

**BABY  
SOUND  
CHECK<sup>®</sup>**

Dedicated to the early identification of hearing loss in infants and young children

# Update on **Baby Sound Check<sup>®</sup>** *A Model Program for Hearing Screening in the Medical Home*



# Collaborative Presentation

Sandra Mintz, MS, CCC-A

- Director of Audiology
  - John Tracy Clinic



Parul Bhatia, MD

- Pediatrician
  - Children's Hospital Los Angeles
  - USC Keck School of Medicine
  - AltaMed Services Corporation



# Hearing Screening in the Medical Home

- Comprehensive
- Better follow up and follow through
- Avoid referral and authorization delays
- Get real-time, immediate results of hearing screen
- Capture children who may not have been screened in the newborn period
- Capture later onset or late/ progressive HL

# Hearing Screening in the Medical Home

- Improved Physician education
- Meet Parental expectations
- Special circumstances:
  - Speech delay
  - Chronic or recurrent middle ear disease
  - Monitor OME with objective test of middle ear function
  - Screen for auditory nerve disorders



# Comprehensive Medical Care

Similar to EKGs, glucose screening, and other screening tests MDs do in the clinic....

BSC helps us

**MOVE TO THE NEXT STEP *FASTER!***



# BSC Project Goals

- Create a sustainable model for hearing screening in community-based clinics
- Screen infants and toddlers who
  - missed screening at birth,
  - are incorrectly diagnosed
  - were lost to follow-up
  - have later-onset or progressive hearing loss



# BSC Project Goals

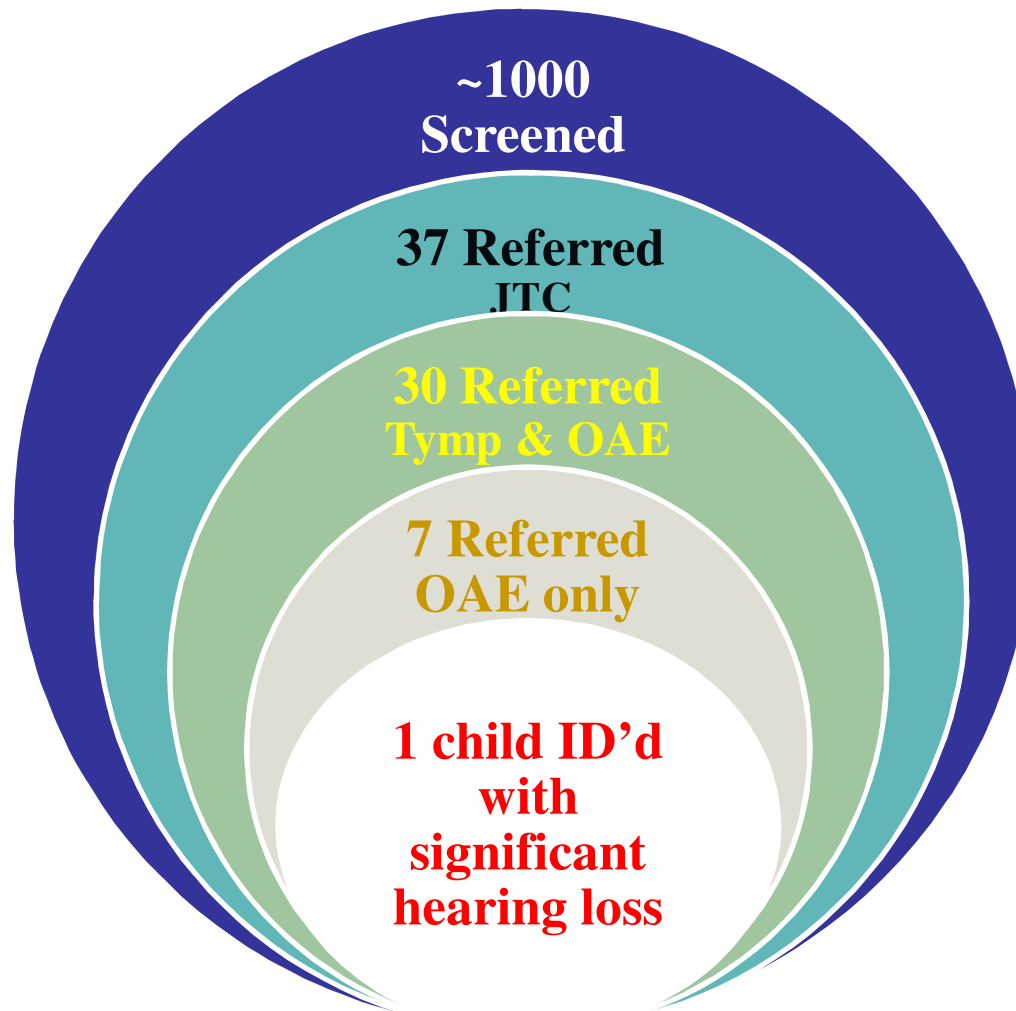
- Integrate comprehensive hearing screening into *routine well-baby care within the medical home*
- Provide continuity of care and follow-up
- Disseminate the model to other health clinics locally and nationally







# Baby Sound Check Outcomes to Date



# First Year Challenges

Challenge	Solution
Competence	Enhanced training materials Workbooks
Time management/ Patient flow	Updated protocols Periodicity Table
Follow through on referrals	Case management Streamlined referral process
Compliance	Tighter tracking Pocket Guides

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# *Baby Sound Check®* Education and Training



# Baby Sound Check Training



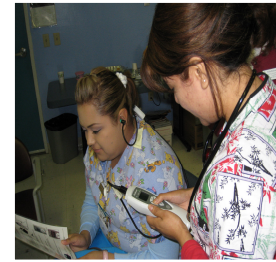
## 174 Medical Staff 5 Health Clinics

- 93 Screeners
  - MAs
  - Nurses
- 38 Providers
  - Pediatricians
  - Family Practice
  - PAs
- 63 Office Staff
- 642 total hours of training



## Provider Training

- At JTC
  - 1.5 hr-Didactic
  - 1 hr - Provider Workbook
- .5 hr-Observation
  - children receiving audiological, educational, and family services at JTC



## MA /Nurse training

- At Health Clinic
  - 1 hr-Didactic
  - 1 hr-Equipment
- 3 hrs @ Preschool
  - Hands-on screening children

# Mentorship Component

- On-site audiologist launch by audiologist
- Weekly site visit for at least three months
- On-going support thereafter



## OAE Quick Reference Card

(Interacoustics OtoRead Screener)

### Daily Equipment Check

- Run a quick test on your own ear to make sure the unit is functioning properly.

### OAE Test Procedure

#### **STEP 1: Examine the Ear**

- Pull gently back on the ear to open the ear canal
- If there is a foreign object, drainage, odor or if child reacts painfully, **do not continue** and inform health care provider
- Note size of ear canal opening

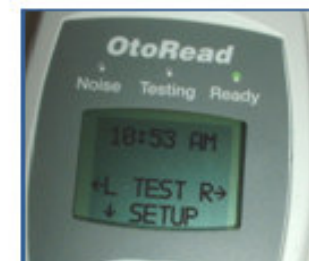
#### **STEP 2: Select Ear Tip**

- Select an ear tip that is the same size or slightly larger than the child's ear canal
- Place ear tip securely on probe, pushing it all the way down

#### **STEP 3: Prepare Child**

- Clip cord to child/parent's clothing where it cannot be easily reached
- Ensure child is quiet and comfortable

#### **STEP 4: Initiate Test**



## Tympanometry/Acoustic Reflex Quick Reference Card

*Interacoustics AT 235h Impedance Audiometer*

### Daily Equipment Check

- Run a quick test on your own ear to make sure unit is functioning properly

### Tympanometry/Reflex Procedure

#### STEP 1: Examine the Ear

- Pull gently back on ear to open ear canal
- If there is a foreign object, drainage, a foul smell, or if child reacts painfully, **do not continue** and inform health care provider
- Note size of ear canal opening

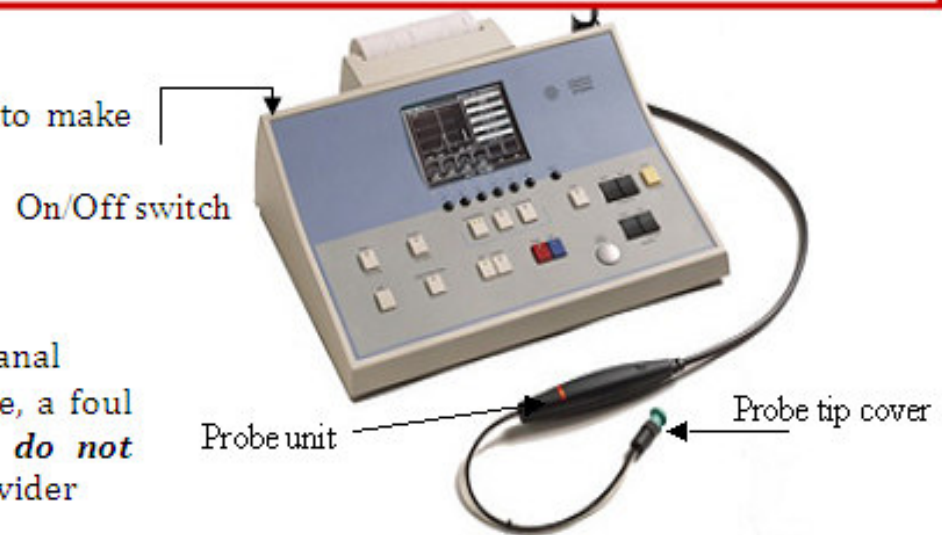
#### STEP 2: Select Probe tip cover/ear tip

- Select an ear tip that is the same size or slightly larger than the child's ear canal
- Place ear tip securely on the probe, pushing it all the way down

#### STEP 3: Prepare Child

- Place shoulder harness on parent or child where it can not be reached
- Ensure child is quiet and comfortable

#### STEP 4: Conduct Tympanometry/Reflex test



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# Grand Round Case Studies

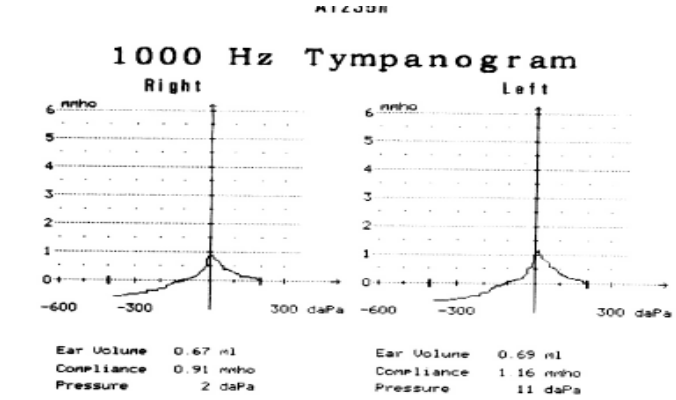
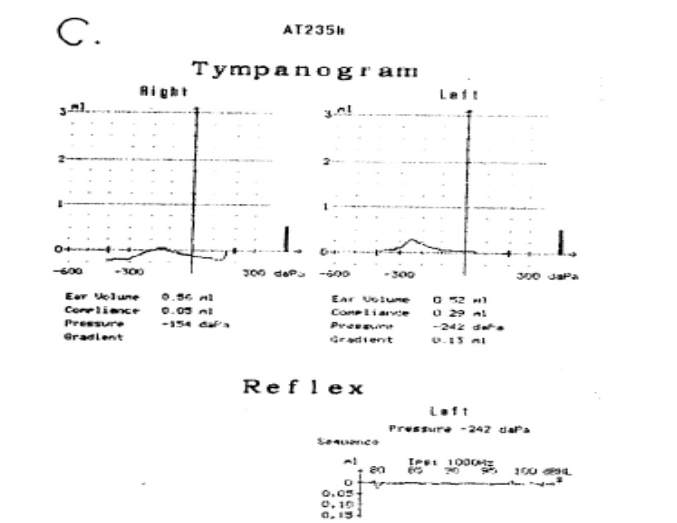
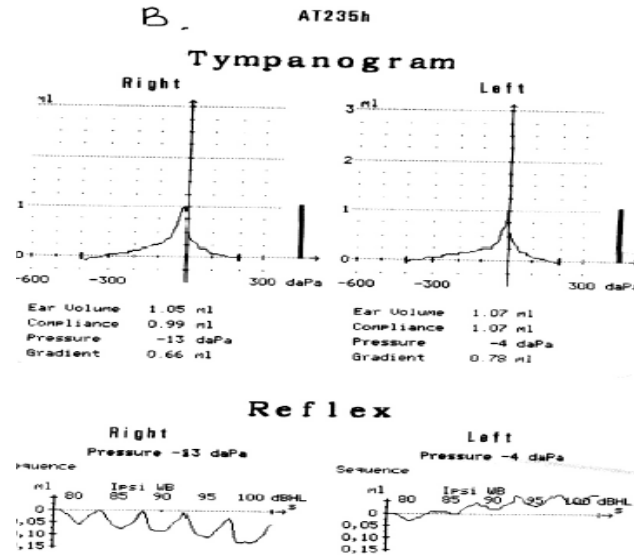
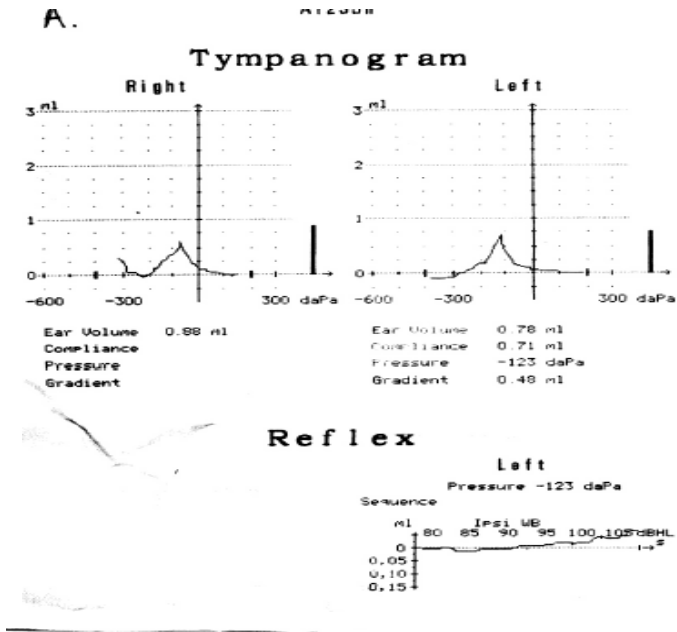
## *Provider Workbook*







# Focus on Tympanogram and Reflex Tracings Solutions



# Time Management: Updated Protocol

## 1 SCREENING PROTOCOL

ALL PATIENTS RECEIVE:			ADDITIONAL TESTS:	
BSC questions	OAE		Tymp	Acoustic Reflexes
Normal	Pass	▶	Do not test	Do not test
Risk Factor ("yes" responses)	Pass	▶	Test	Test
Normal	Refer	▶	Test	Test
Risk Factor	Refer	▶	Test	Test



**AltaMed**  
Health Services

- Bell
- Boyle Heights
- Commerce
- El Monte
- Pico Rivera



**John  
Tracy  
Clinic**

## HEARING SCREENING RESULTS

ATTACH SCREENING PRINTOUTS HERE

www.altamed.org • (800) 337-8665 | www.jtc.org • (213) 748-5481

**MEDICAL ASSISTANTS:** Screener (print): \_\_\_\_\_ Date of Test: \_\_\_\_\_

Parent's Name: \_\_\_\_\_ Parent's Best Phone #: \_\_\_\_\_

PARENT QUESTIONNAIRE

<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Family history of hearing loss?	¿Historia de sordera en la familia?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Concerns about development/speech/language/hearing?	¿Preocupaciones del Desarrollo/Lenguaje/Habla/o Audición?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	History of meningitis, CMV, or infection at birth?	¿Historia de Meningitis / CMV/Infección al nacer?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Major medical conditions?	¿Condiciones de salud mayores?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Frequent ear infections?	¿Infecciones frecuentes de oído?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	PE Tubes?	¿Tubos en los oídos?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	NICU stay?	¿Recibió cuidado intensivo?
	Hospital of birth?	¿Nombre del hospital de nacimiento?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Newborn hearing screening conducted in hospital?	¿Exámenes de audición de recién nacido?
<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Pass newborn hearing screening?	¿Paso los exámenes de audición al nacer?

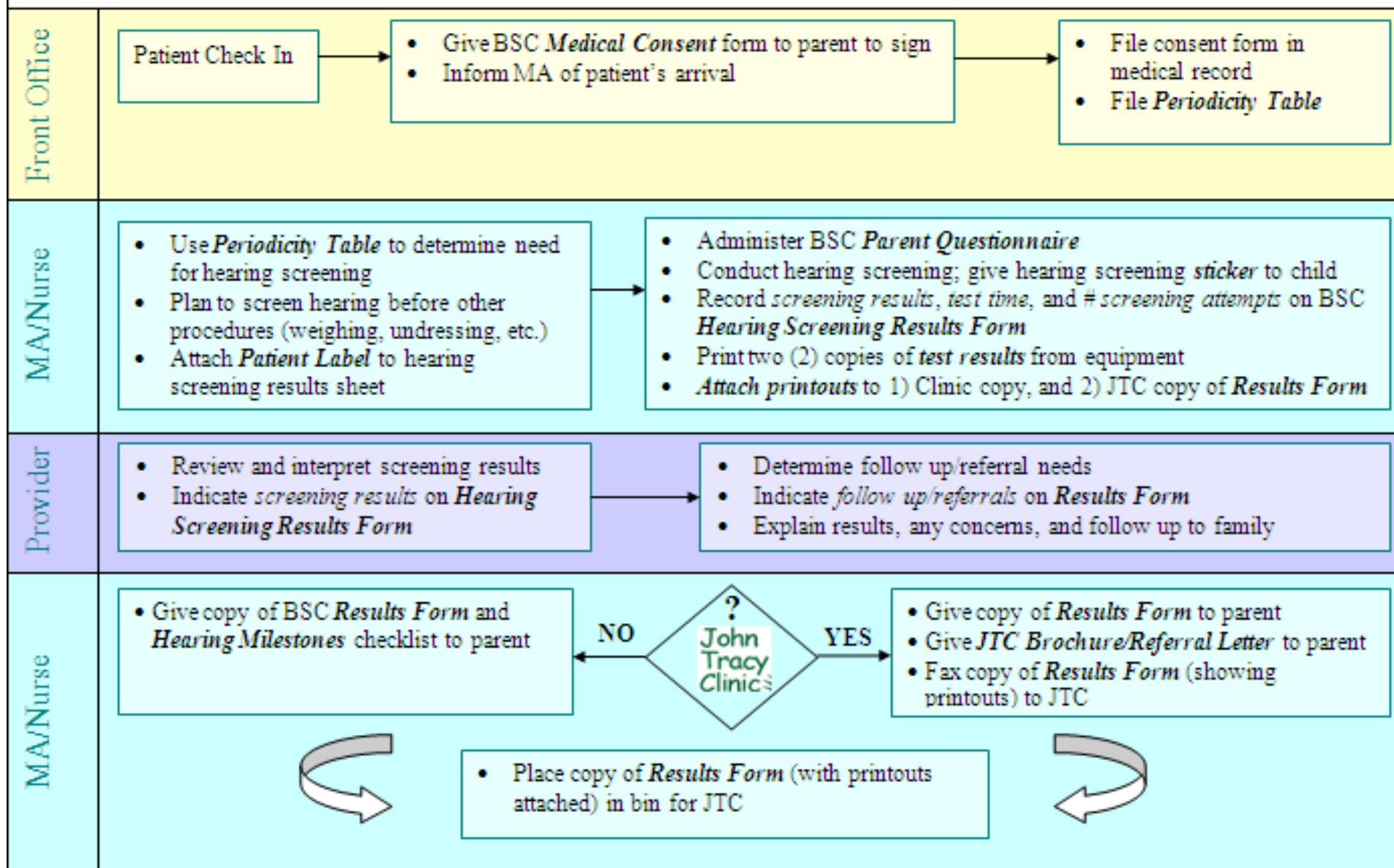


### Baby Sound Check

### Periodicity Table for Hearing Screening

Age	0-9 mos	9-12 mos	13-24 mos	25-36 mos
<b>Interval Until next exam</b>	<b>6 months</b>	<b>12 months</b>	<b>12 months</b>	<b>12 months</b>
<b>Date Tested/Initials</b>	Date: _____ Initials: _____	Date: _____ Initials: _____	Date: _____ Initials: _____	Date: _____ Initials: _____
<b>Results:</b>	<input type="radio"/> Normal <input type="radio"/> Re-screen <input type="radio"/> Refer	<input type="radio"/> Normal <input type="radio"/> Re-screen <input type="radio"/> Refer	<input type="radio"/> Normal <input type="radio"/> Re-screen <input type="radio"/> Refer	<input type="radio"/> Normal <input type="radio"/> Re-screen <input type="radio"/> Refer
<b>Referrals:</b>	<u>Referrals to:</u> <input type="radio"/> ENT <input type="radio"/> JTC <input type="radio"/> Other: _____	<u>Referrals to:</u> <input type="radio"/> ENT <input type="radio"/> JTC <input type="radio"/> Other: _____	<u>Referrals to:</u> <input type="radio"/> ENT <input type="radio"/> JTC <input type="radio"/> Other: _____	<u>Referrals to:</u> <input type="radio"/> ENT <input type="radio"/> JTC <input type="radio"/> Other: _____
<b>Rescreen:</b>	Repeat screen date and result:	Repeat screen date and result:	Repeat screen date and result:	Repeat screen date and result:
<b>Comments</b>				

## AltaMed Visit Protocol





## HEARING SCREENING RESULTS

ATTACH TYMPANOMETRY/REFLEX PRINTOUT HERE

Hearing Screening Results (0 - 3 years old): Bubble in <input type="radio"/> results.		
	Right Ear	Left Ear
OAE	<input type="radio"/> Pass <input type="radio"/> Refer <input type="radio"/> Incomplete	<input type="radio"/> Pass <input type="radio"/> Refer <input type="radio"/> Incomplete
Tymp	<input type="radio"/> Pass <input type="radio"/> Refer <input type="radio"/> Incomplete <input type="radio"/> Did not test	<input type="radio"/> Pass <input type="radio"/> Refer <input type="radio"/> Incomplete <input type="radio"/> Did not test
Reflex	<input type="radio"/> Present <input type="radio"/> Absent <input type="radio"/> Incomplete <input type="radio"/> Did not test	<input type="radio"/> Present <input type="radio"/> Absent <input type="radio"/> Incomplete <input type="radio"/> Did not test

### RESULTS:

# of screenings: \_\_\_\_\_ Total minutes to screen: \_\_\_\_\_

Child cooperative?  YES  NO

### TYMPANOGRAMS

<p><u>PASS</u></p> <p><i>Peaked</i></p> <p>Compliance: <math>\geq 0.2</math></p> <p><u>PE TUBES</u></p> <p>Pass: flat/E.C. volume <math>\geq 1.0</math></p> <p>Refer: flat/E.C. volume <math>&lt; 1.0</math></p>	<p><u>REFER</u></p> <p><i>Flat; no peak; shallow; rounded</i></p> <p>Compliance: <math>&lt; 0.2</math> OR</p> <p>Tymp width/gradient: <math>&gt; 250</math> daPa</p> <p><u>RETEST</u></p> <p><i>Below baseline; unclear peak</i></p>
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# *Baby Sound Check*

## Pass / Refer Guidelines

### OAE

- Pass / Refer programmed into equipment
- No decision-making by medical staff

### Tymp Refer\*

- Compliance  $\leq 0.2$  ml
- Gradient  $> 250$  daPa
- PE Tubes EC Volume  $< 1.0$  ml

### Acoustic Reflexes

- Present / Absence to BBN 80-95 dB



# Follow Up and Referral Process



## 2 PASS / REFERRAL GUIDELINES

OAE	TYMP	WORKING DIAGNOSIS	IMMEDIATE ACTION	ADDITIONAL ACTION
Pass	Pass	Pass hearing screen	None	Rescreen at routine BSC interval
Refer	Pass/ Unable to test	Concern for possible sensorineural hearing loss	STAT referral to Audiologist	Audiologist test results to MD within 1 month
Pass	Refer	Otitis Media with Effusion	Rescreen every 3 months until pass	If 'Refer' OAE at any rescreen, refer to Audiologist & ENT. Refer to ENT if effusion persists for $\geq 6$ months
Refer	Refer	Concern for possible conductive hearing loss	Rescreen in 3 months	Refer to Audiologist & ENT if still fail OAE at rescreen
Pass	Pass & Absent Acoustic Reflex (6+ m old)	Concern for possible auditory neuropathy/ dis-synchrony	STAT referral to Audiologist	Audiologist test results to MD within 1 month



# HEARING SCREENING RESULTS

ATTACH TYMPANOMETRY/REFLEX PRINTOUT HERE

**PROVIDERS:** (Bubble in screening results in table above)

Provider Name (please print): \_\_\_\_\_ Signature: \_\_\_\_\_

Reason for screening:  Routine Baby Sound Check  Developmental Concern  Previous Screening Failed  Other: \_\_\_\_\_

Provider concern regarding child's development, speech, language or hearing?  YES  NO

### REFERRALS

None  Audiology (JTC)  ENT  Other

Treatment for middle ear condition?  N/A  YES  NO

Return to medical clinic for:

Re-screen in: \_\_\_\_\_ months \_\_\_\_\_ weeks




Routine Baby Sound Check in:  6 months  12 months

AFFIX LABELS TO ALL COPIES

Patient Age	Interval until next BSC screen
0-9 months	6 months
10 mos - 3 years	Annually

TOP COPY: CHART • MIDDLE COPY: PATIENT • BOTTOM COPY: JTC

# Tracking

	 AltaMed <small>CHILDREN'S SERVICES</small> <input type="checkbox"/> Bell <input type="checkbox"/> Boyle Heights <input type="checkbox"/> Commerce <input type="checkbox"/> El Monte <input type="checkbox"/> Pico Rivera	 John Tracy Clinic	<b>HEARING SCREENING RESULTS</b> ATTACH SCREENING PRINTOUTS HERE												
www.altamed.org • (800) 337-8665   www.jtc.org • (213) 748-5481															
MEDICAL ASSISTANTS: Screener (print): _____ Date of Test: _____															
Parent's Name: _____ Parent's Best Phone #: _____															
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	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Hospital of birth?	¿Nombre del hospital de nacimiento?												
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	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> DON'T KNOW	Pass newborn hearing screening?	¿Paso los exámenes de audición al nacer?												
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TOP COPY: CHART • MIDDLE COPY: PATIENT • BOTTOM COPY: JTC															

# Compliance



## 1 SCREENING PROTOCOL

ALL PATIENTS RECEIVE:			ADDITIONAL TESTS:	
BSC questions	OAE		Tymp	Acoustic Reflexes
Normal	Pass	▶	Do not test	Do not test
Risk Factor ("yes" responses)	Pass	▶	Test	Test
Normal	Refer	▶	Test	Test
Risk Factor	Refer	▶	Test	Test

**POCKET GUIDE**

## 2 PASS / REFERRAL GUIDELINES

OAE	TYMP		WORKING DIAGNOSIS		IMMEDIATE ACTION		ADDITIONAL ACTION
Pass	Pass	▶	Pass hearing screen	▶	None	▶	Rescreen at routine BSC interval
Refer	Pass/ Unable to test	▶	Concern for possible sensorineural hearing loss	▶	STAT referral to Audiologist	▶	Audiologist test results to MD within 1 month
Pass	Refer	▶	Otitis Media with Effusion	▶	Rescreen every 3 months until pass	▶	If 'Refer' OAE at any rescreen, refer to Audiologist & ENT. Refer to ENT if effusion persists for ≥ 6 months
Refer	Refer	▶	Concern for possible conductive hearing loss	▶	Rescreen in 3 months	▶	Refer to Audiologist & ENT if still fail OAE at rescreen
Pass	Pass & Absent Acoustic Reflex (6+ m old)	▶	Concern for possible auditory neuropathy/dis-synchrony	▶	STAT referral to Audiologist	▶	Audiologist test results to MD within 1 month

# POCKET GUIDE

## RISK INDICATORS FOR PERMANENT HEARING LOSS IN CHILDHOOD\*\*

1. Parental concern\* re: hrg, speech, lang. or develop. delay
2. Family history\* of hearing loss (HL)
3. NICU: > 5 days, ECMO\*, assisted ventilation, ototoxic medications (aminoglycosides, loop diuretics), hyperbilirubinemia with XT
4. In utero infections: CMV\*, herpes, rubella, syphilis, toxoplasmosis
5. Craniofacial anomalies of pinna/ear canal, ear tags/pits & temporal bone anomalies
6. Physical traits and syndromes assoc. with HL
7. Neurodegenerative disorders\*
8. Postnatal infections assoc. w/ SNHL: herpes, varicella, meningitis
9. Head trauma (basal skull/temporal bone fracture\*) with hospitalization
10. Chemotherapy\*

\*greater concern for delayed-onset hearing loss

## ENT WORK UP

For patients (0-3 years) diagnosed with sensorineural hearing loss of unclear etiology (general considerations):

1. Connexin 26; 30
2. EKG (prolonged QTc)
3. Renal ultrasound
4. CT temporal bones
5. Genetics referral
6. Mitochondrial MT-RNR1 or MT-TS1 gene testing

## REFERRALS

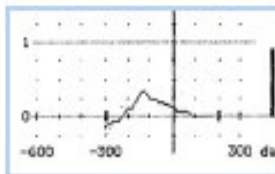
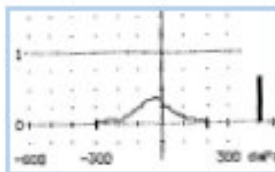
For all patients diagnosed with a confirmed hearing loss:

1. Audiology
2. Otolaryngology (ENT)
3. Early Intervention
4. Speech/language
5. Ophthalmology

# POCKET GUIDE

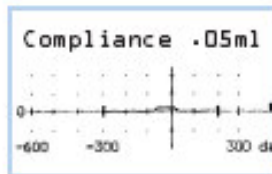
## PASS

Normal Peaked  
Compliance  $\geq 0.2$



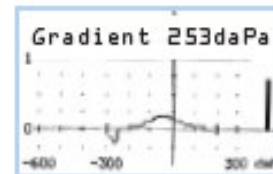
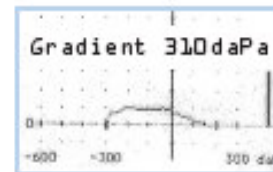
## REFER

No Peak  
Compliance  $< 0.2$



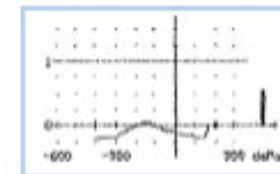
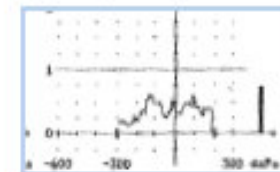
## REFER

Shallow/Rounded/Wide width  
Gradient  $> 250$ daPa



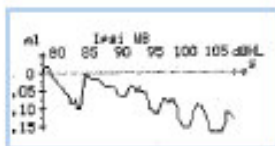
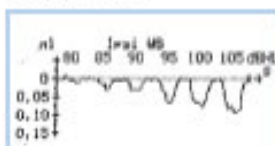
## RE-TEST

Below Baseline  
Unclear peak



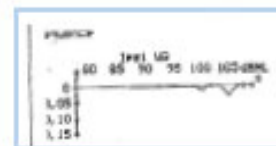
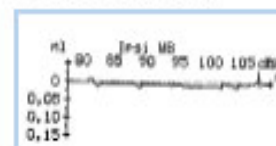
## PASS

Step pattern



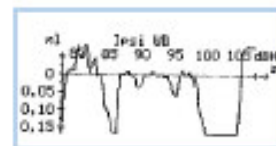
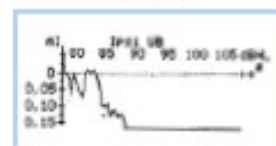
## ABSENT

No clear deflection



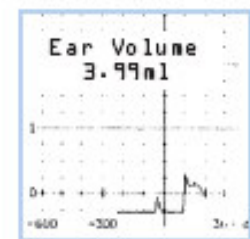
## RE-TEST/INCOMPLETE

No clear pattern



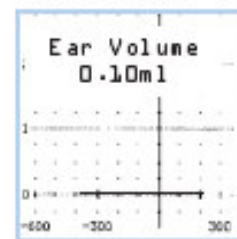
## PE TUBE PASS

Flat/EC Volume  $\geq 1.0$



## PE TUBE REFER

Flat/EC Volume  $< 1.0$



Reference: American Academy of Audiology (2008) *Guidelines for Identification of Hearing Loss and Middle Ear Dysfunction in Children.*



## HEARING MILESTONES

### 0-3 MONTHS

- Stirs in sleep to a conversational voice
- If awake, quiets to voice

### BY 6 MONTHS

- Rouses from sleep to loud sounds
- Turns toward the direction of sound

### BY 9 MONTHS

- Enjoys playing with a bell or rattle
- Turns directly when called by name
- Says several different sounds with changing pitch

### BY 12 MONTHS

- Understands a variety of words (e.g. "no", "bye-bye", "hot", "doggie")
- Begins to imitate some speech sounds
- Says two (2) or three (3) words spontaneously and at the right times (e.g. "da-da" or "ma-ma" )

### BY 18 MONTHS

- Follows simple commands without cues (e.g. "get your shoes")
- Says more than six (6) words

### BY 2 YEARS

- Learns some new words every day
- Uses 2- and 3- word sentences

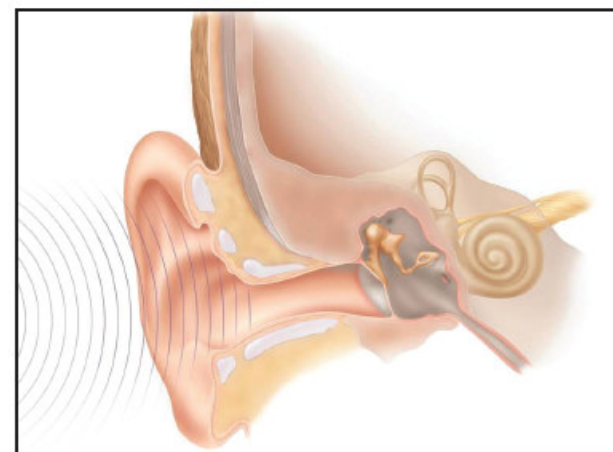
### BY 3 YEARS

- Uses sentences of four (4) or more words
- Family members understand the child's speech

### BY 4 YEARS

- Speaks in full sentences
- People outside the family understand the child's speech

## POCKET GUIDE



John  
Tracy  
Clinic

806 W. Adams Blvd.  
Los Angeles, CA 90007  
(213) 748-5481 • fax (213) 749-1651  
[www.jtc.org](http://www.jtc.org)

# Keys to Baby Sound Check Program Establishment

## Collaboration

Medical & Audiology teams

Optimal  
Training  
Materials

Understanding  
the individual  
challenges of  
incorporating  
HS into busy  
medical  
practices

User-friendly  
equipment

Central  
Coordination  
Center