Improving Otitis Media (OM) Care with EHR-Based Clinical Decision Support and Feedback

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Children's Hospital of Philadelphia

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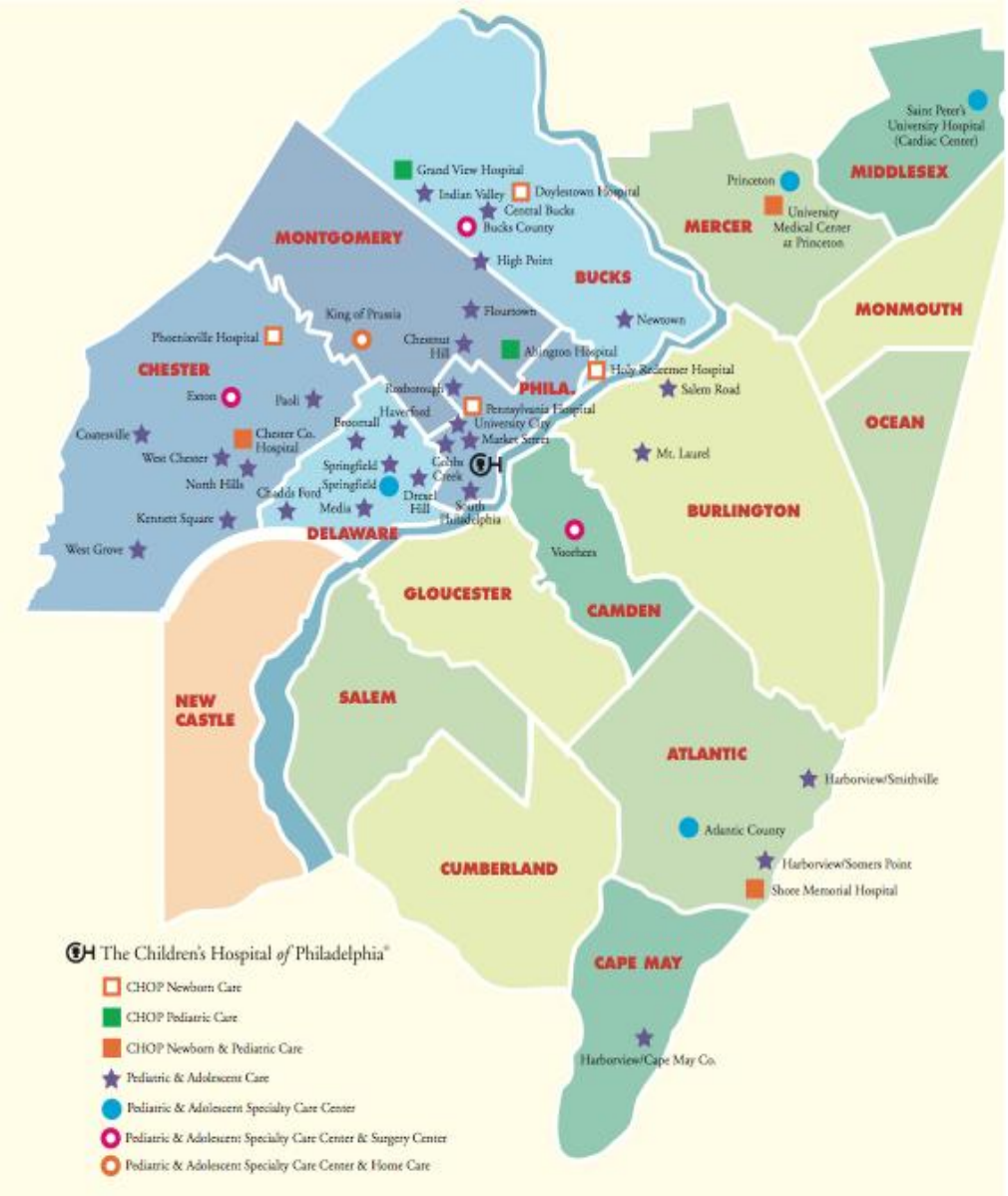
Study Funded by: AHRQ R18 HS017042-02

Study Aims

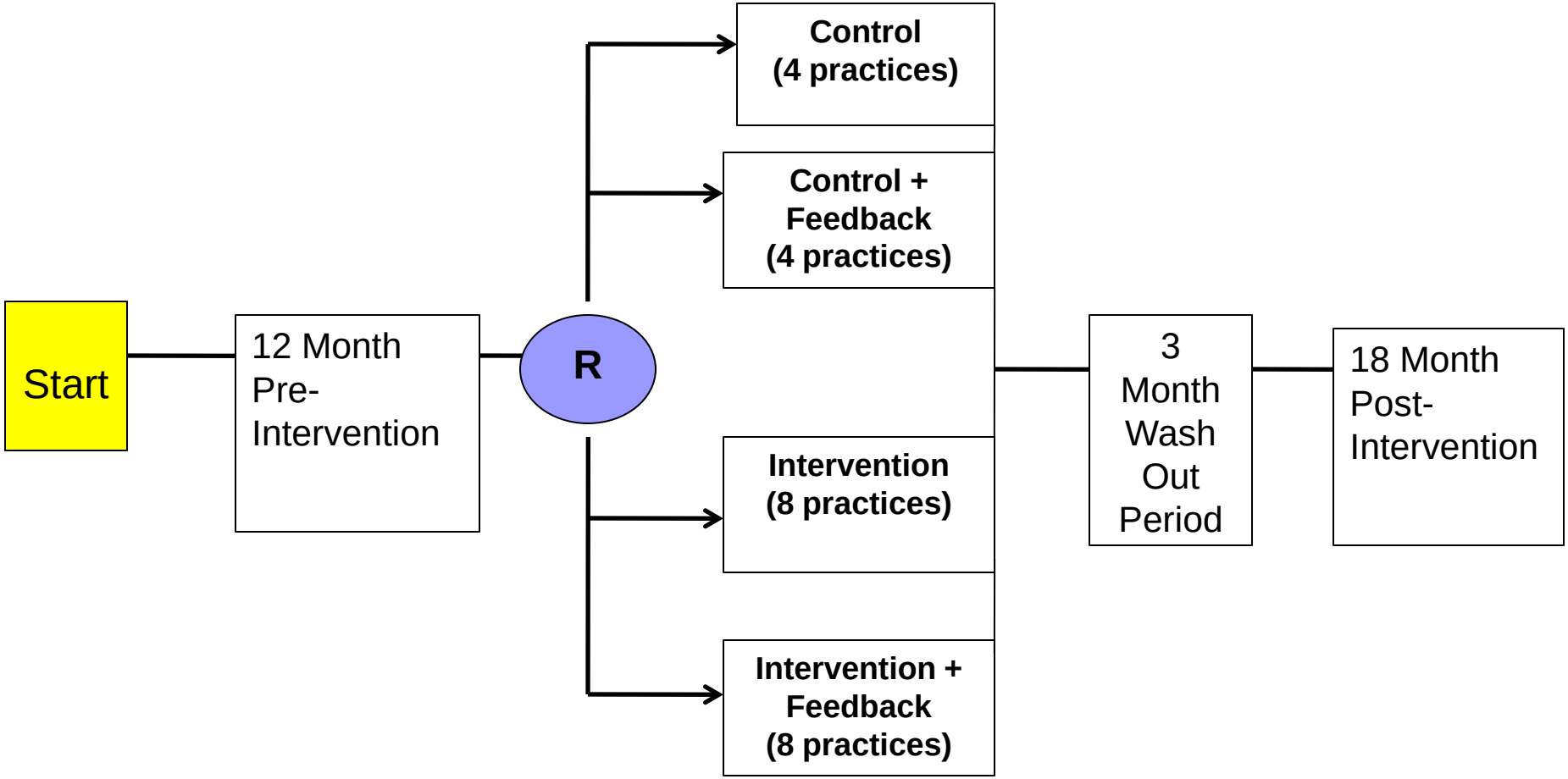
- To develop an integrated (education, CDS, feedback) intervention to improve the quality of OM care
- To examine the effect of the intervention on quality of OM care
- To elucidate patterns and predictors of clinician adoption of the health IT tool

Study Setting

- 24 of 27 Ambulatory Care Practices Participated
- Study practices part of an AHRQ funded Practice-Based Research Network



Study Design: Cluster Randomized Trial



EHRs at CHOP

- All ambulatory care sites use the same EHR system
- Implementation began in 2001
- All sites have been using EHRs since 2006

Web-Accessible AOM Guidelines

Employee Intranet

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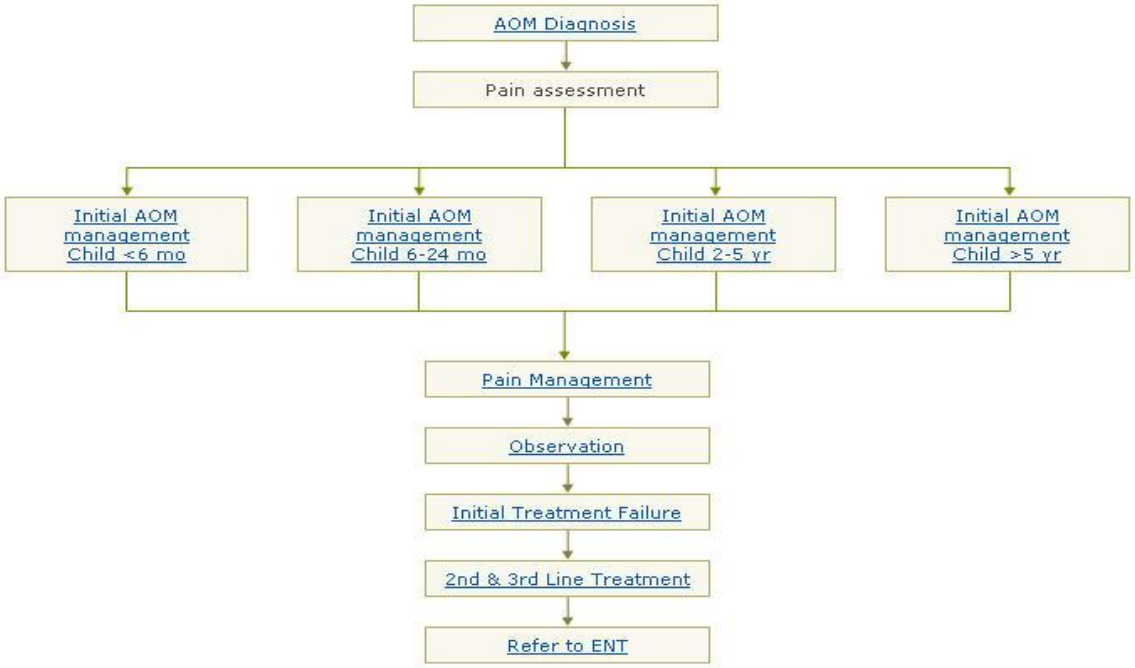
SEARCH search tips

Acute Otitis Media (AOM) Treatment, Children 2 Months to 12 Years Old*

*Applies to children without signs or symptoms of systemic illness unrelated to the middle ear. Children with conditions that may alter the course of otitis media such as cleft palate, genetic conditions such as Down Syndrome, immunodeficiencies, and cochlear implants, are excluded from these guidelines.



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Legal Disclaimer: These clinical practice guidelines are based upon the opinions of staff members of The Children's Hospital of Philadelphia. Treatment should be individualized and based upon the clinical conditions of each patient.

Learn More

Antibiotic Treatment Cost for Acute Otitis Media

Related Links

Diagnosis and Management of Acute Otitis Media +

Site Tools

Back to Otitis Media Pathways

Web-Accessible OME Guidelines

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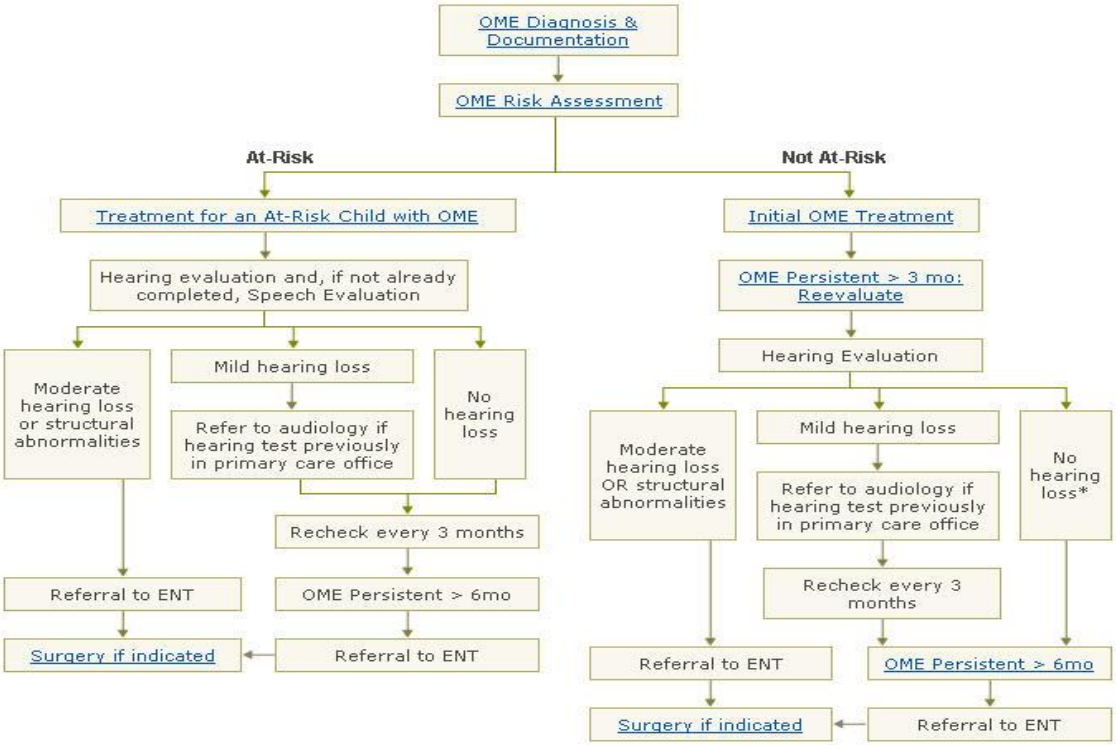
SEARCH search tips

Otitis Media with Effusion (OME) Treatment Pathway, Children 2 Months-12 Years



*For those with no hearing loss, clinicians may consider rechecks as deemed necessary.

Related Links

Otitis Media With Effusion

Site Tools

Back to Otitis Media Pathways

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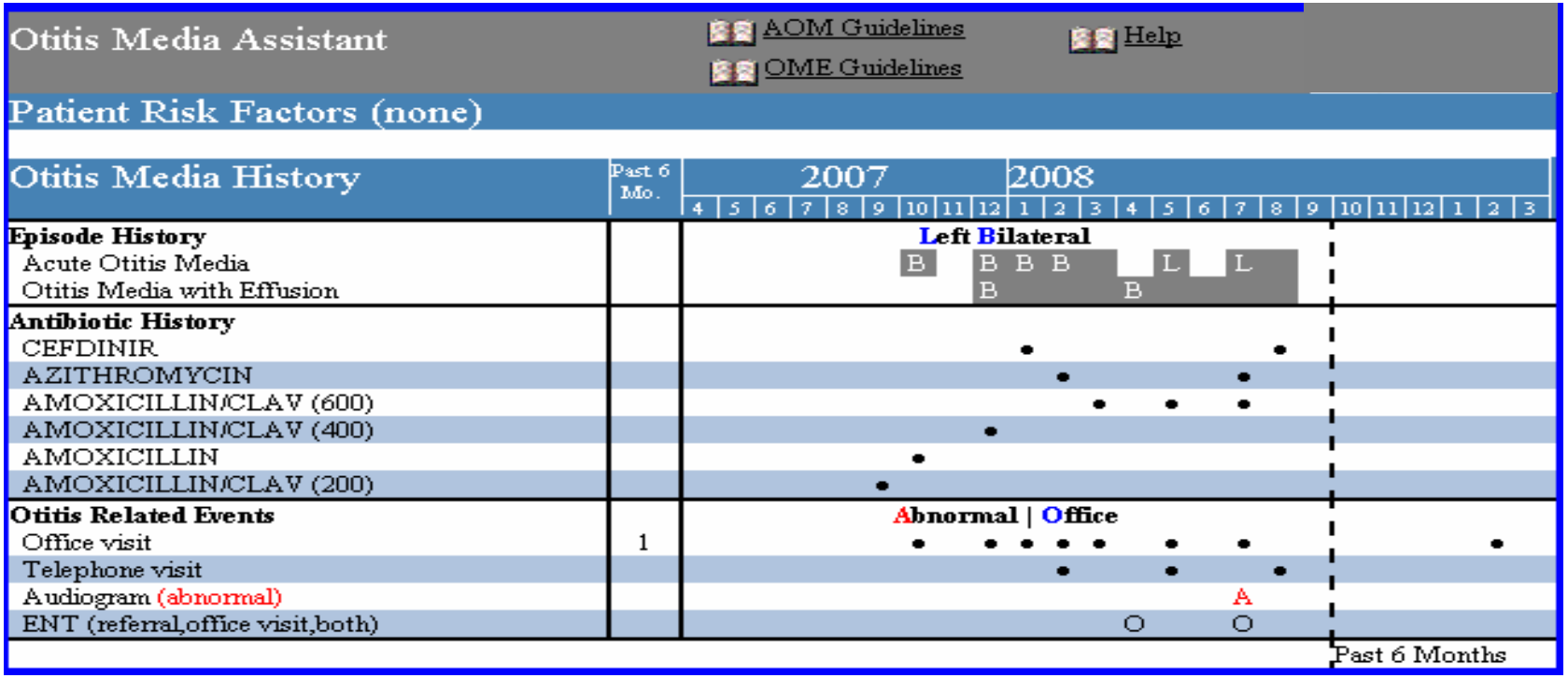
CDS: Episode Grouper



- **Episode History** displays a history of encounters of AOM and OME grouped into episodes
- **Otitis Related Events** displays a history of office visits, phone encounters, audiograms, referrals and surgery.
- **Antibiotic History** displays the patient's history of antibiotic orders

Problem List

Desktop Action Patient Care Scheduling Reports Tools Help

Home Schedule In Basket Chart Encounter Tel Enc Patient Lists Change PCP Login Ctxt Secure Scheduling Epic Help Print Log Out

Home

EpicCare

Allergies: No Known Drug,food,latex,contact,rad Con...

PCP

INS: BLUE SHIELD OT...

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Audiogram
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Order Entry
Imm/Injections
FYI
MyChart Encou...

Hotkey List

Exit Workspace

Problem List

Add | CodeSearch | Full Comments | My View Options

Show: Resolved Deleted

	Priority	Class	Noted	Resolved	Updated
CHR SEROUS OM SIMP/NOS [381.10]				Resolve	
Freq OM. Has ENT appt next week- BMTs recommended					
FEVER [780.6]					

9/07: bagged specimen grew 10-50,00 enterococcus. Fever defervesced without abx. Started on abx after fever down. Will not pursue uti workup based on this history. Will follow closely for other signs of uti

Call Center, Results, Chart Cosign, Charts, Expiring Orders, Overdue Results, Staff Message

10:27 AM

Encounter History

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Home

EpicCare

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Hotkey List
Exit Workspace

Chart Review — Last refresh: 11:01 AM

Filters | Clear All Filters | Text Search | Select All | Deselect All | Review Selected | Master Report | Flowsheet

Encounters | Notes | Laboratory | Imaging | Procedures | ECG | Other Orders | Medications | Letters | Media | Misc Reports

Filtered: Hide Add'l Visits — Hide Add'l Visits ☑ Well Child ☐ My Visits — Clear All

Date	Type	Class	Dept	Provider	Description
	Office Visit				
	Pre, Pend	Day Surgery			
	Telephone				Fever-over the weekend...
	Telephone				Earache
	Office Visit				Routin Child Health Exa...
	Office Visit	Outpatient			ENT/ORL Audiometric Ev...
	Office Visit				Suppur Otitis Media NOS...
	Office Visit				Acute Supp Otitis Media...
	Telephone				Other-DAD CALLED A W...
	Telephone				Fever
	Telephone				Congestion-afebrile, sle...
	Office Visit				Acute Serous Otitis Medi...
	Nurse Triage				
	Nurse Triage				
	Telephone				Ear Problem
	Office Visit				Acute Supp Otitis Media...
	Telephone				Question
	Telephone				Other-HAD RECTAL FEV...
	Office Visit				Suppur Otitis Media NOS...
	Office Visit				Routin Child Health Exa...
	Telephone				Medication Question-M...

Load more

21 records loaded, more records to load | 21 records satisfy filters

Call Center, Results, Chart Cosign, Charts, Expiring Orders, Overdue Results, Staff Message — 11:16 AM

Antibiotic History

Desktop Action Patient Care Scheduling Reports Tools Help

Home Schedule In Basket Chart Encounter Tel Enc Patient Lists Change PCP Login Ctxt Secure Scheduling Epic Help Print Log Out

Home [redacted] EpicCare

[redacted] [redacted] Allergies: No Known Drug,food,latex,contact,rad Con... PCP: [redacted] INS: BLUE SHIELD OT...

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Enter/Edit Resul...
Audiogram
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Imm/Injections
FYI
MyChart Encou...

Hotkey List
Exit Workspace

Chart Review — Last refresh: 11:02 AM

Filters | Clear All Filters | Select All | Deselect All | Review Selected

Encounters | Notes | Laboratory | Imaging | Procedures | ECG | Other Orders | **Medications** | Letters | Media | Misc Reports

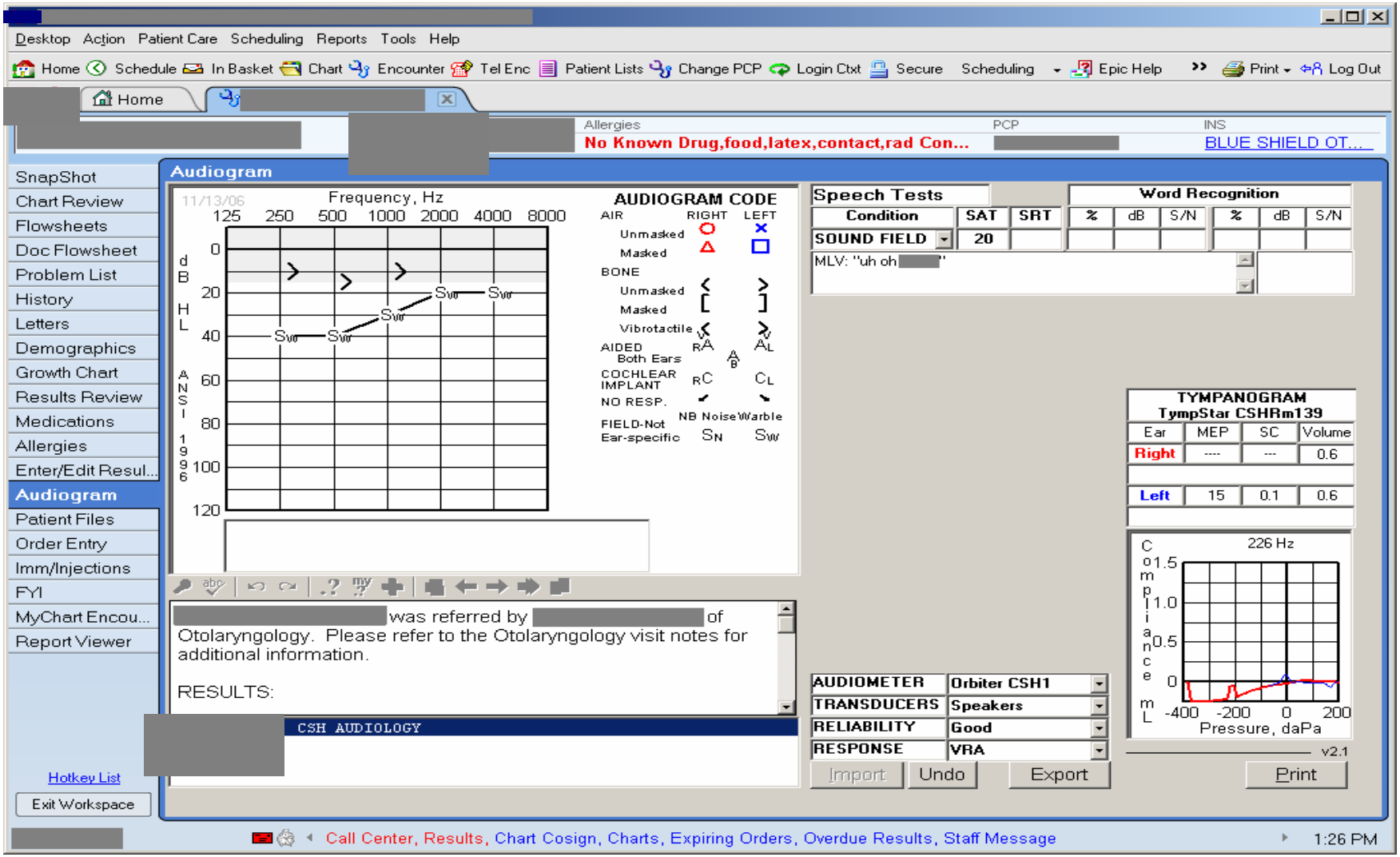
Filtered: Therapeutic Class — ☐ Current Meds Only ☑ Antibiotics ☐ steroids — Clear All

	Date	AMB/IP	Medication	Order Detail	Provider	End Date
	[redacted]	AMB	OMNICEF 125 MG/5ML OR SUSR	1 tsp (125 mg) by mout...	[redacted]	[redacted]
		AMB	AZITHROMYCIN 100 MG/5ML OR...	1 1/2 tsp today, then 3/4...		
		AMB	AUGMENTIN ES-600 600-42.9 MG...	3/4 tsp by mouth 2 time...		
		AMB	AUGMENTIN ES-600 600-42.9 MG...	3/4 tsp by mouth 2 time...		
		AMB	AUGMENTIN ES-600 600-42.9 MG...	3/4 tsp by mouth 2 time...		
		AMB	AZITHROMYCIN 100 MG/5ML OR...	1 tsp (100 mg) by mout...		
		AMB	SULFAMETHOXAZOLE-TRIMETHO...	1 tsp by mouth twice dai...		
		AMB	SULFAMETHOXAZOLE-TRIMETHO...	1 tsp by mouth twice dai...		
		AMB	OMNICEF 125 MG/5ML OR SUSR	1 1/4 tsp daily for 10 days		
		AMB	AUGMENTIN 400-57 MG/5ML OR ...	2.5 ml twice daily x 10 ...		
		AMB	AMOXICILLIN 250 MG/5ML OR SUSR	1 tsp by mouth twice dai...		
		AMB	AUGMENTIN 200-28.5 MG/5ML O...	4 ml by mouth, twice dai...		

14 records loaded, all records loaded | 12 records satisfy filters

Call Center, Results, Chart Cosign, Charts, Expiring Orders, Overdue Results, Staff Message — 11:01 AM

Audiograms



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Home
Allergies
No Known Drug,food,latex,contact,rad Con...
PCP
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Patient Files
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Imm/Injections
FYI
MyChart Encou...
Report Viewer
Hotkey List
Exit Workspace
Audiogram
11/13/06
Frequency, Hz
125 250 500 1000 2000 4000 8000
dB HL ANSI 1996
0 20 40 60 80 100 120
AUDIOGRAM CODE
AIR RIGHT LEFT
Unmasked
Masked
BONE
Unmasked
Masked
Vibrotactile
AIDED Both Ears
COCHLEAR IMPLANT
NO RESP.
NB Noise Warble
FIELD-Not Ear-specific
Speech Tests
Condition SAT SRT
SOUND FIELD 20
Word Recognition
% dB S/N % dB S/N
MLV: "uh oh"
TYMPANOGRAM
TympStar CSHRm139
Ear MEP SC Volume
Right ---- --- 0.6
Left 15 0.1 0.6
226 Hz
Compliance mL
1.5 1.0 0.5 0
-400 -200 0 200
Pressure, daPa
v2.1
was referred by of Otolaryngology. Please refer to the Otolaryngology visit notes for additional information.
RESULTS:
CSH AUDIOLOGY
AUDIOMETER Orbiter CSH1
TRANSDUCERS Speakers
RELIABILITY Good
RESPONSE VRA
Import Undo Export Print
Call Center, Results, Chart Cosign, Charts, Expiring Orders, Overdue Results, Staff Message
1:26 PM

Referrals

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Audiogram
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Order Entry
Imm/Injections
FYI
MyChart Encou...

Hotkey List
Exit Workspace

Chart Review — Last refresh: 01:23 PM

Filters | Clear All Filters | Select All | Deselect All | Review Selected

Encounters | Notes | Laboratory | Imaging | Procedures | ECG | Other Orders | Medications | Letters | Media | Misc Reports

Filtered: Department Specialty — Clear All

Attachment Type	Encounter Type
Authorizing Provider	Episode
✔ **Department Spe...**	Ordering Provider
Encounter Department	Test
Encounter	

	Department Specialty	#Ord
☐	General Pediatrics	25
✔	**Otorhinolaryngology**	**2**

Description	Status
SCHEDULE SURGERY	Final result
CONSULT TO AUDIOLOGY (CHOP)	Final result

Date Range Click for Filter Options
From: To:

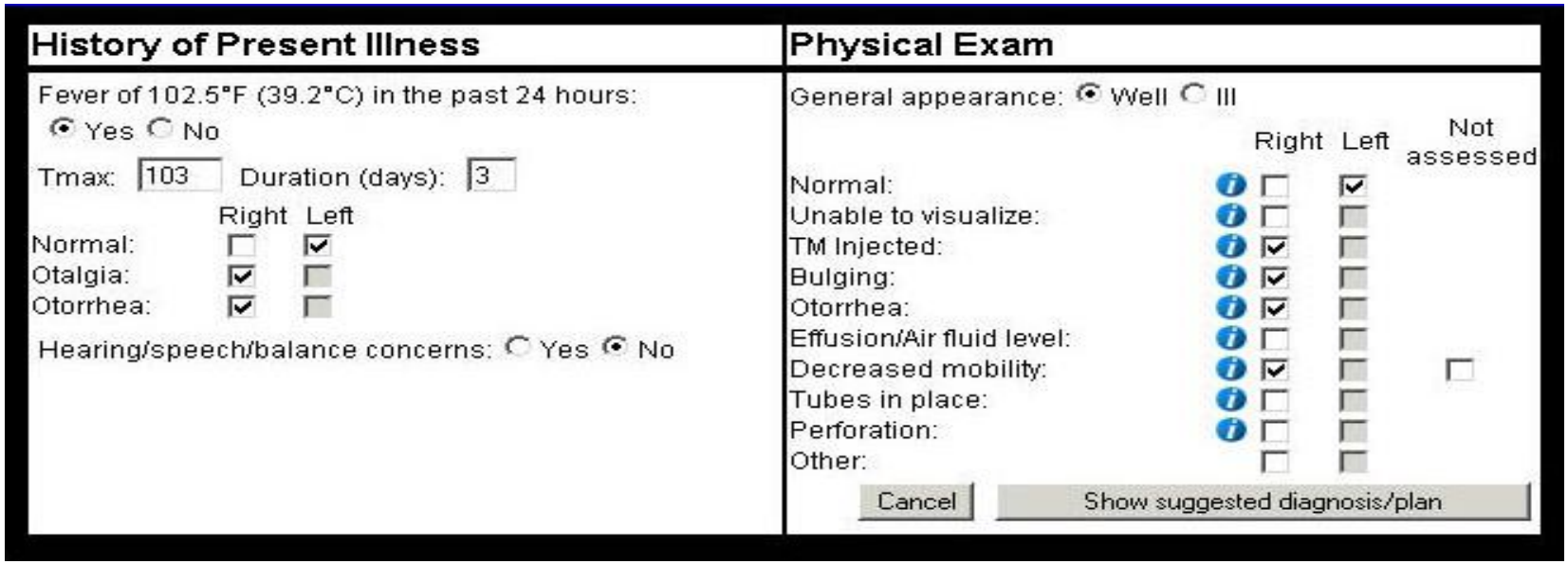
Save | Edit | Clear All Filters | Close

27 records loaded, all records loaded | 2 records satisfy filters

Call Center, Results, Chart Cosign, Charts, Expiring Orders, Overdue Results, Staff Message

1:41 PM

Intervention: History of Present Illness / Physical Exam



- A minimal amount of discrete data is collected to determine determine the diagnosis and the severity of illness
- This information is needed to determine the recommended treatment

Treatment Guidelines

Acute Otitis Media (AOM) Treatment, Children 2 Months to 12 Years Old

Initial AOM Management: Child 2-5 yr

- Treat pain if present
- OBSERVE if illness is not severe OR the diagnosis is uncertain
  - Severe illness is defined as moderate to severe otalgia or fever ≥ 39° C
  - Uncertain AOM diagnosis = acute onset with middle ear inflammation but uncertain effusion
- ANTIBIOTIC TREATMENT when diagnosis is certain AND illness is severe (All 10 days except Zithromax, 5 days):
  - If non-penicillin allergic: Amoxicillin (Amoxil) 80-90 mg/kg/day
  - If Type I Penicillin allergic: Azithromycin (Zithromax)
  - If Non-Type I Penicillin allergic: Cefuroxime (Ceftin), Cefpodoxime (Vantin), or Cefdinir (Omnicef)
  - Perforation: If a perforation exists, add Ofloxacin (Floxin/Ocuflox) 5 drops into the affected ear(s) twice daily for 10 days

Intervention: Assessment and Plan

Assessment and Plan

Type	AAP Guideline	Action	Reason Declined
Diagnosis	Acute Otitis Media	◉ Accept/Sign ○ Decline	
Analgesic	IBUPROFEN 100 mg/5 mL susp, give 150 mg (=1.5 tsp) po q6h prn	◉ Accept/Sign ○ Decline	
Antibiotic	AMOXICILLIN-CLAVULANATE 600 mg/5 mL susp, give 720 mg (=6 mL) po bid for 10 days	◉ Accept/Sign ○ Decline	
Antibiotic	OFLOXACIN 5 gtt bid to affected ear 10 days	◉ Accept/Sign ○ Decline	
Documentation	Otitis Media Progress Note	◉ Accept/Sign ○ Decline	

Cancel | Process Orders/Diagnosis...

- This section displays the calculated guideline based recommendations for treatment of the patient.
- Each recommended item can be accepted or declined.

Intervention: Otitis Media Assistant Order Set

Desktop Action Patient Care Scheduling Reports Tools Help

Home Schedule In Basket Chart Encounter Tel Enc Patient Lists Change PCP Login Ctxt Secure Scheduling Epic Help Print Log Out

Home | Test,Laura

Test, Laura — 4 y.o. female (1/1/2004) 31000092 — Allergies: No Known Drug,food,latex,contact,rad Con... — PCP: Amy Chang — INS: BLUE CROSS BL...

SnapShot
Chart Review
Flowsheets
Doc Flowsheet
Problem List
History
Letters
Demographics
Growth Chart
Results Review
Medications
Allergies/AdvRx
Enter/Edit Resul...
Audiogram
Patient Files
Order Entry
Imm/Injections
Visit Navigator
SmartSet - O...

Hotkey List
Exit Workspace

OTITIS MEDIA HEALTH INFORMATION TECHNOLOGY SMART SET

Association | Primary Dx | Edit Item | Favorite | Pharmacy | Providers | Questionnaire | Health Maint | Accept/Pend | Accept/Sign | Sign/Print | Cancel

- DOCUMENTATION
  - PROGRESS NOTE
    - [x] OMHIT PROGRESS NOTE
- DIAGNOSIS
  - [382.01] Acute Otitis Media w/ Drum Rupture
    - [x] [382.01] Acute Otitis Media w/ Drum Rupture
- ANTIBIOTIC
  - Amoxicillin - Pot. Clavulanate 600/mg/mL Susp 10 Day
    - [x] Amoxicillin - Pot. Clavulanate 600/mg/mL Susp 10 Day
  - Ofloxacin 0.3 % Opth Soln 10 Day
    - [ ] Ofloxacin 0.3 % Opth Soln 10 Day {Drug-Drug Moderate NSAIDs / Quinolones}
- PAIN MEDICATION
  - Ibuprofen 100 mg/5mL Susp
    - [x] Ibuprofen 100 mg/5mL Susp
- OTITIS MEDIA SELECTABLE ITEMS
  - DOCUMENTATION
  - MEDICATIONS: ANTIBIOTICS
  - MEDICATIONS: PAIN
  - PROCEDURES
  - REFERRALS
  - DIAGNOSIS
  - PATIENT INSTRUCTIONS
    - [x] OMHIT PATIENT INSTRUCTIONS (ENGLISH)
  - Follow Up - Select One

SmartSet Notes

Legend
- Standing order
- Future order
- Interaction alert
- Previously defaulted

Right click data row to edit. | Loading SmartSet succeeded.

Start | Citrix Access Platform - T... | Epic ROBERT G - SPRING 200... | 10:11 AM

Progress Note

Additional Progress Notes - Test,Laura

100% More Arial 11

HPI:
Laura is a 4 year old female here with her {GUARDIAN:61}. **Chief Complaint**
Patient presents with
- Frequent Ear Infections

Fever present within 24 hours: **YES**, for **3** days, Tmax: **104**
Right ear: **EAR PAIN** and **OTORRHEA**
Left ear: no ear pain or otorrhea
Hearing/speech/balance concerns: no

History of **3 Acute Otitis Media** (AOM) episodes and **2 Otitis Media with Effusion** (OME) episodes within the past 6 months, the most recent AOM episode began **4/18/2008**, the most recent OME episode began **4/18/2008**.
Last antibiotic was **AMOXICILLIN** on **4/18/2008**.
No risk factors noted in the past.
No recent audiology evaluation.

ROS: Other symptoms include: {ROS positive:11047}
There has been no {ROS negative:11048}

Pain: {pain:11028::"Pain issues as per nursing documentation."}

ALLERGIES: No known drug,food,latex,contact,rad contrast,blood
MEDICATIONS: Reviewed.
CHRONIC PROBLEMS: Reviewed.

PHYSICAL EXAMINATION
GENERAL: **ill appearance**
EARS: Right: **TM INJECTED**, **BULGING**, **OTORRHEA**, **DECREASED MOBILITY** ; Left: normal

Press F3 key to expand form

Accept Cancel

Patient Instructions

Additional Patient Instructions - Test,Laura

100% More Arial 11

General Information
Your child has acute otitis media, commonly known as an ear infection. Virus or bacterial germs can get behind the eardrum and cause ear infections. Fluid and pressure may build up and cause ear pain. Some, but not all children with ear infections have a fever. Young children may be fussy or sleep poorly at night when they have an ear infection. Pulling at the ears may or may not be a sign that a young child has an ear infection.

Treating pain
Pain from an ear infection may last for several days. It is important to treat your child's pain with acetaminophen (Tylenol) or ibuprofen (Motrin or Advil). The correct dose for your child is:
IBUPROFEN 100 mg/5 mL susp, give 150 mg (=1.5 tsp) by mouth every 6 hours as needed

Antibiotics
Your child has an ear infection that needs treatment with antibiotics. Unless they have a serious allergy to penicillin type antibiotics, your child will get the antibiotic Amoxicillin. Studies have shown that Amoxicillin is the best antibiotic to use for ear infections. VVe have decided as a network of CHOP pediatricians and sub-specialists to follow the recommendations of the American Academy of Pediatrics and use this antibiotic first for ear infections because it works well, is less likely to cause bacterial germ resistance to other antibiotics and is covered by insurance companies. Be sure to give the proper dosage every day for the full time it is prescribed. The dose for your child is:
AMOXICILLIN-CLAVULANATE 600 mg/5 mL susp, give 720 mg (=6 mL) by mouth twice daily for 10 days
OFLOXACIN 5 drops twice daily to affected ear 10 days

Perforated Tympanic Membrane
Sometimes, pressure builds up behind the eardrum and fluid may drain out of the ear through a hole in the eardrum. In most cases, the hole will heal itself and the drainage will go away in a couple of days. In addition to other treatments, your doctor will give you an antibiotic drop to put in the ear. Do not put any other medicines in the ear.

Press F3 key to expand form

Accept Cancel

Images

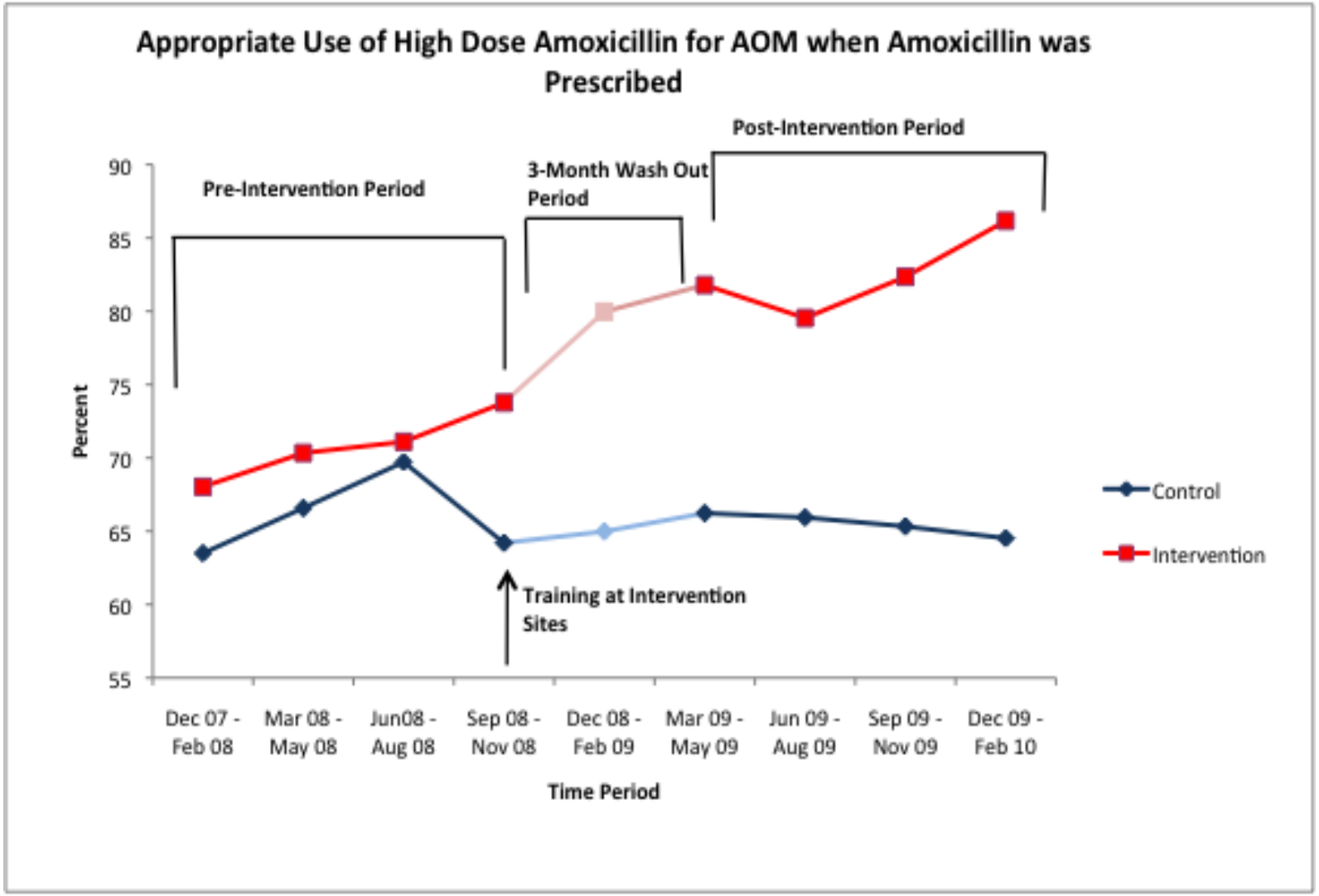
The tympanic membrane is inflamed and bulging, consistent with Acute Otitis Media.

Encounter Identification

Data Type	Acute OM	OM with Effusion	OM Unclassified	Normal
Text	16% [2]	3% [5]		
ICD-9	21% [3]	0.2% [6]		
Exam	4% [4]	0.1% [7]	22% [8]	33% [1]

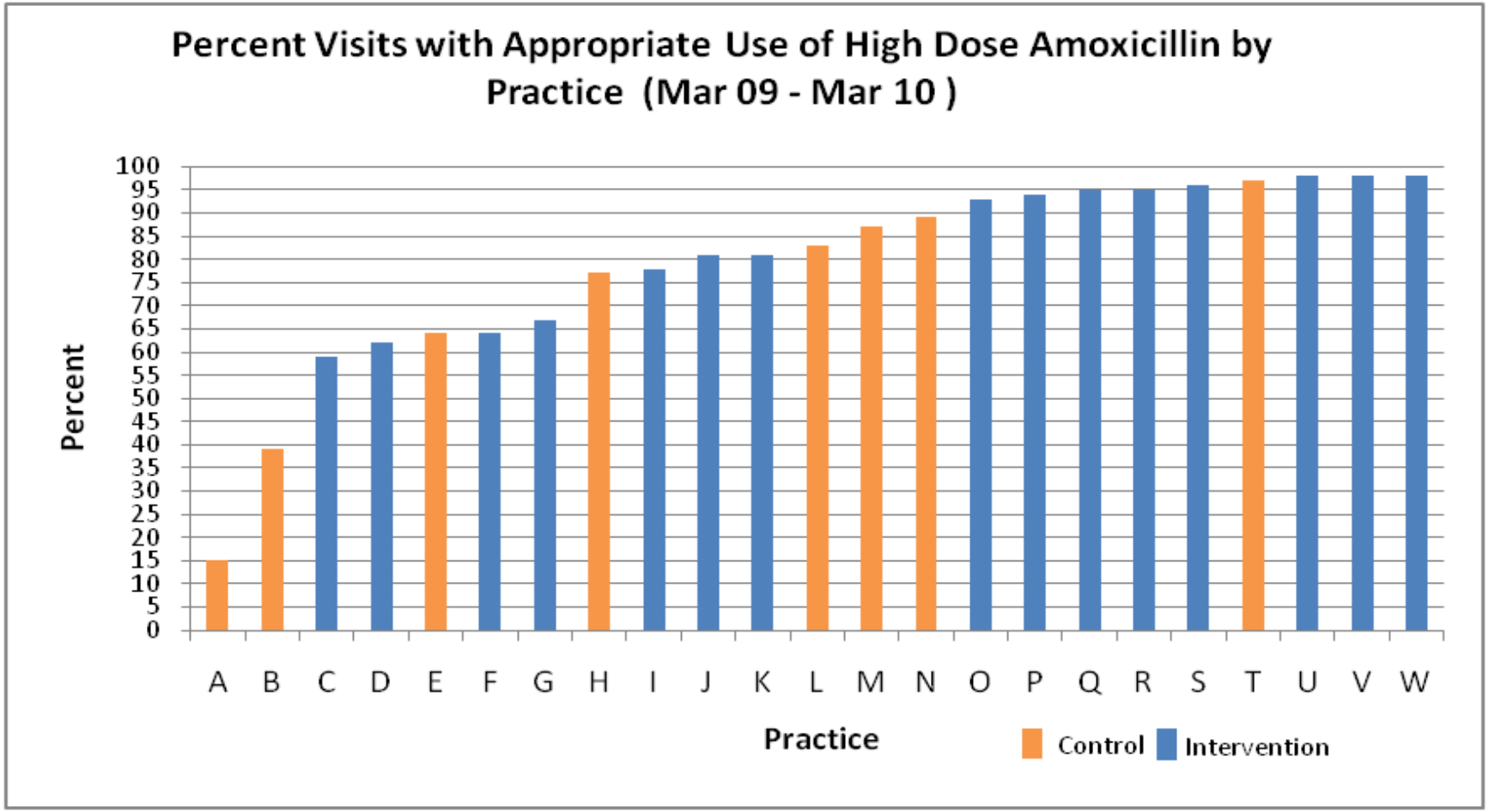
- Percents based on total number of encounters in incident episodes during pre-intervention period
- Encounters were classified using the hierarchy indicated by the numbers in brackets

Results Pre and Post Intervention



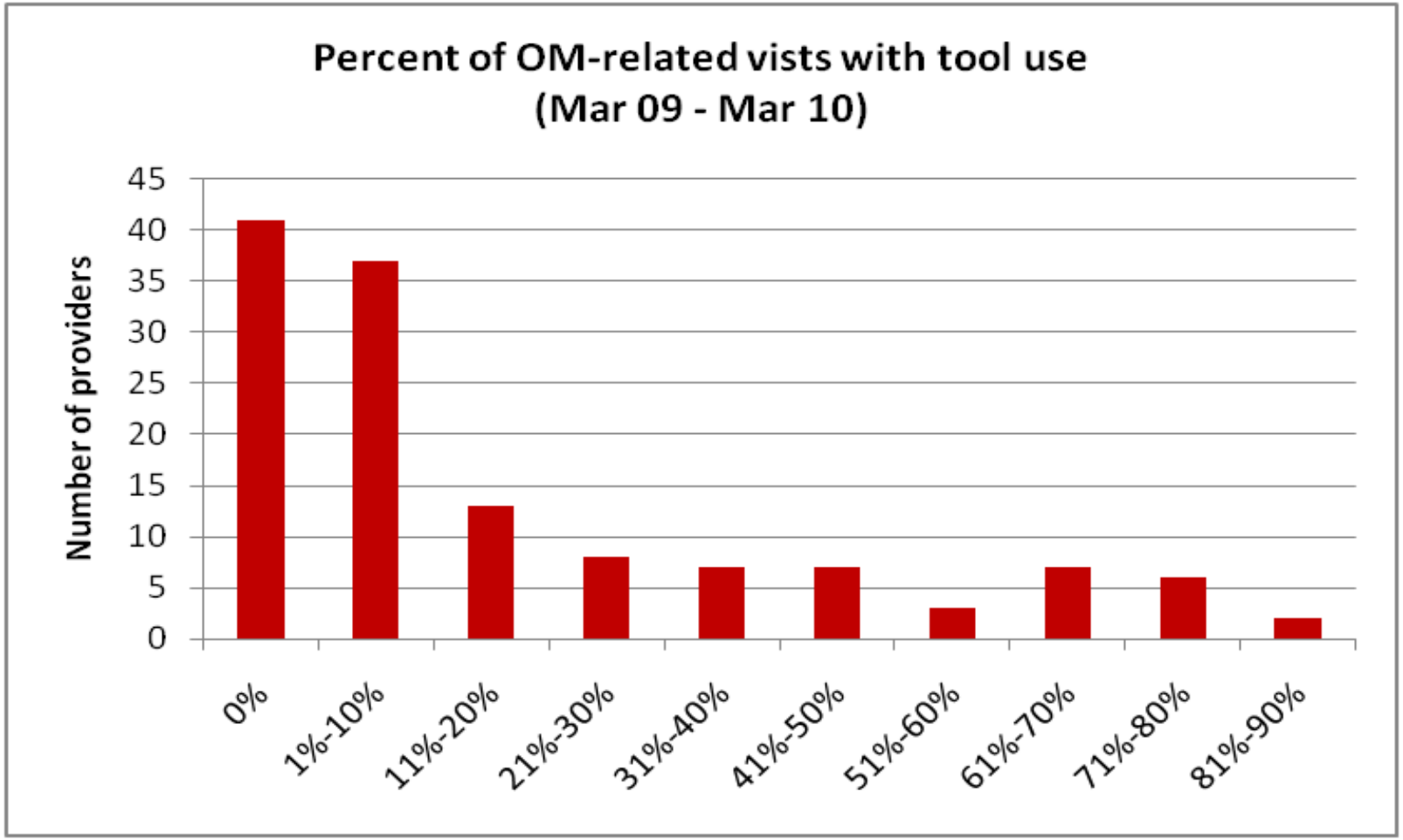
If patient weight < 25kg then high dose was defined as ≥ 60mg/kg/day
If patient weight ≥ 25 kg then high dose was defined as ≥ 1500 mg/day

Practice-Level Variation



If patient weight < 25kg then high dose was defined as ≥ 60mg/kg/day
If patient weight ≥ 25 kg then high dose was defined as ≥ 1500 mg/day

Provider-Level Tool Use



Provider Feedback on Tool

Positive

- Visual timeline of past OM episodes
- Find pictures useful for resident teaching and parent education
- Medication dosing is provided

Negative

- Double documentation when patient has conditions other than OM
- Resistance to changing workflow
- Prefer existing features in EHR
- Too many variables to fill in
- Already familiar with Otitis Media Guidelines