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Pediatrics 2006;117:1695-1701

DOI: 10.1542/peds.2005-1673

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.pediatrics.org/cgi/content/full/117/5/1695>

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American Academy of Pediatrics

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Incidence and Predictors of Serious Bacterial Infections Among 57- to 180-Day-Old Infants

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The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

BACKGROUND. Numerous researchers have investigated fever in infants <2 months of age. However, the etiology of fever and usefulness of screening tests in older (2–6 months) infants is not well studied.

METHODS. This was a **prospective** study of febrile infants 57–180 days old. Evaluation included blood and urine tests and direct fluorescent antibody (DFA) of nasal swabs for respiratory viruses. Additional studies were performed at the discretion of managing clinicians.

RESULTS. Serious bacterial illness (SBI) was diagnosed in 44 (**10.3%**) of **429** infants: **41 with bacteruria and 4 with bacteremia** (1 infant had concurrent *Escherichia coli* bacteruria and bacteremia). Lumbar puncture, performed in 58 (13.5%) infants, revealed no cases of bacterial meningitis. DFAs were positive in 163 (38.0%) infants: the majority were respiratory syncytial virus or influenza A. **SBI was noted in 4.9% of infants with positive DFA. Age and height of fever were not significant predictors of SBI.** White blood cell count (17.1 K/mm³ vs 12.4 K/mm³) and CRP (2.6 mg/dL vs 0.9 mg/dL) were elevated in infants with SBI, as was the Yale Observation Score (9.4 vs 8.0).

CONCLUSIONS. A substantial proportion (10.3%) of older febrile infants has SBI. In the postpneumococcal vaccine era, only 1 infant had pneumococcal disease; **bacteremia was noted in 0.9%**. Bacteruria is commonly associated with fever in this age range. Infants older than 8 weeks remain at risk for bacteremia and bacteruria, regardless of positive DFA or other apparent source of fever. CRP is a better indicator than white blood cell count, but no single ideal indicator of SBI was identified for this age group.

www.pediatrics.org/cgi/doi/10.1542/peds.2005-1673

doi:10.1542/peds.2005-1673

Key Words

bacterial infections, white blood cell count, fever, febrile infant, C-reactive protein

Abbreviations

SBI—serious bacterial infection
WBC—white blood cell
CRP—C-reactive protein
YOS—Yale Observation Scale
RSV—respiratory syncytial virus
PED—pediatric emergency department
CI—confidence interval
ANC—absolute neutrophil count
ROC—receiver operator curve

Accepted for publication Oct 18, 2005

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275). Copyright © 2006 by the American Academy of Pediatrics

THE MANAGEMENT OF fever in infants <2 months of age has been heavily investigated in the last 30 years and has resulted in establishment of standards of care in academic centers. Long's¹ "rules of management" in 1984 required hospitalization of all febrile infants <8 weeks of age, whereas studies in the early 1990s provided refinement of fever management in infants. Studies at leading centers established that fever in certain infants >4 weeks of age could be safely managed in an outpatient setting.²⁻⁵

Researchers have also investigated the etiology and management of fever in preschool-age children. Several studies examining the use of potential serious bacterial infection (SBI) predictors, such as WBC, C-reactive protein (CRP), and procalcitonin, have been published.⁶⁻¹⁰ Such previous studies have included infants >2 months of age, but only as part of a wide age range incorporating several years to adulthood. To our knowledge, no study has previously specifically targeted older (57-180 days) febrile infants. This population is especially challenging to many clinicians. On one hand, waning risk of postpartum infections, maturing immune systems, and initiation of vaccinations fuel a growing comfort when evaluating these older febrile infants. On the other, infants of this age range may remain fairly vulnerable to SBIs, and their social development remains relatively immature. It is likely that infants in the 8-24-week age range represent a transitional phase of physiology but have not been specifically targeted in previous studies. The 2 principal aims of our study are to establish the epidemiology of febrile illnesses and to evaluate the usefulness of screening tests in this population.

METHODS

Infants 57-180 days of age with rectal temperatures >37.9°C who consecutively presented to the emergency department of Yale-New Haven Children's Hospital were prospectively enrolled after informed consent. All of the children underwent a complete evaluation including history and physical examination and scoring of clinical appearance using the Yale Observation Scale (YOS) by an attending-level faculty experienced in its use.^{11,12} Standard laboratory evaluation on all of the infants included complete blood count with differential, latex particles in antibody assay for CRP (Kamiya Medical, Seattle, WA), blood cultures (Bactec, Becton, Dickinson and Co, Franklin Lakes, NJ), and urine for urinalysis and urine culture. Urine was obtained by urethral catheterization in all of the cases except for 2 infants where catheterization failed and suprapubic needle aspiration was performed instead. DFA test (SimulFluor Respiratory Screen, Chemicon International, Temcula, CA) for common respiratory viral antigens ([RSVs] influenza A and B; parainfluenza types 1, 2, 3; and adenovirus) was performed on nasal swabs from each infant. Previously published data from our institution have found this DFA

respiratory screen to be equivalent or superior to viral culture for all of the viruses except adenovirus (sensitivities 92-99.9% for parainfluenza, influenza, and RSV; 70% for adenovirus).¹³ Viral cultures or polymerase chain reactions were not routinely obtained. Additional studies, such as chest radiograph, lumbar puncture, and stool studies, were performed at the discretion of the attending physician.

Clinicians were asked to note the presence or absence of an obvious source of fever after physical evaluation of the patient and before return of laboratory or other studies. Examples of obvious source included: presumed viral upper respiratory infection, otitis media, and bronchiolitis. "None" was noted if no source could be attributed by examination.

Informed, signed consent was obtained from the guardians of the infants. Children whose families chose not to participate were excluded. Age, gender, laboratory results, historical details, and physical examination findings were recorded.

Bacterial culture results were monitored until their completion, typically 2 days for urine cultures and 5 days for blood and cerebrospinal fluid cultures. Urine cultures were considered positive if there were >10 000 colonies of a single organism per mL. Blood cultures were continuously monitored by an automated system (Bactec 9240, Becton Dickinson). Positive culture results were reported to the pediatric emergency department (PED) physician staff and primary care pediatrician. Discharged patients with positive blood cultures were contacted and instructed to return to the PED for reevaluation and subsequent management. Computerized hospital records were used to obtain duration of inpatient stays and ultimate diagnoses and were monitored for return visits to the PED within 14 days, regardless of the chief complaint.

The data were analyzed using SPSS 12.0 for Windows, (SPSS, Inc). Independent *t* test comparison of means for potential SBI indicators was used. In addition, values for CRP, WBC, temperature, YOS, and age were banded into quartiles and quintiles. These banded values were analyzed with SBI using cross-tabulation and the Pearson χ^2 technique. The study protocol, consent forms, and information sheets were approved by the Yale School of Medicine Human Investigation Committee.

RESULTS

From February 2003 through February 2004, 429 (96%) of 448 eligible infants were enrolled in the study. Nineteen patients meeting enrollment criteria presented to the PED during the time period but were not enrolled (ie, family refusal or inadvertent omission). Of those enrolled, 211 were female and 218 were male. There were 45 (10.5%) blood and/or urine specimens from 44 (10.3%) febrile infants that were positive for bacteria.

One (0.2%) child had concurrent positive urine and blood cultures positive for the same pathogen (*Escherichia coli*). Overall, positive bacterial cultures were noted in 41 (9.6%; 95% CI: 6.9–12.7) urine specimens and 4 (0.9%; 95% CI: 0.3–2.4) blood specimens. CSF obtained from 58 infants revealed no cases bacterial meningitis; 4 were ultimately diagnosed with Enterovirus meningitis.

Bacterial Causes of Fever

There were 422 (98.4%) blood culture results available from the 429 infants enrolled. The quantity of samples from 7 (1.6%) infants was not sufficient or was missing. Four blood cultures (0.9%; 95% CI: 0.3–2.4) were positive with known pathogens, 23 (5.4%) with likely contaminants and 395 (93.6%) were without bacterial growth. The identified pathogens included 1 each: *E coli*, *Enterococcus casseliflavus*, group B *Streptococcus*, and *Streptococcus pneumoniae*. Common contaminants included *Staphylococcus* and *S mitis* (Table 1).

Urine samples were available from 424 (98.8%) of the enrolled 429 infants. Forty one (9.7%; 95% CI: 7.0–12.9) were positive with known urinary pathogens (Table 1). Six infants had sterile pyuria (>11 WBC per high-power field).

Nonbacterial Causes of Fever

Viral DFA was successfully obtained and processed from 413 (96.3%) of the enrolled febrile infants: 163 (39.5%; 95% CI: 34.7–44.3) were positive. Three (0.7%) patients were diagnosed with adenovirus, 51 (12.3%) with influenza A, 6 (1.5%) with influenza B, 21 (5.1%) with parainfluenza, and 79 (19.1%) with respiratory syncytial virus (RSV). Two (0.5%) infants had a DFA specimen positive for RSV and a second virus: 1 had adenovirus and the other had influenza A. Sixteen (3.7%) viral specimens were deemed to have insufficient or lost quantity. The remaining 251 (60.8%) samples were negative. Of the infants with positive DFAs, 8 (4.9%; 95% CI: 2.1–9.4) had a concurrent SBI, 1 of which had the concurrent bacteremia and bacteruria. This observed

rate was significantly lower ($P < .001$) than the 13.5% (34 of 251; 95% CI: 9.6–18.4) rate of SBI in those with a negative DFA.

Lumbar puncture in 58 febrile infants revealed no cases of bacterial meningitis, although pleocytosis was noted in 7 CSF samples. There were, ultimately, 5 cases of viral meningitis diagnosed (4 enterovirus by polymerase chain reaction).

Of 159 chest radiographs, there were 14 (8.8% of subjects with chest radiograph; 3.3% of study patients overall) primary diagnoses of pneumonia made by radiographic examination by a radiology or pediatric emergency medicine attending physician. Of those cases, 6 had concomitant positive viral testing (1 influenza B and 5 RSV). Varicella was identified in 1 patient after additional testing outside of the study protocol. Because none of these patients had documented bacterial culture with identified organism, they were not classified in the SBI group. However, the examining clinicians chose to empirically treat all of them with antibiotics because of their young age. Eleven of the 14 infants diagnosed with pneumonia were ultimately admitted to the hospital: 10 to the regular inpatient care area and 1 to the intensive care unit.

Physicians indicated their impression of an obvious source of illness in 264 (61.5%) infants, such as otitis media or upper respiratory infection. There was a significantly lower rate of SBI in those with an attributable source of fever on physical examination (6.1% vs 18.1%; $P < .001$). Final diagnoses are detailed in Table 2.

TABLE 1 Pathogenic Bacterial Isolates

Disease	n	%
Bacteremia	4	0.9
Group B <i>Streptococcus</i>	1	
<i>Enterococcus casseliflavus</i>	1	
<i>Escherichia coli</i> ^a	1	
<i>Streptococcus pneumoniae</i>	1	
Bacteruria	41	9.7
<i>Escherichia coli</i>	33	
<i>Citrobacter koseri</i>	2	
<i>Klebsiella pneumoniae</i>	2	
<i>Citrobacter freundii</i>	1	
<i>Enterococcus, group D</i>	1	
<i>Klebsiella oxytoca</i>	1	
<i>Streptococcus Viridans</i>	1	

^a Concurrent bacteremia with bacteruria

TABLE 2 Final Diagnoses

Diagnostic Category	n	%
Total patients enrolled	429	
Presumed viral syndrome (includes upper respiratory infection 61)	166	38.7
Documented viral illness (includes 7 infants with bacteruria and 1 with bacteruria and bacteremia)	163	38.0
Serious bacterial illness (includes 4 bacteremia and 41 bacteruria)	44	10.3
Bronchiolitis (RSV identified in 20 infants)	29	6.8
Otitis media	25	5.8
Gastroenteritis	15	3.5
Rotavirus identified in 4 infants		
Pneumonia	15	3.5
Aseptic meningitis (enterovirus identified in 4 infants)	5	1.2
Immunization fever	4	<1
Cellulitis	3	<1
Abscess (var)	2	<1
Closed head injury	2	<1
Dehydration	1	<1
Impetigo	1	<1
Intussusception	1	<1
Omphalitis	1	<1
Varicella	1	<1
"Fever" or no diagnosis		

No. of diagnoses exceeds no. of subjects because of concurrent diagnoses.

Predictors

WBC Count

Mean WBC count was higher in febrile infants with SBI than those without (17.4 ± 8.1 vs 12.4 ± 5.5 K/mm³, respectively [mean \pm SD]; $P < .05$). When stratified into quartiles, SBI incidence seems to have a linear increasing relationship with WBC (Table 3). A cutoff of 8.8 K/mm³ for WBC would miss $<3\%$ of infants with SBI, whereas a cutoff ≥ 15.7 K/mm³ has twice the risk of SBI. Of the 4 infants with bacteremia, 2 had WBC <15 K/mm³ and 2 had WBC >20 K/mm³. Using a traditional WBC cutoff of 15.0 K/mm³ would have had a sensitivity of 45.4% (20 of 44) for SBI. When radiographically diagnosed pneumonias are included in the SBI group, mean WBC was 16.7 ± 7.8 K/mm³ vs 12.3 ± 5.5 K/mm³ in the non-SBI group.

The percentage of neutrophils did not significantly differ between the SBI and non-SBI groups (47.8% vs 38.9%; $P = .10$). However, mean absolute neutrophil count (ANC) was significantly different (6972 ± 6097 in the non-SBI group vs $11\ 662 \pm 9234$ in the SBI group; $P < .01$). Plotting of receiver operator curves (ROCs) revealed areas under the curve of 0.72 and 0.70 for WBC and ANC, respectively (Fig 1).

CRP

Mean CRP values were significantly higher in subjects with SBI compared with those without (2.7 ± 3.7 vs 0.9 ± 1.4 mg/dL, respectively; $P < .001$). However, a wide range of values was noted in infants without SBI. When analyzed in banded ranges (quartiles), no infant with a CRP <0.2 mg/dL had SBI, whereas 23.6% of those with a CRP >0.97 mg/dL had SBI. Three of the 4 infants with

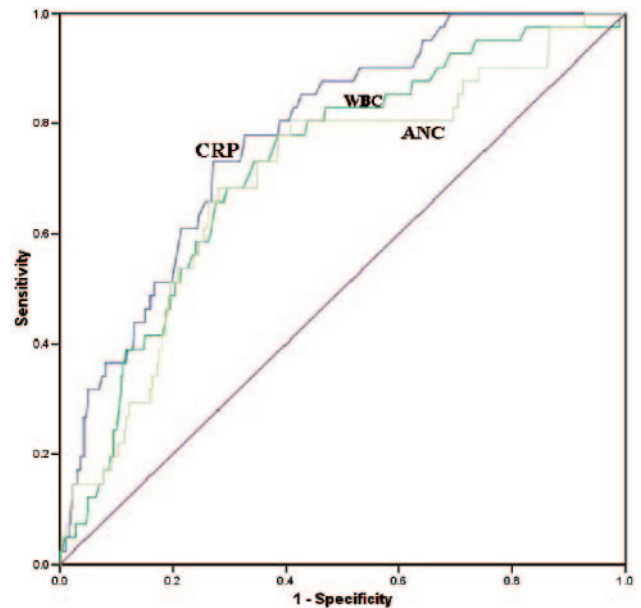


FIGURE 1
ROC for CRP, WBC, and ANC in identifying serious bacterial illness.

bacteremia had CRPs ≥ 3.0 mg/dL. However, the infant with *S pneumoniae* bacteremia had a CRP of 0.86 mg/dL, whereas the WBC was 23.5 K/mm³. The area under the curve of 0.78 on the ROC for CRP was the largest of the analyzed predictors.

YOS

The mean YOS for febrile infants with and without SBI differed by 1.4 (9.4 ± 4.6 vs 8.0 ± 3.6 , respectively; $P < .05$). When infants were grouped into “not-ill appearing” (YOS ≤ 10), “ill appearing” (YOS 11–20), and “very ill appearing” (YOS ≥ 21), those in latter group had the highest rate of SBI (40% vs 10.0% and 13.1%, respectively). Although a “very ill appearing” child seems much more likely to have SBI, infants with low and moderate YOS scores did not differ much in their likelihood for SBI. Reliance on a YOS ≤ 10 by itself would have missed 3 of 4 infants with bacteremia, (the infants with *E coli*, *S pneumoniae*, and *Enterococcus* bacteremia had scores of 6, 8, and 10, respectively). The only “ill appearing” child with bacteremia was the infant with group B *Streptococcus*, with a YOS of 26. Overall, 34 of 44 infants with SBI were considered “well-appearing.”

Age

There were not enough infants in each month age range to have enough power to accurately analyze them individually as their own cohort. However, when analyzed together in banded quartiles for SBI incidence, younger age by itself does not seem to be an independent risk factor for SBI (Table 4). The youngest infants in the study, 57–89 days of age, were not statistically significantly more likely to have SBI compared with the oldest

TABLE 3 Potential Predictors and SBI

Predictor	No. With SBI	No. Without SBI	% With SBI	(95% CI)
WBC, banded quartiles in K/mm ³				
≤ 8.7	3	102	2.9	(0.6–8.1)
8.8–11.6	6	94	6.0	(2.2–12.6)
11.7–15.6	12	93	11.4	(6.0–19.1)
≥ 15.7	23	79	22.5	(14.9–31.9)
$P < .001$ total	44	368	10.7	(7.9–14.1)
CRP, banded quartiles in mg/dL				
≤ 0.19	0	100	0.0	(0–3.6)
0.20–0.51	6	88	6.4	(2.4–13.4)
0.52–0.97	14	90	13.5	(7.6–21.6)
≥ 0.98	21	68	23.6	(15.2–33.8)
$P < .001$ total	41	346	10.6	(7.7–14.1)
Age, banded quartiles in days				
57–89	12	125	8.8	(4.6–14.8)
90–119	13	85	13.3	(7.3–21.6)
120–149	8	91	8.1	(3.6–15.3)
150–179	11	74	12.4	(6.3–21.0)
$P = .212$ total	44	375	10.3	(7.6–13.5)

Table of available samples of potential predictors in banded quartiles vs serious bacterial infection.

TABLE 4 Summary of Potential Predictors of SBI

Predictor	Infants With SBI (N = 44)	Infants Without SBI (N = 375)	P
CRP, mg/dL	2.7 ± 3.7	0.9 ± 1.4	<.001
WBC, K/mm ³	17.4 ± 8.1	12.4 ± 5.5	<.05
ANC	11 662 ± 9234	6972 ± 6097	<.01
YOS	9.4 ± 4.6	8.1 ± 3.6	<.05
Duration of fever, h	26.5 ± 41.5	18.6 ± 21.7	<.001
Temperature, °C	38.4 ± 0.8	38.5 ± 1.0	.178
Age, days	117.8 ± 33.7	112.7 ± 36.2	.24

Data are mean ± SD.

infants, who were 150–179 days of age (8.8% vs 12.9%), and were no more likely than those aged 120–149 days. Of note, all of the infants with bacteremia ranged from 109 to 159 days of age. The child with *S pneumoniae* bacteremia had received 1 dose of pneumococcal vaccine.

Gender and Circumcision Status

Gender by itself was not a risk factor for SBI. The incidence of SBI in males was nearly identical to that in females. Of 218 male infants, 23 (10.6%; 95% CI: 6.8–15.4) had SBI compared with 21 (10.0%; 95% CI: 6.3–14.8) of 211 female infants. The rate of bacteremia showed no gender bias: bacteremia was noted in 21 (9.7%; 95% CI: 6.1–14.4) of 217 male and 20 (9.7%; 95% CI: 6.0–14.5) of 207 female infants.

Of the 217 male infants with urine cultures, circumcision status was recorded in 178. Fifty (28.1%) were uncircumcised, whereas 128 (71.9%) were circumcised. Of the uncircumcised males, 36% (95% CI: 22.9–50.8) had bacteremia compared with 1.6% (95% CI: 0.2–5.5) of the circumcised males ($P < .001$). There was 1 case of bacteremia among the male infants of undocumented circumcision status. This is in contrast to the overall 9.7% rate of bacteremia in the female infants.

Fever Duration and Height

Duration of fever before evaluation in the PED was significantly longer in infants with SBI compared with those without. The mean duration of fever was 18.6 ± 21.7 hours in the non-SBI group compared with 26.5 ± 41.5 hours in the SBI group ($P < .001$). Height of fever was nearly identical in the 2 groups, 38.5 ± 0.8 in the non-SBI group and 38.4 ± 1.0 in the SBI group ($P = .18$).

Ethnicity

Our urban, tertiary care pediatric hospital has a fairly diverse patient mix. Whites comprised 41.3% of patients, Hispanics were the next largest group (34.2%), and blacks comprised one fifth (20.0%) of all enrolled infants. The remainder of patients were Asian (1.4%) and self-described “other” (3.0%). From the collected urine samples, bacteremia was found in 12.8% (22 of

172; 95% CI: 8.2–18.8) of whites, 20% (1 of 5; 95% CI: 0.5–71.6) of Asians, 11.8% (17 of 144; 95% CI: 7.0–18.2) of Hispanics, and 7.7% (1 of 13; 95% CI: 0.2–36.0) of “other.” Of note, not 1 black infant had a positive urine culture result ($\chi^2 = 11.9$; $P < .025$), although 1 black infant did have bacteremia (group B *Streptococcus*).

DISCUSSION

Management of fever in infants is a common dilemma for clinicians. Substantial attention has been focused on the management of fever in young infants.^{2–7} However, little data has been generated to help clinicians formulate an evidence-based approach to the management of fever in infants 2–6 months old. The purpose of our study was to elucidate the epidemiology of fever in older infants and to determine the utility of routinely available testing in the management of fever in this age group.

Our data indicate that bacterial presence is commonly associated with fever in 2–6-month-old infants. Fortunately, the occurrence of invasive bacterial disease is rare. Overall, the incidence of bacteremia (0.97%) remains low, similar to rates seen in younger infants and older preschool age children. Unfortunately, 3 of the 4 infants with bacteremia had falsely reassuring well appearance; only 1 was judged clinically ill seeming by YOS standards. The unreliability of clinical appearance to predict presence of bacterial disease reinforces our reluctance to allow well appearance to curtail laboratory investigation of SBI.¹⁴

Our observed 5% rate of contaminated blood cultures is on par with reports published previously.^{15,16} The current practice of drawing blood cultures at time of placement of intravenous catheters may be a factor, as described in recent literature.¹⁵ As is often the case in pediatrics, a careful balance needs to be struck between patient comfort and exacting medical practice.

Although the infants with bacteremia were evenly split along gender lines, from the data available, uncircumcised males had a 22.5 times greater risk compared with circumcised males. Unfortunately, circumcision status was unrecorded in 39 infants; however, even in the unlikely event that all of them were uncircumcised (none of whom had bacteremia), the observed rate of bacteremia in uncircumcised males is still >13-fold higher. Previously published reports have found uncircumcised males at greater risk for urinary tract infections; some investigators advocate circumcision for repeated urinary tract infections.^{17,18} Our data corroborate previously noted association of race with incidence of bacteremia.^{19–22} Lower incidence of vesicoureteral reflux in blacks compared with other racial groups might partially account for the lower incidence of bacteremia.^{19,23}

SBI, especially bacteremia, remains a common finding in infants with fever, even in those with a documented viral illness. Our rate of 4.9% bacteremia in infants with a positive DFA is very similar to that noted by Levine et

al²⁴ in their cross-sectional study of febrile RSV-positive infants. Although it is tempting to attribute the cause of fever to DFA-positive or clinically apparent upper respiratory infections, it seems important to screen for bacteremia in this age population. Delayed identification and treatment of bacteremia could have substantial impact on long-term health.²⁵

Acute-phase reactants seem to have limited value as predictors of SBI. Although there is a significant difference in mean CRP, WBC, and ANC between groups with and without SBI, none is a reliable single predictor of infants at high or low risk for SBI, especially given the wide ranges of values observed in this study. For example, if the mean non-SBI ANC value of 6972 was used as a cutoff, 13 cases of SBI would have been missed. Although CRP had the largest area under the ROC curve (0.78), a low cutoff of 0.98 mg/dL for CRP has too low specificity to be a clinically ideal single predictor. Despite this, however, a CRP >0.98 mg/dL should raise concern about the presence of SBI, because >20% of febrile infants in that group was diagnosed with SBI. On the other hand, a CRP <0.19 mg/dL would be extremely reassuring.

Although YOS was significantly lower in infants with SBI, well appearance does not eliminate the risk of the presence of SBI. Overall, clinical well appearance, corroborated by low total YOS score,^{6–10} is a more reliable indicator of a lower likelihood of presence of SBI in this age range than in febrile infants <2 months of age (10% vs 66%, respectively).^{5,14} Still, 1 in 10 well-appearing older febrile infants has SBI. Although YOS interobserver reliability was not explicitly examined during the study, only attending-level physicians assigned scores.

Of interest, only 1 case, or 0.2% (95% CI: 0–1.3), of the febrile infants had pneumococcal bacteremia detected during the course of the study. This low rate seems to support the presumption of effectiveness of current vaccination practices, because the observed rates of pneumococcal infection before that were 1.4% (95% CI: 1.2–1.7).²⁶ The 95% CI does fall just inside that of the previously published report. However, our study was not designed to assess the impact of modern vaccination practices on the incidence of SBI because of pneumococcal strains, per se.

Unfortunately, the low incidence of blood-borne bacterial infection (0.97%) subverts the extrapolation of a statistically significant and accurate evaluative algorithm to exclude bacteremia in older febrile infants. This limitation is all the more sobering given that 3 of our 4 cases of bacteremia were judged to be not ill appearing based on clinical examination and YOS criteria.

CONCLUSIONS

Fever in older infants remains a challenging clinical issue. The rate of bacteremia in our population was low but not negligible. Clinical impression is not a reliable

indicator of bacteremia. Falsely positive blood cultures remain a significant concern with important consequences, such as potential hospitalization and empirical administration of antibiotics. Bacteremia is much more common than bacteremia in 2–6-month-old febrile infants and is prevalent in females and uncircumcised males regardless of the presence of an “obvious fever source.” Clinical assessment of presumed source of fever on examination significantly lowers but does not eliminate the risk of SBI.

Clinical examination and WBC, even in these older infants, remain insensitive indicators of SBI. CRP, a relatively new indicator, is significantly more sensitive than other traditional indicators but may be difficult to use clinically given the small observed differences between infants with SBI and those without. Bacterial meningitis was not observed in the infants who clinically warranted lumbar puncture. However, in light of high rates of bacteremia even in the face of well appearance or clinical and laboratory evidence of viral illness, investigation of the presence of bacteremia in febrile 2–6-month-old infants is recommended, especially for females and uncircumcised males.

ACKNOWLEDGMENTS

We thank the many families and patients who participated in this study. We are also very grateful for the diligent work of the PED faculty, residents, and nursing staff. We also especially acknowledge the statistical aid provided by James Dziura, PhD.

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AMA TO DEVELOP MEASURE OF QUALITY OF MEDICAL CARE

“The performance measures are supposed to focus on diagnostic tests and treatments that are known to produce better outcomes for patients—longer lives, improved quality of life, and fewer complications. Federal officials say tracking how well and efficiently doctors or hospitals treat heart attacks and illnesses like diabetes or pneumonia could provide consumers with useful information. . . . In a separate letter to Congressional leaders, 10 national doctor groups representing a wide range of specialties said: ‘We are dismayed that an agreement was reached on issues that are critical to the future of our specialties and our patients without our participation or knowledge. The American Medical Association cannot be the sole representative for the groups who are paramount to the development and implementation of quality measures.’”

Pearl R. *New York Times*. February 21, 2006

Noted by JFL, MD

Incidence and Predictors of Serious Bacterial Infections Among 57- to 180-Day-Old Infants

Allen L. Hsiao, Lei Chen and M. Douglas Baker

Pediatrics 2006;117;1695-1701

DOI: 10.1542/peds.2005-1673

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