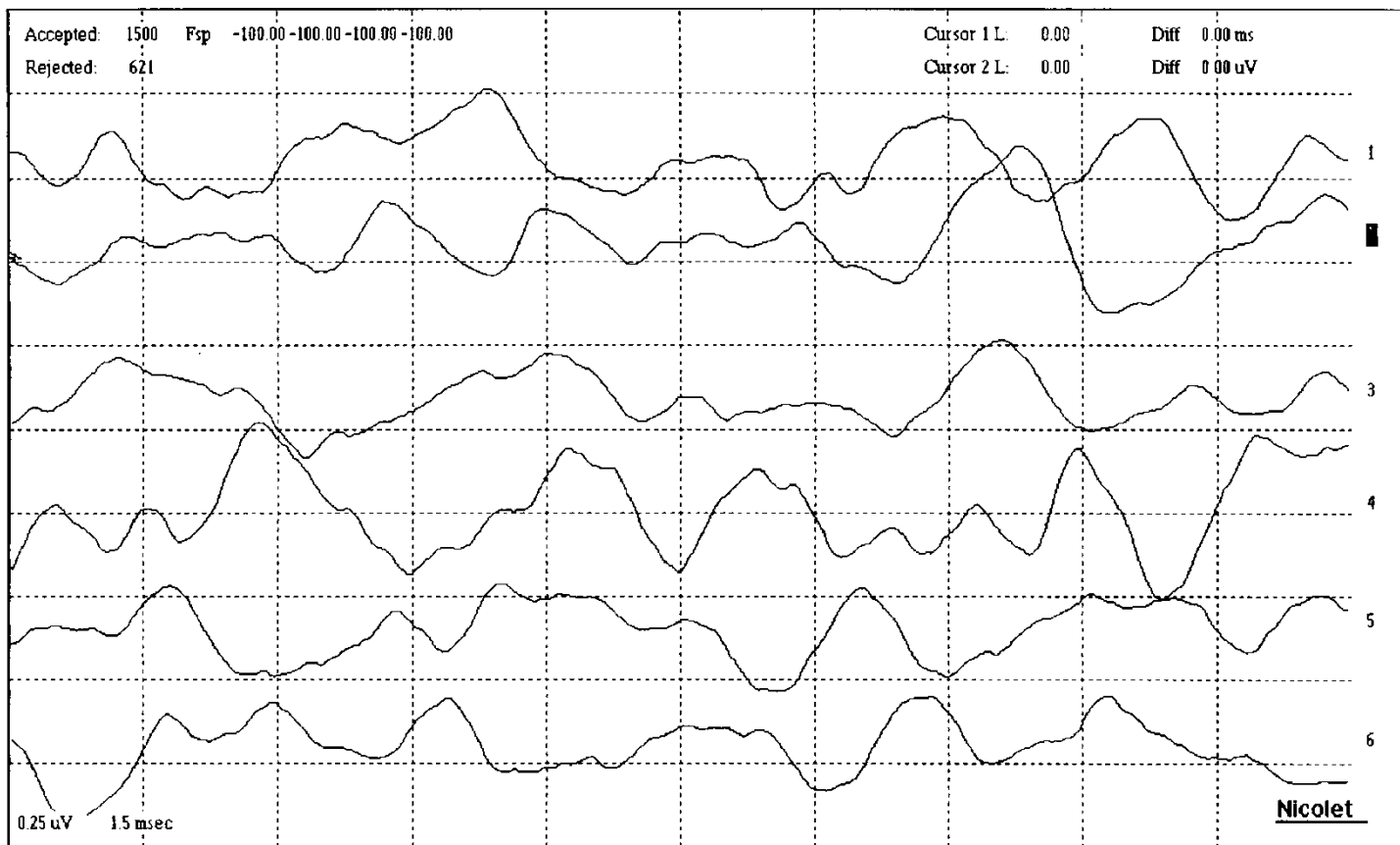
Sensitivity and Sweep Time Per Division

1 | 0.25 uV 1.5 msec    2 | 0.25 uV 1.5 msec    3 | 0.25 uV 1.5 msec    4 | 0.25 uV 1.5 msec    5 | 0.25 uV 1.5 msec    6 | 0.25 uV 1.5 msec

# Simulated example from legal case

“Hearing within normal limits”

Threshold ABR Left



Sensitivity and Sweep Time Per Division

1 | 0.25 uV 1.5 msec 2 | 0.25 uV 1.5 msec 3 | 0.25 uV 1.5 msec 4 | 0.25 uV 1.5 msec 5 | 0.25 uV 1.5 msec 6 | 0.25 uV 1.5 msec

## “QA4” ABR audit (2012 / 13)

- Each centre required to submit 4 cases
  - 2 discharge & 2 PCHI
  - Cases selected by NHSP, not the centre
- Single national assessor (me!) rated each centre, moderated by another assessor
- Feedback given via NHSP, including:
  - Identification of issues
  - Suggestions for improvement
- Audit results (all aspects of post-screening service) available to the public
- This ensured pressure for improvement from parents and service commissioners

# “QA4” ABR audit outcomes

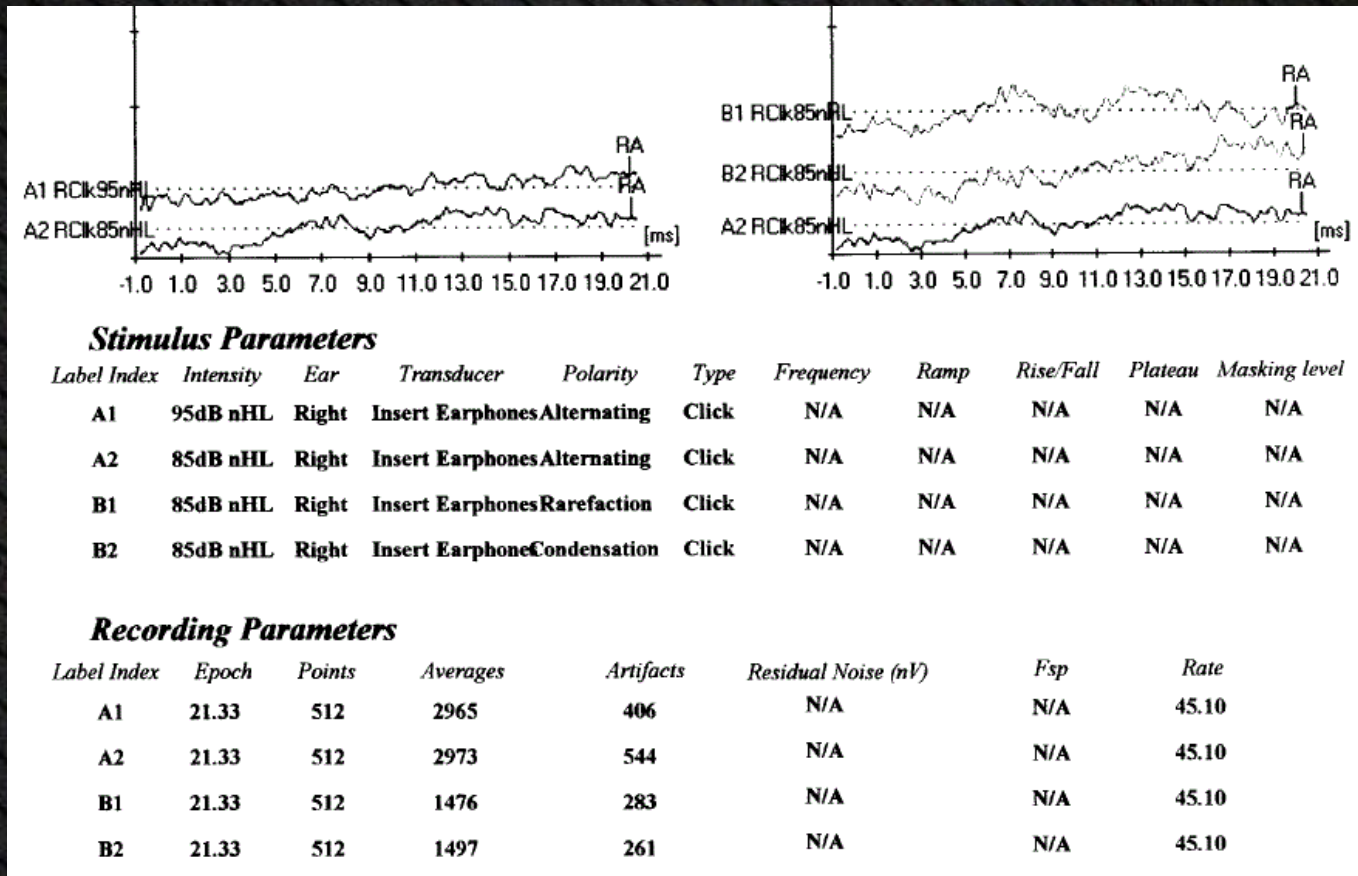
- **1 (best)** All cases are satisfactory with no (or only minor) issues 12%
- **2** All cases are generally satisfactory but with some improvement indicators 35%
- **3** Discharge cases are generally satisfactory with or without improvement indicators. PCHI cases have more significant shortcomings 48%
- **4** Both discharge and PCHI cases have significant shortcomings 5%
- **5 (worst)** Serious shortcomings (suspend service?) 0%

All 5, 4 & some 3 sites had phone call from assessor to discuss issues and to decide whether to initiate mentoring

# NHSP ABR interpretation

- “Old school” approach:  
a response is either there or it is not
- NHSP approach:  
not 2 but 3 possible outcomes
  - Response is present, with a high degree of certainty  
(NHSP terminology “Clear Response”, CR)
  - Response is absent, with a high degree of certainty  
(NHSP terminology “Response Absent”, RA)
  - Recording conditions too poor to tell  
(NHSP terminology “Inconclusive”, Inc)
- Inconclusive levels *cannot* contribute to the definition of threshold

# QA4 Example: spot the issue!



- There are two, but which is most important?
  - “RA” claimed but no estimation of residual noise
  - Maximum safe stimulus level exceeded with inserts

# Tubal insert phones - Warning!

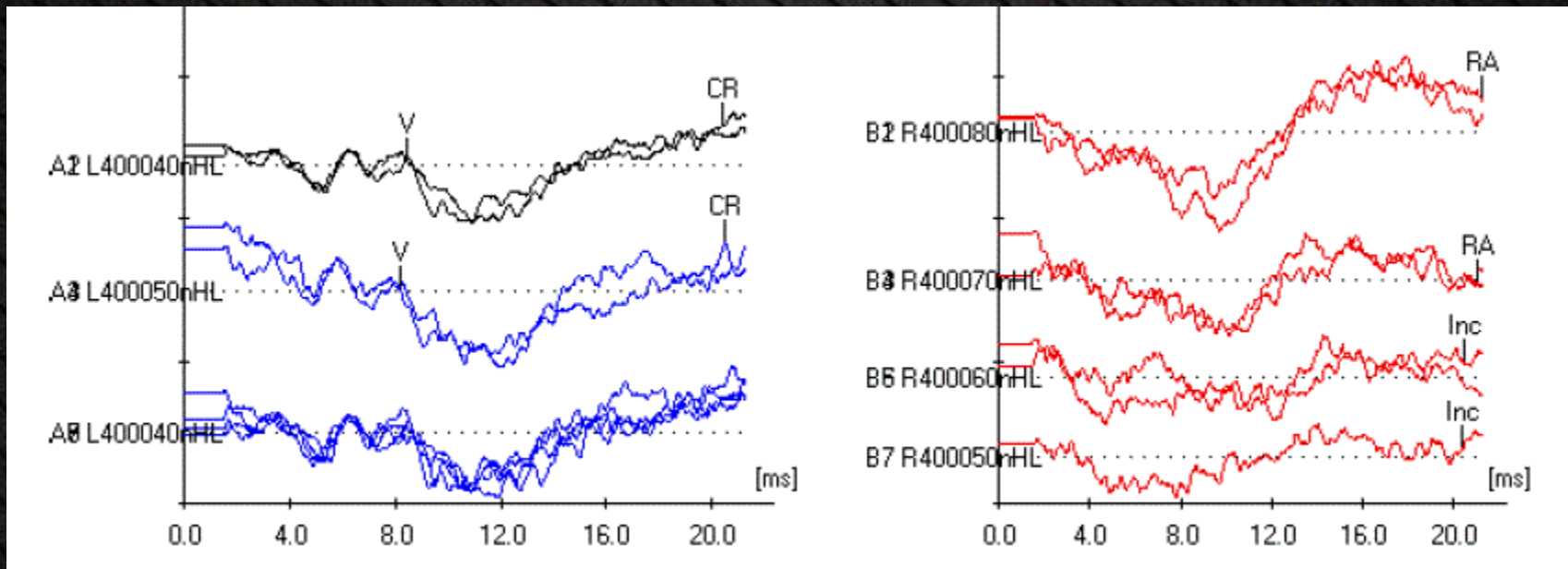
- All calibration data is derived from adults
- Unlike supra-aural phones, the enclosed volume of inserts depends on just the canal size
- In a neonate, this is *much* smaller than in an adult
- Physics: +6dB per halving of volume
- The actual stimulus will be 10-20dB higher in a newborn so “100” dBnHL is really 110-120dBnHL and that is about 140-150dB peak SPL!

(From Sininger et al, 1997, Hear Res 104; 27-38

Voss & Herrman 2006 Ear & Hearing, 26, 636-650)

- Beware delivering highest intensities via inserts  
EVEN WHEN THERE IS NO ABR!
  - the baby’s *hair cells* might be normal!
  - *Never* test >85dB

# QA4 Example: what's going on here?



- It is fine (4 runs at 40dB, weighted add)
- Rt labelled “RA” because it doesn’t look “quite right”
- Presumed to be artifactual (a clamped run would help)
- Electrode misconnection has inverted the waveforms



# So, there is a problem – Solutions?

- Available options include:
  - Require ABR testers to undergo certification (driving test)
  - Free “refresher” courses for all ABR testers
  - On-site visits to identify issues and initiate re-training
  - Close monitoring / mentoring of worst performing sites
  - Suspend service of sites resistant to change
  - Promote the development of regional peer review groups, with national moderation & support
  - Introduce remote “tele-audiometry” ABR or on-line expert
  - Continue QA audits to monitor quality
- So what did NHSP do?

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# Tester certification

- If starting from scratch, is a viable option
- Particularly attractive if one ABR system specified
- Expensive: involves both training & examination
- Long lead-time and resource dependent
- Rejected by NHSP as a solution for England

# On-site visits for struggling sites

- Implemented, post QA4 (5 sites)
- 1-day visit by an ABR expert (AM clinic, PM talk)
- Non-obvious issues occasionally revealed
  - e.g. sources of electrical interference
  - e.g. poor electrode technique
- Areas of misunderstanding quickly revealed
- Springboard to a period of mentorship
  - The visit fosters relationship of trust (& obligation to engage?) with mentor
- Testers were initially apprehensive but visits very effective in initiating change

# Remote mentoring of worst performing sites

- Typically 12-15 sites at any one time
- Follow up on issues exposed by QA audit
- Every ABR (waveforms & report) sent to mentor by email within 2 days of testing
- Mentor emailed back with review and suggestions
- Issues logged by mentor
- Case selection was eased as progress was made
  - e.g. changed to bilateral referrals only or PCHI only
- Site released when standards were acceptable
- Efficient but a few sites wouldn't engage in process
  - maybe seen as “punishment” for poor performance

# Peer Review- what's involved?

- The obvious:
  - Technical issues / test parameters
  - Waveform interpretation
  - Result reporting
- The less obvious:
  - Practical arrangements (age of baby; timing of clinics)
  - Test strategy (doing the correct tests, correct order)
  - Case management (follow-up / referral when necessary)
- BSA ABR peer review document:
  - [www.thebsa.org.uk/bsa-groups/electrophysiology-group/ep-additional-resources/](http://www.thebsa.org.uk/bsa-groups/electrophysiology-group/ep-additional-resources/)

# Models of ABR Peer Review

Periodic get-togethers to discuss “interesting” cases

- Good for bonding working relationships with colleagues ✓
- Some improvement in skills ✓
- Only as good as the best member ✗
- Process is too slow to help individual patients ✗
- No training in reviewing skills ✗
- Embarrassing cases not selected ✗

Poor

# Models of ABR Peer Review

## NHSP Generic scheme

- Data is transferred by secure email in < 48 hours ✓
- Cases selected systematically ✓
- Consistent review result format (Excel spreadsheet) ✓
- Good for bonding working relationships with colleagues ✓
- Reviewers receive training & are accredited ✓
- Fast turn-round time: advice can inform next session on the same baby ✓
- Doesn't require IT investment / costs ✓
- Doesn't integrate with English ABR national database ✗
- Reviewer is known to tester ✗?

Better



# Peer Review Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M
2	For Tester Use	Site/Dept		Comments from tester re background / results / plans for further tests etc. (Do not exceed cell width)									
3		Tester		Well baby. ABR at 1 week corrected age suggested severe bilateral loss but had considerable interference issues so results uncertain.									
4		Case ID	Example	Today bilateral flat loss confirmed. Tymps flat R & L. Impressions taken.									
5		Reason for test	Newborn screen referral										
6		Newborn Screen outcome	NCR bilateral										
7		Date of test (dd/mm/yyyy)											
8		Corrected Age at test (weeks)	6	Aids fitted - for F/U at 8/12.									
9		Over 48 hr in NICU/SCBU - yes/no	No										
10		ABR AC Transducer / Stim Type	Insert / Pips										
11		Outcome of ABR/any further action	PCHI management										
12		Date of next appt if any											
13		Date sent for review											
14		For Reviewer use	Reviewer name		Comments from Reviewer (Do not exceed cell width; use separate rows)								
15				Good that you got 2 frequencies but RA requires replication, with noise <25nV.									
16				It is important to know if this baby has a conductive or sensorineural loss so I would urge you to consider bringing back for 4k BC. If need to aid take care with fitting as AC thresholds could be									
17	Date review returned to site												
18	Discussed with tester? yes/no		No										
19	ABR quality judgement	Improvement indicators	Note to reviewer: there are 6 rows above for your comments. Limit what you enter in each cell so that it can be read (no text is hidden), as in this example. These cells do not wrap the text.										
20	Action required beyond planned?	ABR repeat											
21													
22	ABR THRESHOLDS in dBnHL			RIGHT EAR					LEFT EAR				
23	Notes: Use =, <=, or > prefix If masking was used add (M) after the result e.g. =40(M) By convention, <=50 is taken as 'agreeing within 10dB' with =50 but <=55 (or more) is taken as not agreeing with =55 (or more) Agree within 10dB also requires agreement with standard Gold std requires = some threshold (or <=30eHL AC4kHz) Reviewer explanations may be added as comments - Hover mouse over cells with red corner to view comment			Air Conduction					Air Conduction				
24				0.5k	1k	2k	4k	Click/CM	0.5k	1k	2k	4k	Click/CM
25				tester - result:	=80			=75		=75			=70
26				Gold standard?	Yes			Yes		Yes			Yes
27				reviewer - result:	<=80			<=75		<=75			<=75
28				reviewer - agree within 10dB?	No			No		No			No
29				Bone Conduction					Bone Conduction				
30				0.5k	1k	2k	4k	Click	0.5k	1k	2k	4k	Click
31				tester - result:									
32				Gold standard?									
33	reviewer - result:												
34	reviewer - agree within 10dB?												
35													
36		Category	Indicator	Details (Do not exceed cell width)									
37	Improvement	Interpretation	Labelled RA but unreplicated waveform	4k Rt 70, 4k Lt 60, 1k Rt 75, 1k Lt 70. These do not qualify for RA.									
38	Improvement	Interpretation	Threshold recorded as = when should be <=	All. Without valid RA these must be reported as <=									
39	Improvement	Interpretation	Reported as Gold Standard but is not	All. Gold standard thresholds >30dBnHL require an RA 5-10dB below									
40	Improvement	Interpretation	Mismatch between chart and eSP entry	4k Lt 70 marked Inc (correct) but reported as though it was CR									
41	Improvement	Interpretation	More than 2 traces overlaid	4k Lt 75 - makes estimation of residual noise difficult									
42	Improvement	Test Strategy	A further 2 waveforms, added pairwise needed to resolve	Additional traces for Lt 4k at 70 to resolve.									
43	Improvement	Test Strategy	BC would be helpful	Is this case conductive or sensorineural?									
44	Improvement			NB "reviewer - agree within 10dB" is No (see cell A30)									
45	Improvement												
46	Improvement												
47	Improvement												
48	Improvement												
49	General / other Reviewer comments	This area can also be used for further comments by the reviewer if needed.											
50													
51	Number of improvement indicators in each category												
52	Admin	0											
53	Parameters	0											
54	Recording Quality	0											
55	Display	0											
56	Interpretation	5											
57	Strategy	0											
58	CM	0											

Outcome measures			
threshold:	n agree	n disagree	% agree
reviewer	0	4	0%
No of categories	1		
No of improvement indicators	7		

# Models of ABR Peer Review

## Cloud-based structured scheme

- Good for bonding working relationships with colleagues ✓
- Reviewers receive training & are accredited ✓
- Data is secure & readily accessible ✓
- Integrates with English ABR national database ✓
- Cases selected systematically ✓
- Review is anonymous ✓
- Requires IT investment / costs ✗
- Review initiated only when all testing is complete ✗

Best

# Features of a good ABR PR scheme

- Cases for review must be selected systematically
  - e.g. all bilateral referrals
  - e.g. all PCHI cases + sample of discharge cases
- Reviewers trained and accredited to ensure standards
- Periodic moderation of reviewers to maintain standards
- Provision of independent Expert for advice & arbitration
- Evaluation of outcomes – annual report of audit
- Timescale of reviews: <7 days (reviewer's advice used for the next test session for that case)

# Advantages of a good ABR PR scheme

- Annual audits of PR scheme: evidence a reduction of errors
  - e.g. South London audit: Yr2 -v- Yr1 errors reduced  $p < 0.001$
- Lowers the risk of costly diagnostic & management errors
- Being a reviewer improves your own clinical practice
- Provides infrastructure of support for challenging cases
- Fosters professional pride in giving a good service
- Gives parents greater confidence in the service
- But...
  - must strike a balance between effectiveness and admin overhead

# How are we doing in England?

As a percentage of the live birth population (2014):

- One cloud-based PR scheme (East of England: 10%)
  - Being made available to other regions on a fee-paying basis
- Established regional “generic” email schemes (22%)
- Regional “generic” email schemes being developed (32%)
- No formal PR scheme (36%)
  - Seen as optional / avoidable; no penalty for non-engagement
- Is the English government addressing this?
- No: there has been a policy blunder!

# “Public Health England”

- Created in April 2013 to oversee public health policy
- NHSP subsumed within PHE in April 2014
  - New mandate: limit all activity to the screen
  - NHSP’s support & QA of diagnostic services stopped (now the responsibility of >130 individual hospitals)
- Standards are likely to fall now that QA is abandoned
- ERA Training & Consultancy Ltd offers
  - Training courses (as always) see [www.eratraining.co.uk](http://www.eratraining.co.uk)
  - Peer reviewer training & accreditation
  - “Support Voucher” scheme for advice on clinical cases
  - But never easy to sell services that were previously free!
  - Reluctant sites just look the other way
  - Would be far better if services were provided via NHSP



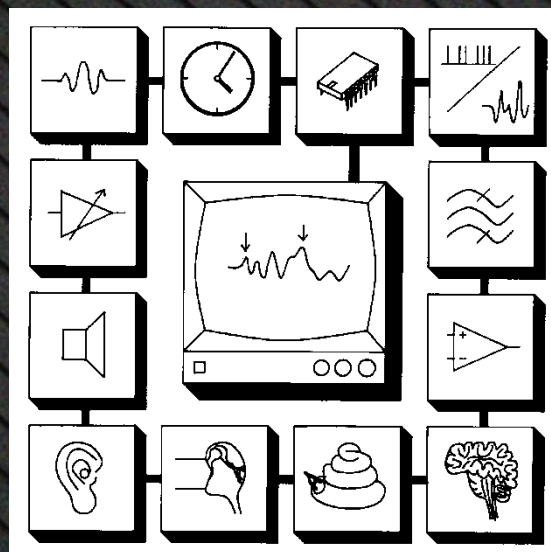
# Take-home messages?

- Vital to establish & ensure use of national protocols
  - Need to be agreed & “owned” by testers
- Provide high quality training, specific to protocols
- Conduct regular QA audits
  - can’t assume all testers adhere to protocols
- Provide technical/clinical support #
- Establish framework to facilitate quality improvements for struggling centres #
- Establish systematic ABR peer review scheme
  - Inc training & accreditation of reviewers #

# can be remote



Many thanks for your attention!



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