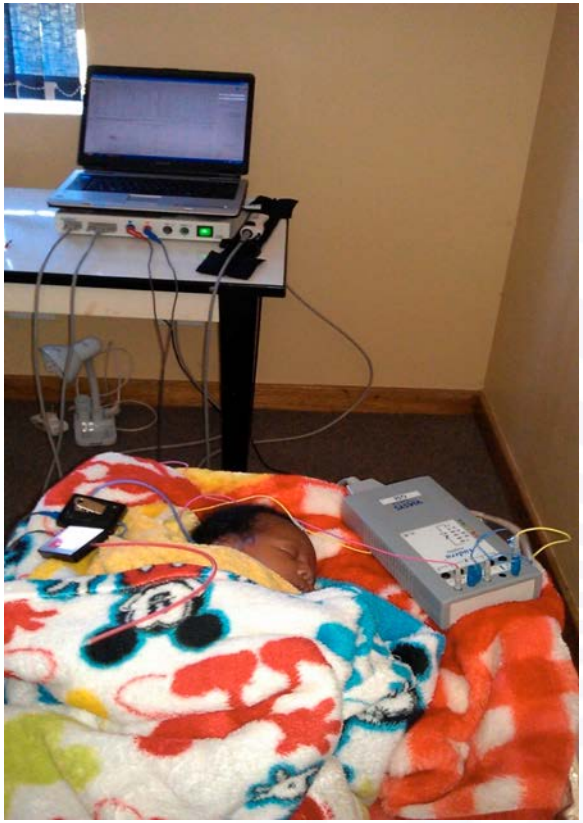

The Evaluation of a 2000Hz Auditory Steady State Response (ASSR) Newborn Hearing Screening Protocol

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Outline of Presentation

- Current NHS techniques
- Clinical application of ASSR
- ASSR in NHS
- Aims
- Procedure
- Results
- Conclusion

Current Newborn Hearing Screening Methods

- Automated Auditory Brainstem Response (AABR) and Evoked Oto-Acoustic Emissions (EOAE)

- Joint Committee of Infant Hearing (JCIH, 2007)
  - 100% Sensitivity & 95% Specificity
  - <4% Referral rate
  - Mild loss detection
  - Time efficient

- Limitations

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ASSR

- Diagnostic validity of ASSR
  - Severe to profound hearing losses
  - Difficult to test populations

- An objective electrophysiological hearing testing technique that record responses related to activity at the brainstem level (Stach, 2002), by presenting continuous tones modulated in amplitude at specific modulation frequencies (Hall & Swanepoel, 2010).

- "… electrophysiological response to a rapid auditory stimuli to create an estimated audiogram" (Beck et al., 2012).

Application of ASSR in NHS

- Cone-Wesson, Rickards et al., 2002
  - ASSR's ability to detect residual hearing due to 120dB output
  - Not sensitive to middle ear ailments
  - 2000Hz's mean threshold closest to actual hearing threshold

- Cuban Neuroscience Centre (Perez-Abalo et al., 2009)
  - First Mf-ASSR semi-automated device called Baby Screen
  - 100% sensitivity, 96% specificity
  - Screening time 2.6minutes

- Possible screening application:
  - Objective
  - Frequency specific
  - No subjective waveform interpretation

Aims

determine the **sensitivity & specificity** of 2KHz

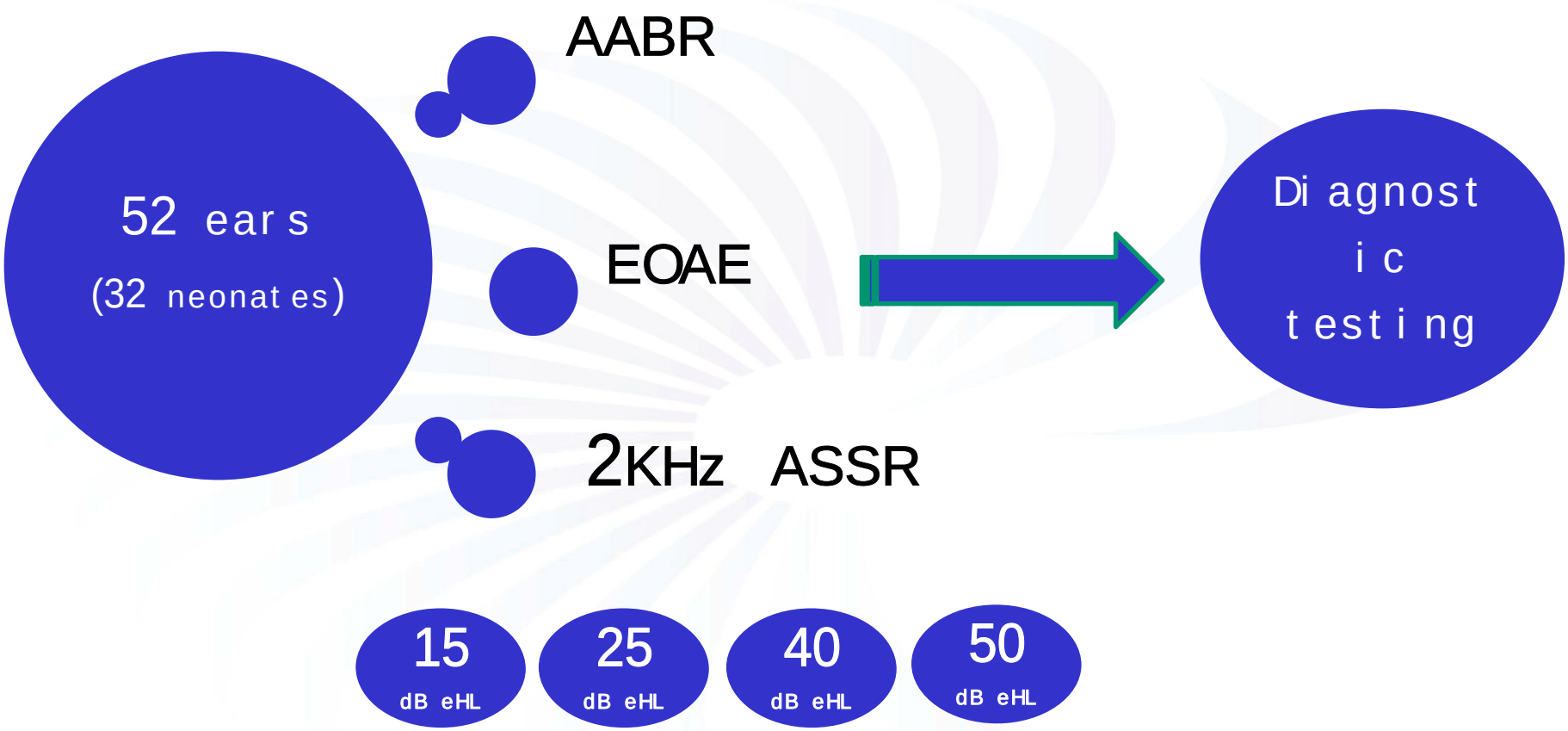
+

To determine the **test time** of the 2KHz ASSR

→

Performance Characteristics

Procedure


52 ears
(32 neonates)
AABR
EOAE
2KHz ASSR
Diagnostic testing
15 dB eHL
25 dB eHL
40 dB eHL
50 dB eHL

Results One: ASSR Intensity Levels

ASSR Intensity Level (dB nHL)	n=	Sensitivity	Specificity	Referral Rate (ears)
ASSR 30	49	100%	25%	76%
ASSR 40	52	100%	55%	46%
ASSR 50	51	100%	88%	14%
ASSR 60 *	49	100%	94%	8%
ASSR 60	49	100%	94%	8%

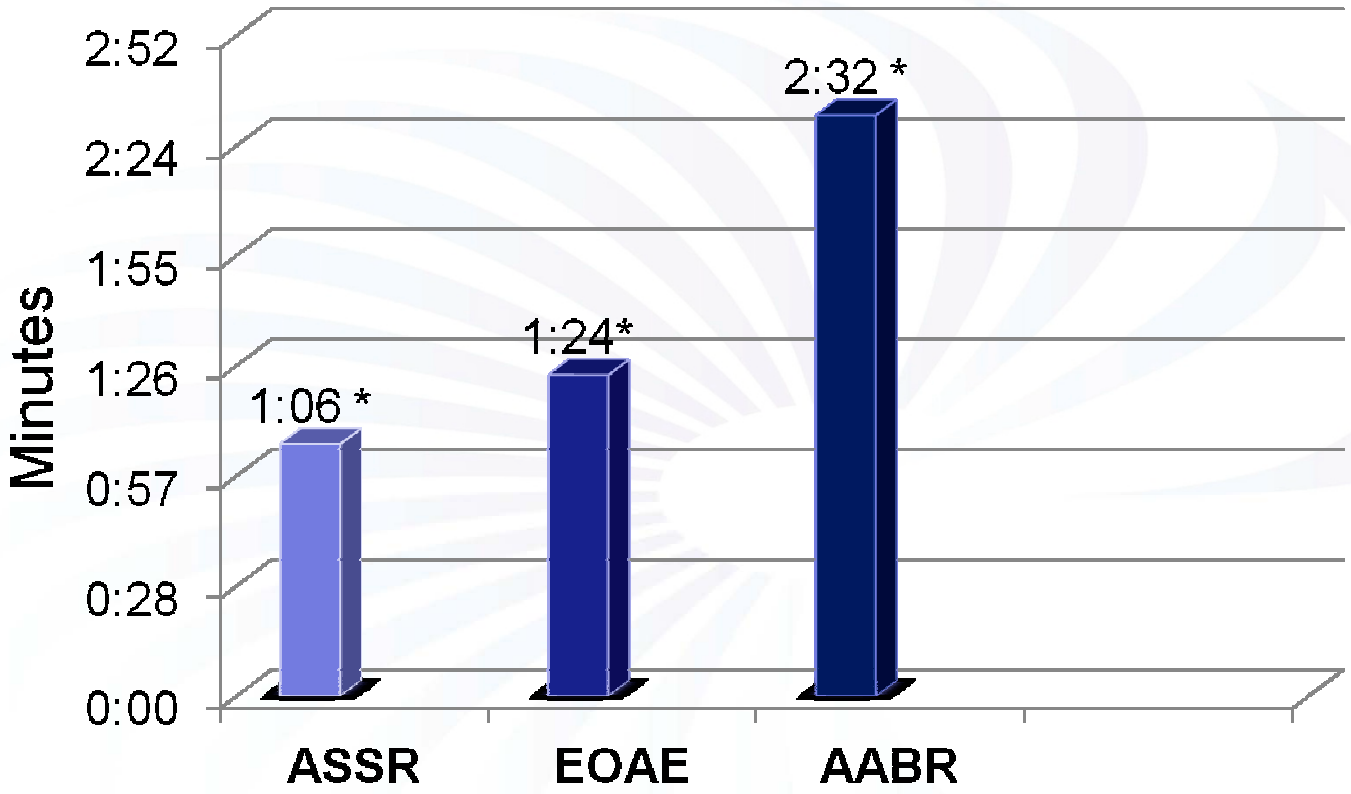
* Closest to performance characteristics specified by JCIH (2007)

Results Two: Performance Characteristics

ASSR Intensity Level (dB nHL)	n=	Sensitivity	Specificity	Referral Rate (ears)
ASSR 60 *	49	100%	94%	8%
ASSR 50	51	100%	88%	14%
AABR	52	100%	80%	21%
EOAE	52	100%	65%	37%

* Closest to performance characteristics specified by JCIH (2007)

Result Three: Median Test Times (per ear)



*p<0.0001

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Conclusion

- *Suggested ASSR screening protocol*
  - 2000Hz is feasible
  - 50dB nHL has equivalent characteristics to AABR & EOAE in detecting borderline mild hearing losses
  - Significantly shorter screening ti

- *Future direction*
  - Neuromaturational effect
  - Device automation

- *Results promising*

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Thank you