



Disclosure

- I have no financial relationships to disclose
- I will not discuss any off-label use and/or investigational use in my presentation

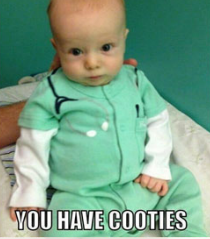
Objectives

- Review new recommendations in the management of the febrile infant
- Discuss common causes of fever in pediatric patients
- Optimize treatment strategies of commonly encountered pediatric infections

Pediatric Fever

- 15% of all ED visits annually for patients < 15 years of age

THERE'S NO EASY WAY TO SAY THIS...



ACIP Clinical Policy: Recommendations for Selecting the Antimicrobial and Chemoprophylaxis Therapy for Patients with Fever in the Emergency Department and Outpatient Settings. Accessed from: <https://www.cdc.gov/acip/files/clinical/051015-051015.pdf>

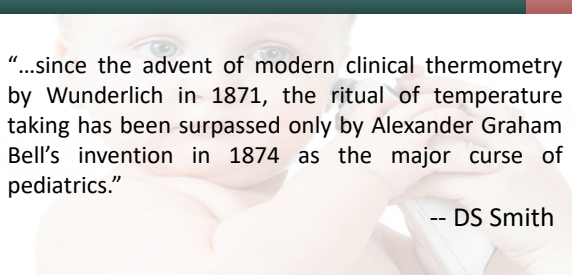
The COA Emergency Department

Patient Counts and Statistics for: 10/31/2022					
	10/31/2022	MTD: 10/2022	YTD: 2022	Rolling 12	
Total Patients Seen in ED	264	7733	60508	72813	
Male	139	4143	31893	35571	
Female	125	3590	28615	37242	
Unknown	0	0	0	0	
Avg. Length of Stay	04hrs 34m	04hrs 42m	04hrs 39m	04hrs 12m	
Median Length of Stay	04hrs 23m	04hrs 13m	03hrs 25m	03hrs 24m	
Probability of Admittance in ED	13%	14%	17%	17%	
Pts. Admitted	34	1111	9988	12038	
Pts. Discharged	168	5266	40520	54500	
Pts. expired	0	4	19	24	
Pts. LBTC (left before treatment complete)	0	26	209	250	
Pts. Left AMA (against medical advice)	0	4	38	44	
Pts. LWBS (left without being seen)	48	1114	3487	4143	
Pts. Not Documented	13	116	883	917	
Pts. Transferred	1	93	639	807	
# of Resuscitations	1	22	190	189	
# of Traumas	0	35	320	387	
# EAU Patients	0	0	0	0	
Avg. Age of Patient (Yrs)	6	6	6	6	
Avg. Patients per Hour	11	10	8	8	
Avg. Patients per Day	264	249	199	199	
Avg. Patients per Month			6051	6050	

The COA Emergency Department

Top 10 Diagnosis in the ED for: 10/31/2022 and their Reference Comparisons

Rank	Diagnosis	Daily Count	% Based on: # pts	YTD Count	% Based on: # pts	Rolling 12 Count	% Based on: # pts
1	Fever	52	20%	6289	10%	7386	10%
2	Viral illness	32	12%	2283	4%	2776	4%
3	Cough	21	8%	1801	3%	2145	3%
4	Flu-like symptoms	15	6%	183	0%	199	0%
5	Influenza	13	5%	233	0%	275	0%
6	Vomiting	10	4%	2866	5%	3325	5%
7	URI (upper respiratory infection)	7	3%	1147	2%	1388	2%
8	Otitis media	6	2%	793	1%	1082	1%
9	Bronchiolitis	6	2%	1367	2%	1734	2%
10	Dehydration	5	2%	1065	2%	1251	2%




“...since the advent of modern clinical thermometry by Wunderlich in 1871, the ritual of temperature taking has been surpassed only by Alexander Graham Bell’s invention in 1874 as the major curse of pediatrics.”

-- DS Smith

What is a fever?

- 99.9° F/ 37.7° C?
– “Because he usually runs 96”
- 100.4° F/ 38° C?
– Wunderlich took 1 million measurements on 25,000 patients and determined this was upper limit of normal
- 102.2° F/ 39° C?
- All of the above?



Wunderlich R. *Fever Without Source in Children & in 36 Months of Age*. *Praktisch-Chir W Ann* 2006;167:194.



BIRDWATCHING
You're doing it wrong

MYTH: Fever is a Disease

- Fever is a symptom...not a disease
- Significant number of ED visits
 - 3.3% return within 72 hours
- Fever Phobia:
 - A popular term for the response of parents to childhood fever, which may result in inappropriate over management with antipyretics.

Key points for families

- The exact number doesn't matter
- Treatment brings temperatures down 2-3°F
- All fevers do not have to be treated
- Temperatures < 100° F/37.7° C are not low grade

17 day old with T 100.6°F/38.1°C



- CBC
- Blood culture
- Urine (cath or SPU) with culture
- CSF studies
- ALT/AST
- Procalcitonin/CRP
- +/- viral testing
- +/- stool studies
- +/- CXR

Bonell EA, Benjamin ES. Evaluation and Management of Febrile, Well-Appearing Young Infants. Infect Dis Clin N Am 2015;29:575-585.

Biomarkers and Bacterial Infections

- Procalcitonin
- C-reactive Protein
- WBC count
- ANC
- < 3 months of age



Datta MS et al. Lack of Accuracy of Biomarkers and Physical Examination to Detect Bacterial Infection in Febrile Infants. *Pediatr Emer Care* 2016;32:664-668

Biomarkers and Bacterial Infections

- Procalcitonin performed the best...
- ...but would not have identified 30% of infants with invasive bacterial infections.
- CRP still considered useful.

Datta MS et al. Lack of Accuracy of Biomarkers and Physical Examination to Detect Bacterial Infection in Febrile Infants. *Pediatr Emer Care* 2016;32:664-668

17 day old with T 100.6°F/38.1°C



- Admission
- Abx directed toward:
 - E. coli
 - GBS
 - *Listeria* *is so 2015*
- Ampicillin (50 mg/kg) + Gentamycin (2.5 mg/kg)
- OR
- Ampicillin (50mg/kg) + Cefotaxime (50mg/kg)
- Acyclovir (20 mg/kg)

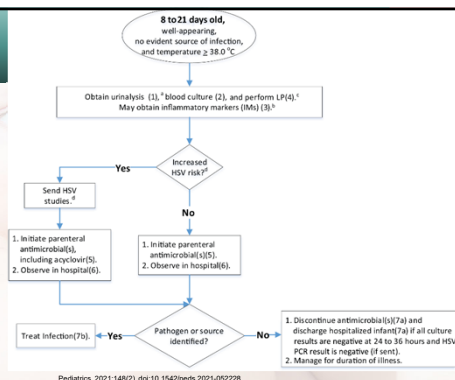
Bennett EA, Benjamin ES. Evaluation and Management of Febrile, Well-Appearing Young Infants. *Infect Dis Clin N Am* 2015;29:575-585

17 day old with T 100.6°F/38.1°C



- What if she has a urinary tract infection?
- What if he has influenza or RSV?

**Clinical Practice Guideline:
Evaluation and Management of Well-Appearing Febrile Infants 8 to 60 Days Old**



45 day old with T 101.9°F/38.8°C



Rochester Criteria

- Prospective study to determine if a set of criteria could accurately identify febrile infants <3 months at low risk of SBI
- Low Risk Rochester Criteria
 - Previously Healthy
 - No Soft Tissue, Skeletal, or Ear Infection
 - WBC 5,000-15,000 (Bands <1,500)
 - UA WBC <10/hpf

Dagan R, et al. / Pediatrics 1985

Boston Criteria

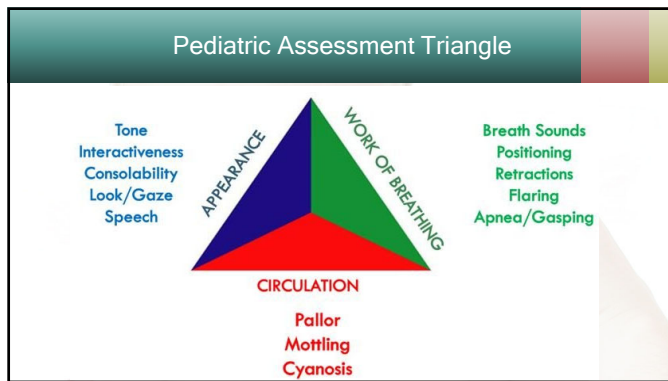
- Prospective consecutive cohort study to determine outcome of outpatient treatment of febrile infants 28-89 days with Ceftriaxone IM
- Low Risk Boston Criteria
 - Looks Well
 - No Source of Infection
 - WBC <20,000
 - Urine WBC <10/hpf or Leukocyte Esterase Negative
 - CSF WBC <10
 - CXR Normal (If Obtained)

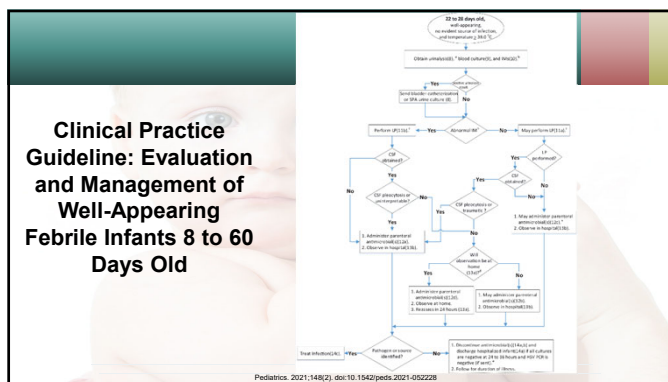
Baskin MN, et al. / Pediatrics 1992

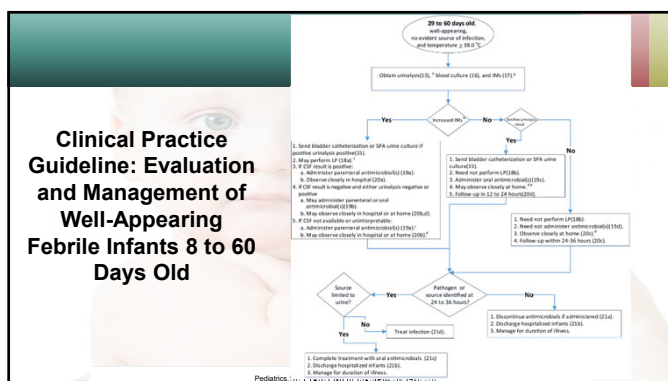
Philadelphia Criteria

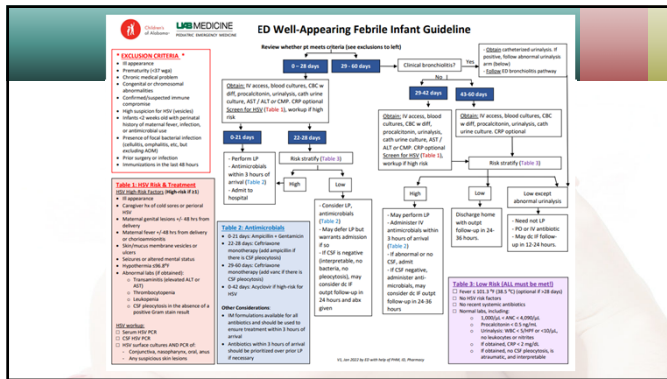
- Randomized controlled study to evaluate efficacy of managing febrile infants 29-56 days without antibiotics or hospitalization
- Low Risk Philadelphia Criteria
 - Looks Well
 - No Source of Infection
 - WBC <15,000
 - Urine WBC <10/hpf
 - CSF WBC <8
 - CXR Normal (If Obtained)

Baker MD, et al. / New Engl J Med 1993









Changes & Reasoning: HSV

- Guidelines indicate HSV screening extends up to 60 days old
- On review of local and national data, in addition to expert opinion, decreased the upper age cutoff to **42 days old**
- Added the following risk factors
 - Ill-appearance
 - Elevated AST OR ALT (not just ALT)
 - Caregiver hx of cold sores or perioral HSV

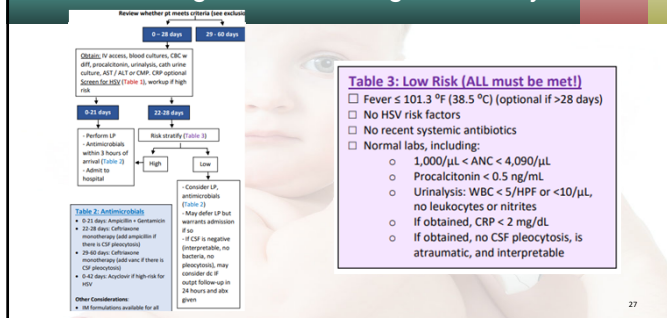
Table 1: HSV Risk & Treatment
HSV High-Risk Factors (High-risk if ≥1)

- Ill appearance
- Caregiver hx of cold sores or perioral HSV
- Maternal genital lesions < 48 hrs from delivery
- Maternal fever > 48 hrs from delivery or chorioamnionitis
- Skintaneous membrane vesicles or ulcers
- Seizures or altered mental status
- Hypothermia < 98.6°F
- Abnormal labs (if obtained):
 - Transaminitis (elevated ALT or AST)
 - Thrombocytopenia
 - Leukopenia
 - CSF pleocytosis in the absence of a positive Gram stain result

HSV workup:

- ☐ Serum HSV PCR
- ☐ CSF HSV PCR
- ☐ HSV surface cultures AND PCR of:
 - Conjunctiva, nasopharynx, oral, anus
 - Any suspicious skin lesions

Changes & Reasoning: 22-28 days



"He tested positive for (*insert virus here*) positive."

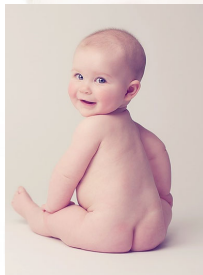
- Concern for bacterial co-infections
- Secondary analysis of prior study population
- Viral testing +
- Objective:
 - Identify those with presence of bacterial meningitis, bacteremia, or UTI

Table III. Rate of SBI among febrile infants with and without documented viral infections

	Virus positive		Virus negative, n (%) (95% CI)		Risk Ratio (95% CI)
	n (%)	95% CI	n (%)	95% CI	
Any SBI	44/1200 (3.7%)	2.7%-4.9%	222/1745 (12.7%)	11.2%-14.4%	3.5 (2.5-4.8)
UTI	33/1200 (2.8%)	1.9%-3.8%	186/1745 (10.7%)	9.2%-12.2%	3.9 (2.7-5.6)
Bacteremia	10/1100 (0.9%)	0.3%-1.4%	50/1743 (2.9%)	2.1%-3.8%	3.0 (1.9-7.7)
Meningitis	9/1200 (0.8%)	0.1%-1.0%	147/1745 (8.4%)	6.4%-1.2%	1.0 (0.7-5.9)

The Journal of Pediatrics Volume 203, December 2018, Pages 86-91.e2

Bottom Line



- The rate of SBI is lower...
- But not insignificant...
- Especially with UTIs.

The Journal of Pediatrics Volume 203, December 2018, Pages 86-91.e2

45 day old with T 101.9°F/38.8°C

- WBC 12.7
- Procalcitonin 0.75
- UA:
 - 1+ LE
 - Negative nitrites
 - 30-50 wbc/hpf

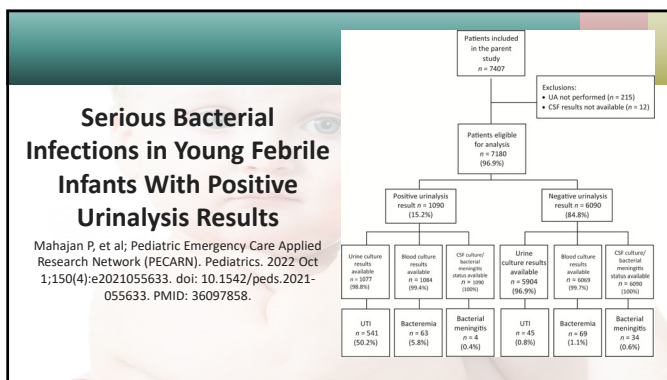
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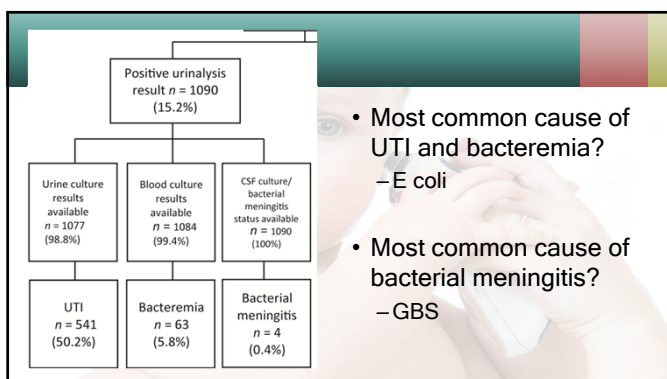
Who would:

LP

Not LP

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IBI Across ANC and PCT Levels

	ANC $<4 \times 10^3$ cells/mm ³		ANC $\geq 4 \times 10^3$ cells/mm ³	
	PCT <0.5 ng/mL	PCT ≥ 0.5 ng/mL	PCT <0.5 ng/mL	PCT ≥ 0.5 ng/mL
Bacteremia	0/148 (0.0%)	1/32 (3.1%)	3/135 (2.2%)	23/325 (7.1%)
≤28 d	0/37 (0.0%)	1/13 (7.7%)	1/40 (2.5%)	13/121 (10.7%)
>28 d	0/111 (0.0%)	0/19 (0.0%)	2/95 (2.1%)	10/204 (4.9%)
Bacterial meningitis	0/148 (0.0%)	0/32 (0.0%)	0/135 (0.0%)	1/158 (0.6%)
≤28 d	0/37 (0.0%)	0/13 (0.0%)	0/40 (0.0%)	1/68 (1.5%)
>28 d	0/111 (0.0%)	0/19 (0.0%)	0/95 (0.0%)	0/90 (0.0%)

IBI Across ANC and PCT Levels

	ANC $<4 \times 10^3$ cells/mm ³		ANC $\geq 4 \times 10^3$ cells/mm ³	
	PCT <0.5 ng/mL	PCT ≥ 0.5 ng/mL	PCT <0.5 ng/mL	PCT ≥ 0.5 ng/mL
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>28 d	0/111 (0.0%)	0/19 (0.0%)	0/95 (0.0%)	0/90 (0.0%)

Ramgopol S et al. *J Pediatr* 2020;221:132-7.

OUTCOMES OF YOUNG INFANTS WITH HYPOTHERMIA EVALUATED IN THE EMERGENCY DEPARTMENT

Hypothermia in Young Infants

- Multicenter, retrospective cohort study
- Hypothermia as an admission or discharge diagnosis
- Demographics, diagnostic testing and outcomes
- Outcomes:
 - Presence of SBI
 - ED or hospital mortality

Ramgopal S et al. / *Pediatr* 2020;221:132-7.

Results

- 80% had blood and urine cultures
- 42% had CSF
- 30% had HSV testing
- Majority admitted
 - 1/3 to ICU
- 8% had SBI:
 - 5.6% bacteremia
 - 2.4% UTI
 - 0.3% meningitis
 - 0.3% pneumonia
 - 0.2% neonatal HSV
- 0.2% mortality

Ramgopal S et al. / *Pediatr* 2020;221:132-7.

Ramgopal S et al. *Am J Emerg Med* June 2019;37(6):1139-1143.

FACTORS ASSOCIATED WITH SERIOUS BACTERIAL ILLNESS IN INFANTS \leq 60 DAYS WITH HYPOTHERMIA IN THE EMERGENCY DEPARTMENT

Age/Sex	Full Term	Initial Temperature	WBC	ANC	Platelets	SBI
4d, M	Yes	35.7	6.5	1.6	381	UTI
4d, F	Yes	36.4	12.1	4.7	210	UTI
5d, M	No	35.9	7.1	2.3	216	Bacteremia
6d, F	Yes	35.6	11.1	3.0	77	Meningitis
6d, M	Yes	33.2	4.8	1.2	109	Bacteremia/Meningitis
7d, F	Yes	36.0	19.4	9.8	108	Meningitis
16d, F	Yes	34.0	6.7	2.9	118	UTI
21d, M	Yes	36.6	8.8	2.5	489	UTI
22d, M	No	34.8	23.1	14.8	442	Bacteremia/Meningitis
27d, F	No	35.8	13.4	9.1	293	UTI

Bruno et al. Am J Emerg Med 2019;32(6):1139-1143

Three Deaths

- 31 day old, 33.5°C, apnea
– Severe hemorrhagic encephalitis of undetermined etiology
- 29 day old, 35°C, lethargy
– Extensive encephalomalacia, likely secondary to congenital infection
- 16 day old, 33.7°C, recurrent apnea and bradycardia
– Ketoglutaric aciduria

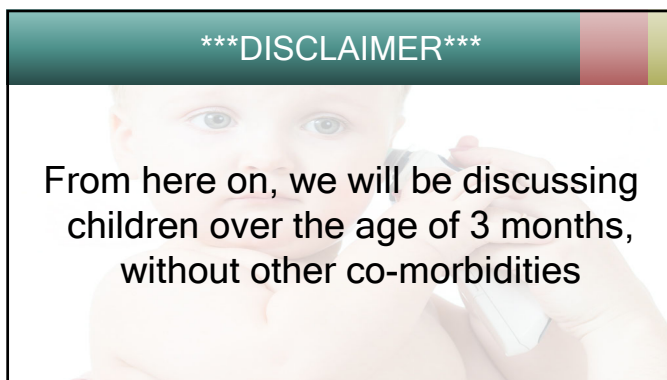
Bruno et al. Am J Emerg Med 2019;32(6):1139-1143

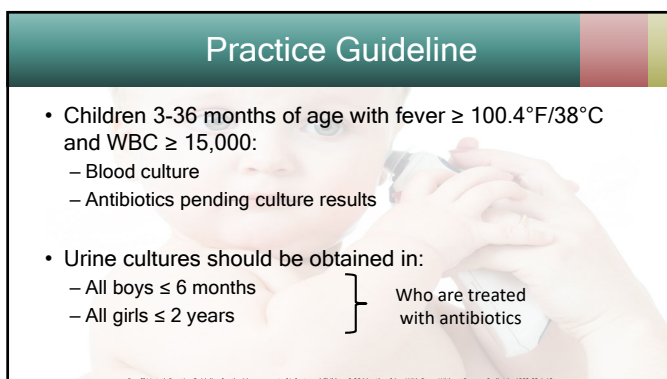
Higher Risk Group

- 15-28 days
- Higher WBC and ANC
- Lower platelet count

Bruno et al. Am J Emerg Med 2019;32(6):1139-1143





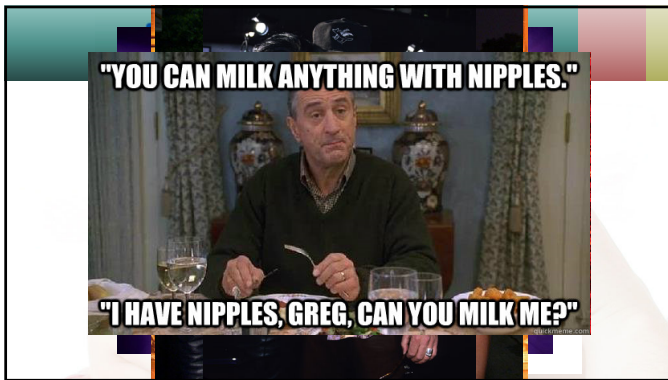


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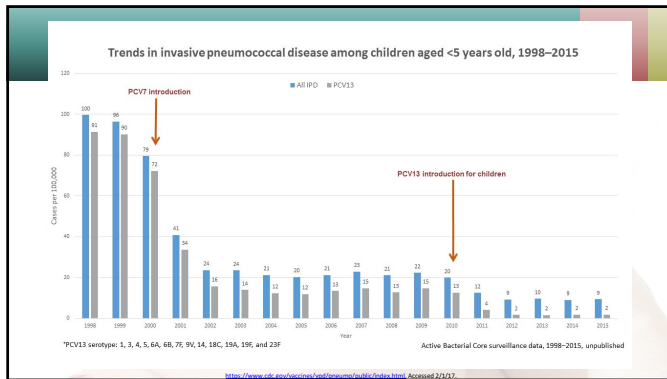
What was the most important thing that happened in 2000?

- The world didn't end.
- The Yankees won the world series.
- The Rams won the super bowl (and were in St. Louis)
- The Olympic games were in Sydney.
- Something else entirely.

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2 yo Female with T 105°F/40.5°C

- That's it.

Results - Occult Bacteremia

	Pre-PCV7	Post-PCV7
Total ED visits 3-36 months	13,507	21,500
Patient with BC performed	1251	2028
Fever without a source	148	275
+ BC	17 (11.5%)	14 (5.1%)
+ <i>S pneumoniae</i>	6	0
Contaminants	7	13
Occult bacteremia rates	6.8%	0.4%

Wootte E, Pavoni R. Arch Dis Child 2009;94:144-147.

Results - UTI

	Pre-PCV7	Post-PCV7
Fever without a source	148	275
Urine culture performed	81	168
+ Urine culture with pathogen	10 (6.8%)	21 (7.6%)
+ <i>E coli</i>	60%	71%

Wootley E, Barakat R. Arch Dis Child 2009;94:544-547

Urinary Tract Infection

- 3-5% of febrile children presenting to an ED
- One of the most common pediatric admission diagnoses
- Can be a common co-infection

Clark CJ et al. JAMA Child Adolesc Med 2015;171:220-241

UTI Risk Factors

>56 Days, NOT TOILET TRAINED

Female Risk Factors*

Non-black
T ≥39°C
Fever ≥2 days
No source
<12 months

Number of Risk Factors Present

Consider screening ≥2
Recommend screening ≥3

*Recommended screening if previous history of UTI, fever ≥2 days

Male Risk Factors*

Non-black
T ≥39°C
Fever ≥2 days
No source
<6 months

Number of Risk Factors Present

Circumcised
Consider screening ≥2
Recommend screening ≥3

Uncircumcised
Consider screening ≥1
Recommend screening ≥2

Lavelle JM et al. Pediatrics 2016;138(1):e20153025

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UTICalc

Version 3.0

For children 2 to 23 months of age.

Probability of UTI based on clinical characteristics

Enter child's clinical characteristics below (all fields are required)

Age < 12 months

☐ Yes ☐ No

Maximum temperature > 39 °C (i.e., 102.2°F)

☐ Yes ☐ No

History of UTI*

☐ Yes ☐ No

Female or uncircumcised male

☐ Yes ☐ No

Other fever source**

☐ Yes ☐ No

Duration of fever > 48 hrs

☐ Yes ☐ No

Probability of UTI

Calculate Clear

*Parent reported or documented history of UTI

UTICalc

Version 3.0

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Duration of fever > 48 hrs

☐ Yes ☒ No

Probability of UTI

8.87%

Calculate Clear

Probability of UTI based on clinical & laboratory characteristics

Only enter available test results; leave fields blank for test results that are not available.

Nitrite

☐ Yes ☐ No

Leukocyte esterase

☐ Yes ☐ No

WBC/mm³

Bacteria on Gram stain

☐ Yes ☐ No

Probability of UTI

Calculate Clear

*Parent reported or documented history of UTI

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WBC/mm³

Bacteria on Gram stain

☐ Yes ☐ No

Probability of UTI

6.5%

Calculate Clear

*Parent reported or documented history of UTI

Obtaining urine samples

- Bag specimen
- Catheter specimen
- Suprapubic specimen

Lavelle JM et al. *Pediatrics* 2016;138(1):e20153023.

TWO-STEP PROCESS FOR ED UTI SCREENING IN FEBRILE YOUNG CHILDREN: REDUCING CATHETERIZATION RATES

- 6-24 months of age
- Urine bag placed on patients
- Reassessment

Two-Step Process for ED UTI Screening in Febrile Young Children: Reducing Catheterization Rates

OBJECTIVE: To evaluate the effectiveness of a two-step process for ED UTI screening in febrile young children (6-24 months of age) to reduce catheterization rates.

DESIGN: Retrospective cohort study.

SETTING: Emergency department.

PATIENTS: Febrile young children (6-24 months of age) with suspected UTI.

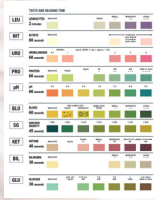
INTERVENTIONS: Two-step process for ED UTI screening: (1) Urine bag placement; (2) Reassessment.

MEASUREMENTS AND MAIN RESULTS: The two-step process significantly reduced catheterization rates compared to the standard of care (p < 0.001).

CONCLUSIONS: The two-step process for ED UTI screening in febrile young children is effective in reducing catheterization rates.

Who Got a Cath?

- If point of care urine dipstick was positive:
 - Moderate or large leukocyte esterase
 - Positive nitrites



Lowell JM et al. Pediatrics 2016;138(1):e20153023.

Pre- and Post-Intervention

	Baseline (n = 1520)	Intervention (n = 828)
% Screened for UTI	63	69
Urine bag only	0	39
Urine bag then cath	0	14
Catheterization only	63	16
Culture positivity rate (%)	4.3	4.4
Revisit rate (%)	3.8	3.8
Median ED LOS (min)	276	288

Lowell JM et al. Pediatrics 2016;138(1):e20153023.

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Lowell JM et al. Pediatrics 2016;138(1):e20153023.

Treatment

- Do they need admission?
 - Febrile?
 - Vomiting?
 - Age?
- Length of therapy
 - 7 days
- Prophylaxis
 - High risk patients



Treatment

- Gram negative rods
 - Cephalexin
 - 50-100 mg/kg/day
 - Cefdinir
 - 14 mg/kg/day
 - Amoxicillin
 - 90mg/kg/day
 - Trimethoprim-sulfamethoxazole
 - 10 mg/kg TMP/day
 - Nitrofurantoin
 - 5-7 mg/kg/day



9 mo with T101.9°F/38.8°C and a "risin"



Key points from H&P

- Presence of fever
- Previous and current treatment
- Overall appearance
- Is the patient vomiting?
- Presence of lesion(s)
- Reliability of follow-up

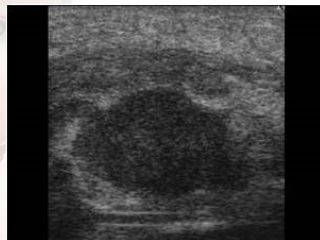
Is it a *Staph* infection?

- *Staphylococcus aureus* (SA) is the most commonly isolated human bacterial pathogen
- *Methicillin resistant SA* was once confined to hospitals and high risk patients (HA-MRSA)
- Not anymore!

David MC, Daum RC. CA-MRSA: Epidemiology and Clinical Consequences of an Emerging Epidemic. Clin Microbiol Rev 2010;23(3):618-687.

CA-MRSA

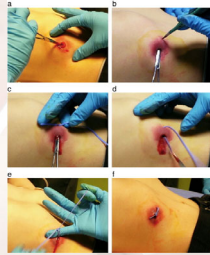
- What about ultrasound?
- Yes if there is any question
- Alters management a significant portion of time



Reister DB et al. Scratching the Surface: A Review of Skin and Soft Tissue Infections in Children. Curr Opin Pediatr 2015;77:303-307.

CA-MRSA

- Blood cultures?
 - No need
- Wound packing?
 - Probably not
 - Vessel loops



Penster D8 et al. Scratching the Surface: A Review of Skin and Soft Tissue Infections in Children. Curr Opin Pediatr 2015;7:303-307.

CA-MRSA

- Pain management?
 - Yes, please
- Topical
- Local
- Oral
- Intranasal
- Intravenous



Penster D8 et al. Scratching the Surface: A Review of Skin and Soft Tissue Infections in Children. Curr Opin Pediatr 2015;7:303-307.

Emergency Management of Pediatric Skin and Soft Tissue Infections in the Community-associated Methicillin-resistant Staphylococcus aureus Era

- Clindamycin f
- Trimethoprim-
- Procedural sec
 - 75%
- Antibiotics after
 - 94%



Ministry 80 et al. Emergency Management of Pediatric Skin and Soft Tissue Infections in the Community-associated Methicillin-resistant Staphylococcus aureus Era. Acad Emerg Med 2010;17:187-193.

Antibiotics after I&D?

- 3 months to 18 years
- 80% CA-MRSA
- Failure rates?
 - 5.3% placebo
 - 4.1% antibiotic
- New lesions at 90 days?
 - 28.8% placebo
 - 28.3% antibiotic

Doung M et al. Randomized Controlled Trial of Antibiotics in the Management of Community-acquired Skin Abscesses in the Pediatric Patient. Ann Intern Med 2010;151:401-409

What antibiotic should I use?

- Clindamycin
 - 10 mg/kg/dose TID
- Trimethoprim-sulfamethoxazole
 - 5 mg/kg TMP/dose BID
- Mupirocin

10 week old with T 101°F/38.3°C

- Received 2 month immunizations yesterday

SBI in Recently Immunized

<u>Age/Sex</u>	<u>SBI</u>	<u>Hours Since Vaccination</u>
77d/♂	UTI	12-24
68d/♂	UTI	48-72
63d/♀	UTI	48-72
64d/♀	UTI	48-72
67d/♂	UTI	48-72
77d/♀	UTI	48-72

Wuiff M, Bachur R. Academic Emergency Medicine 2009;16:1284-1289.

YOU MEANT TO TELL ME

**THERE ARE OTHER WAYS YOU
COULD HAVE TAKEN MY
TEMPERATURE**

4 yo with T103°F/39.4°C and Rash

- Other vital signs stable
- Well appearing
- Normal exam except diffuse petechial rash

Fever and Petechiae



Elkshammer MD, Coluzzi JE. Pediatric Mxth: Fever and Petechiae. CDEM 2008; 10(5):429-482

Fever and Petechiae

- Looks sick → treat as meningococemia
- Rash limited to SVC distribution, "ILL" criteria not present, normal labs, and is well appearing → follow routine fever guidelines

Elkshammer MD, Coluzzi JE. Pediatric Mxth: Fever and Petechiae. CDEM 2008; 10(5):429-482

Fever and Petechiae

- Rash below the nipple line and well appearing:
 - CBC, blood culture, and CRP
 - Give antibiotics
 - Observe 4 hours
- Remains well appearing
- CRP < 6 mg/L

} Discharge with close follow-up

Elkshammer MD, Coluzzi JE. Pediatric Mxth: Fever and Petechiae. CDEM 2008; 10(5):429-482

RESPIRATORY INFECTIONS

Pneumonia

- After PCV-7, admissions for community acquired pneumonia decreased by 40%
 - PCV-13 introduced in 2010
- Most common cause of CAP?
 - Viruses
- Most common **bacterial** cause of CAP in children?
 - *Mycoplasma pneumonia*

Katz SE, Williams DS. Pediatric Community Acquired Pneumonia in the United States. Infect Dis Clin Rev. 2018; 32(1):47-63.

Presentation

- Can be very subtle
- Most common sign/symptom?
 - Fever
 - No single sign/symptom is pathognomonic



Katz SE, Williams DS. Pediatric Community Acquired Pneumonia in the United States. Infect Dis Clin Rev. 2018; 32(1):47-63.

Treatment

- Amoxicillin
- Augmentin/Cefdinir
- Azithromycin



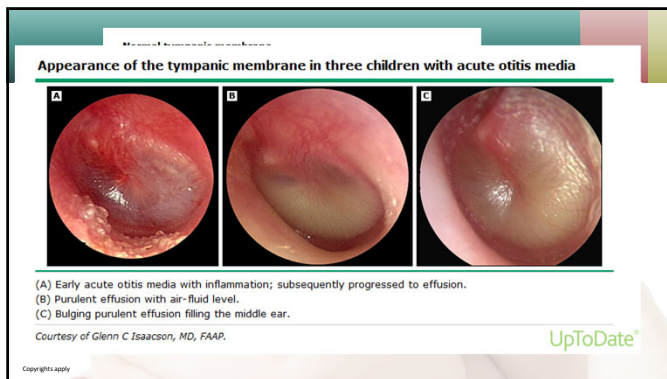
Kelly SE, Williams DA. Pediatric Community-Acquired Pneumonia in the United States. Infect Dis Clin N Am 2018; 32(1):47-61.

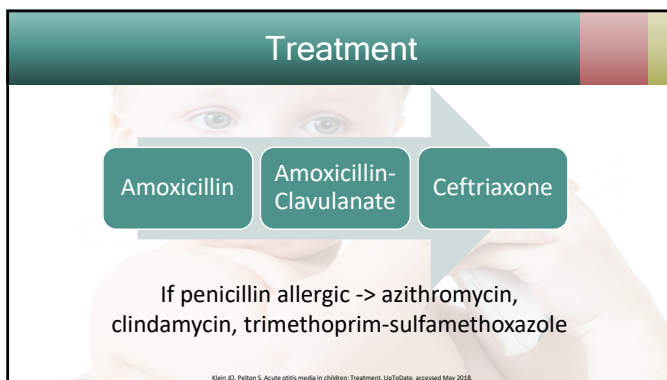


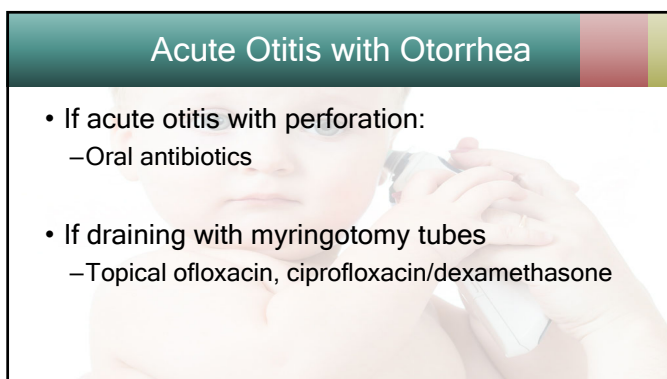
Clinical Diagnosis

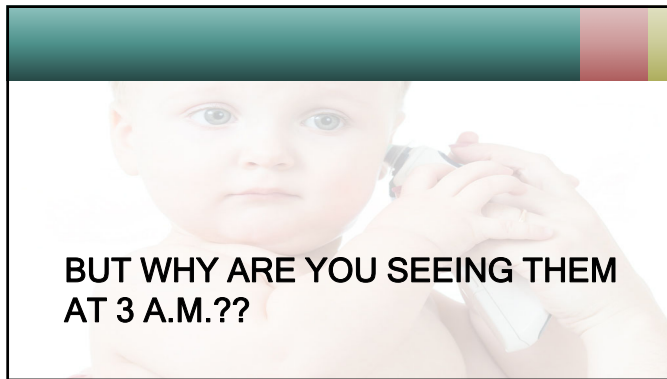
- Bulging tympanic membrane
- Other signs of inflammation + middle ear effusion
- Purulent otorrhea and otitis externa has been excluded

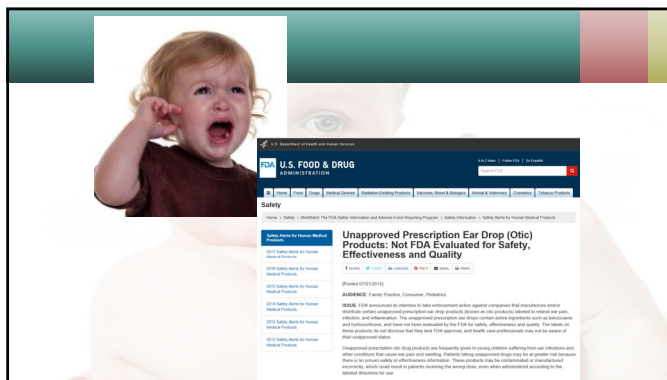
Klein JD, Pelton S. Acute otitis media in children: Treatment. UpToDate. accessed May 2018.











But it's 3 a.m...

- Randomized to:
 - Herbal extract
 - Ametocaine + phenazone
- Both groups had similar improvement in pain scores

Ingredients:
Olive Oil, Verbascum Thapsus oily extract, Calendula Officinalis oily extract, Hypericum Perforatum oily extract, Lavender Oil, Tocopherol (Vitamin E) in Sunflower Oil, Rosmarinus Officinalis extract in Rapeseed Oil, Garlic Oil, Carnosic Acid.

Savell TM et al. Efficacy of Naturalistic Extracts on the Management of Ear pain Associated with Acute Otitis Media. Arch Pediatr Adolesc Med 2003; 155:796-799

When poll is active, respond at polllev.com/annalisesorrentino308
 Text ANNALISESORRENTINO308 to 22333 once to join

Which of the following is required for the diagnosis of acute bacterial sinusitis?

- Green nasal discharge
- Persistent daytime cough
- URI symptoms for greater than 5 days
- Headache/facial pain
- Fever > 102 F

Powered by **Poll Everywhere**
 Start the presentation to see live content. For screen share software, share the entire screen. Get help at polllev.com/app

Sinusitis

- Children have 6-8 viral URIs annually
 - 5-13% may be complicated by secondary bacterial sinusitis
- Peak incidence between 3-6 years
- Maxillary are most commonly involved in young children
- About 50% will resolve spontaneously
- Increase in complications seen in recent years

Normal development

- Ethmoid and maxillary are present at birth
- Sphenoid develop around 3 and aerates at age 8
- Frontal sinuses develop from anterior ethmoid
 - Become clinically important around 10 yo

What causes sinusitis?

URI causing mucositis in nose and paranasal sinuses

Can result in obstruction of sinus ostia causing negative pressure environment

Sniffing and nose blowing causes aspiration of mucus into paranasal sinus

Because of obstruction, mucus cannot be removed and bacteria begin to multiply

Acute Bacterial Sinusitis

- URI symptoms for >10 days without improvement, AND
- Nasal congestion and discharge of any quality
- Persistent cough

Acute Severe Bacterial Sinusitis

- Criteria for ABS, AND
- Ill appearance, AND
- Fever > 102.2°F, AND
- Purulent nasal discharge, typically 3-4 days in duration

Predisposing Factors

- URI
- Allergic rhinitis
- Smoke exposure
- GERD
- Immunodeficiency (if resistant to therapy)
- CF
- Ciliary dyskinesia
- Asthma
- Dental problems
- Biofilms

Presentation - Acute

- URI symptoms for > 7-10 days
- 2 most common symptoms:
 - Rhinorrhea
 - Daytime cough
- Nasal congestion
- AOM
- Headache

Medical treatment

- 80-90 mg/kg amoxicillin or amoxicillin-clavulanate for 10-14 days
- Cefuroxime, cefpodoxime, cefdinir for 10-14 days
- PCN allergic:
 - Non-type 1: cephalosporins
 - Type 1: clarithromycin/azithromycin
- Beware of:
 - Macrolide resistance
 - First generation cephalosporins
 - Trimethoprim-sulfamethoxazole

Medical treatment

- Optimize treatment of underlying diseases
- Decongestants
- Antihistamines
- Afrin™
 - Especially in frontal sinusitis
 - Can use safely for up to 7 days

No proven
benefits
in children

Hong A, et al. Pediatric Acute Bacterial Infection: Diagnosis and Treatment Strategies. Pediatric Emergency Care. 2015;31(12):109-116.

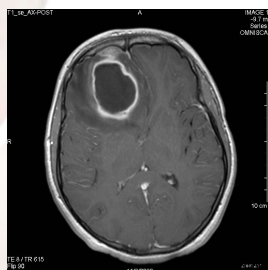
Medical treatment

- Saline rinses
 - Increases mucociliary clearance rates
 - Aids in vasoconstriction
 - Decreases bacterial counts
- Nasal steroids
 - Essential for those with concurrent allergic rhinitis

Hong A, et al. Pediatric Acute Bacterial Infection: Diagnosis and Treatment Strategies. Pediatric Emergency Care. 2015;31(12):109-116.

Intracranial Complications

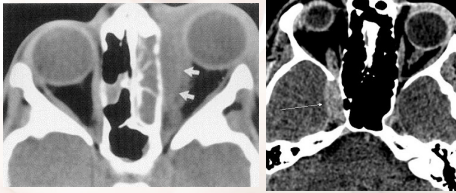
- Typically from frontal disease
- Most commonly in teenage boys
- Via hematogenous spread or direct invasion
- Fever, headache, photophobia, AMS, seizure, +/- nuchal rigidity



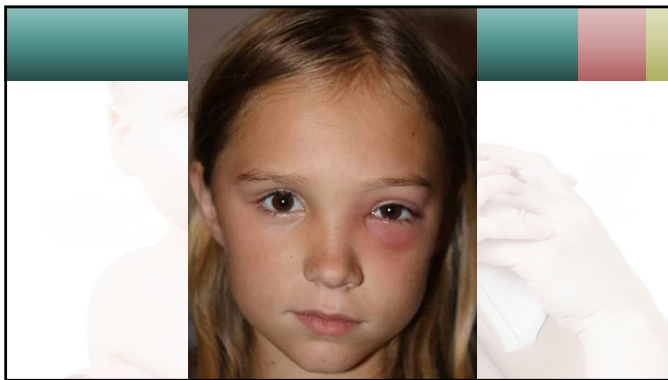
Hong A, et al. Pediatric Acute Bacterial Infection: Diagnosis and Treatment Strategies. Pediatric Emergency Care. 2015;31(12):109-116.

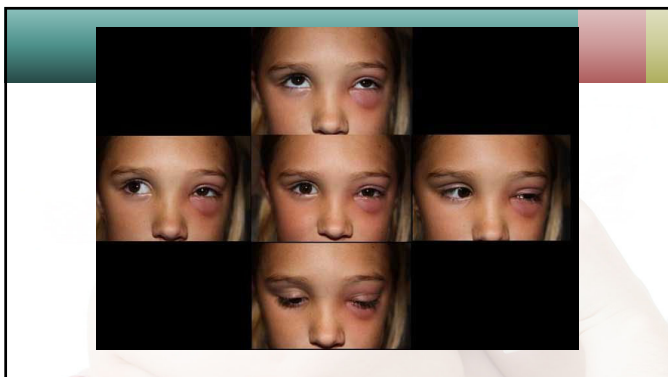
Orbital Complications

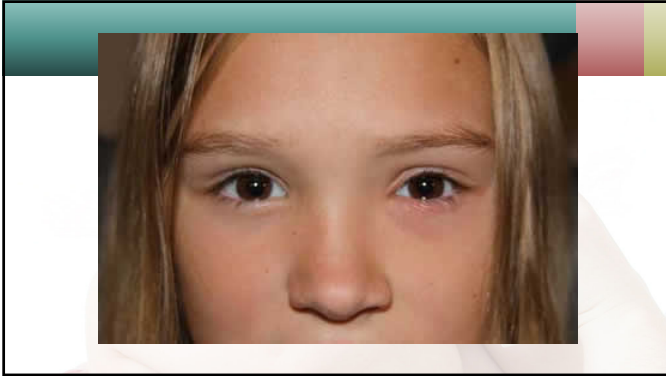
- Most common
- Typically the result of ethmoid disease

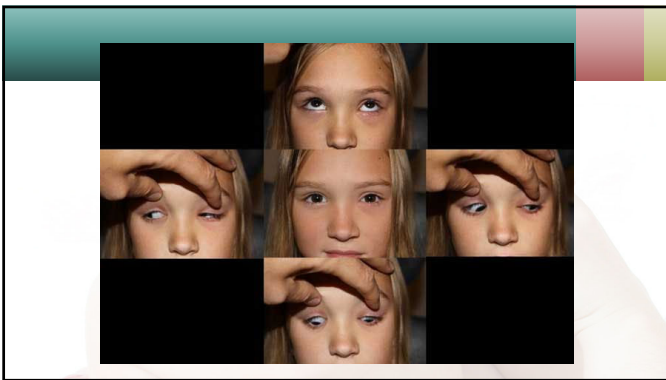


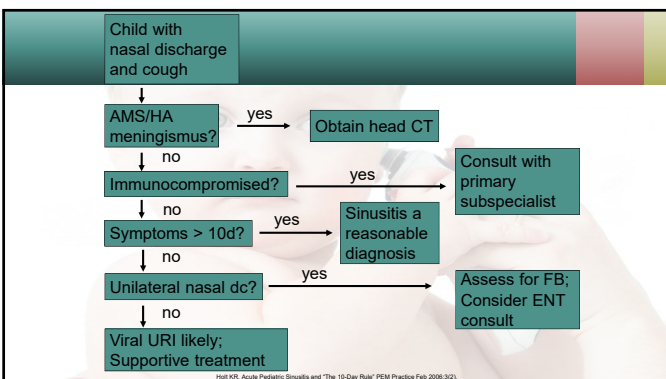
Hong X, et al. Pediatric Acute Ethmoid Sinusitis: Etiology and Complications. Pediatric Allergy Immunology 2015; 30(1): 109-116











TAKE HOME POINTS

- Lot of moving parts when it comes to fever in patients <60 days of age
 - Use the clinical practice guidelines to help
- Widespread immunizations have drastically changed the landscape of pediatric fever
 - But more and more children are un- or under-immunized

TAKE HOME POINTS

Questions?

annalise@uab.edu