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## Editorial: Clinical Policy for Children Younger Than Three Years Presenting to the Emergency Department With Fever

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**See related article, p. 530.**

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In this issue of *Annals*, the American College of Emergency Physicians (ACEP) Clinical Policies Committee presents ACEP's "Clinical Policy for Children Younger Than Three Years Presenting to the Emergency Department With Fever."<sup>1</sup> This evidence-based guideline is one of many developed by this committee and published in *Annals*. I am pleased that so many physicians and medical organizations have recognized the value of evidence-based medicine, have overcome initial apprehensions about "cookbook medicine" and potential malpractice risks, and have adopted the use of complaint-specific guidelines as a starting point to determine the appropriate diagnostic tests and treatments in carefully selected groups of patients. I await the day when these guidelines will be incorporated into an electronic medical record and can be used contemporaneously with patient care by the majority of practicing physicians.<sup>2,3</sup>

In general, this clinical policy restates much of what was noted in an article I authored in *Annals* in 2000, which was an update of a guideline developed by experts in pediatric emergency medicine and pediatric infectious diseases published simultaneously in *Pediatrics* and *Annals of Emergency Medicine* in 1993.<sup>4,5</sup> The original guideline was primarily created for the following reasons: (1) to reduce the number of hospital admissions in the 1- to 3-month age group using the

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“Rochester” or low-risk clinical and laboratory criteria and (2) to reduce the risk of sending a infant or small child aged 3 months or older home with occult pneumococcal bacteremia that might progress, if untreated, to bacterial meningitis. The latter aspect of the guideline was controversial because both the risk of occult pneumococcal bacteremia and the risk of subsequent pneumococcal meningitis varied in different publications depending on methodology and because of concerns of excessive testing and treatment.<sup>6</sup>

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#### OCCULT BACTEREMIA

The clinical policy states, “Once the pneumococcal vaccine becomes broadly included within pediatric practice, future studies will be necessary to determine whether empiric antibiotic treatment of children suspected of harboring occult bacteremia is warranted.”<sup>1</sup> Although the currently licensed vaccine (Prevnar, Wyeth Laboratories, Madison, NJ) is active against only 7 of the 90 serotypes of *Streptococcus pneumoniae*, it has already dramatically reduced the risk of invasive diseases resulting from *S pneumoniae* in young children by approximately 90%.<sup>7</sup> This vaccine is now routinely included in pediatric practice, and vaccine shortages no longer exist in any state.<sup>8</sup> In children who have received 3 doses of this vaccine, the risk of occult pneumococcal bacteremia and subsequent bacterial meningitis is thus sufficiently remote to no longer warrant the use of WBC counts, blood cultures, and empiric antibiotics. In fact, in a recent study of a newer nonavalent conjugate vaccine, after 2 doses, more than 95% of infants had serotype-specific antibody and after 3 doses more than 98% had serotype-specific antibody for all 9 serotypes.<sup>9</sup> Thus, I believe that after 2 doses of conjugate *Haemophilus influenzae* and *S pneumoniae* vaccines, the only occult bacterial infection one need be concerned about is a urinary tract infection. Conjugate pneumococcal vaccines reduce nasopharyngeal acquisition of vaccine-specific serotypes of *S pneumoniae*, which may in turn reduce the incidence of pneumococcal disease among nonvaccinated individuals; this is termed indirect or herd immunity.<sup>10</sup> Although the emergence of antibiotic-

resistant strains has complicated disease management, pneumococcal conjugate vaccines have been shown to protect against pneumococcal disease caused by such strains because most antibiotic-resistant strains are of the serotypes included in these vaccines.<sup>11</sup> Thus, widespread use of these conjugate vaccines may prevent disease by providing both direct and indirect immunity and may reduce the use of antibiotics and the development of antibiotic resistance worldwide.<sup>12</sup>

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#### OCCULT URINARY TRACT INFECTIONS

As noted in the clinical policy, occult urinary tract infections are relatively common in infants and young children with fever without source, especially in females and uncircumcised males younger than 2 years and circumcised males younger than 1 year, and a catheterized urine specimen should be obtained to exclude this diagnosis. Bag urine specimens are not acceptable because cultures obtained from these specimens are often contaminated. Emergency nurses who are able to accomplish intravenous lines in young children should be competent in obtaining catheterized urine specimens. Parents need to be informed that a catheterized urine specimen for culture will be necessary anyway if a bag specimen urinalysis is positive, and that obtaining a catheterized urine specimen will decrease time in the emergency department (ED). I do not think a urine culture needs to be sent whenever a urine specimen is obtained; this is only necessary in children younger than 3 months. In infants older than 3 months, urinary tract infection is unlikely if results for urine leukocyte esterase and nitrate are negative or there is no significant pyuria.<sup>13,14</sup> It may be appropriate to consider occult urinary tract infections in children with fever greater than 39°C (>102.4°F) with minor respiratory infections or inconclusive signs of acute otitis media.<sup>15</sup>

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#### OCCULT PNEUMONIA

I am pleased the committee adopted the position that a chest radiograph should be obtained in febrile children aged younger than 3 months with evidence of acute res-

piratory illness and that there is insufficient evidence to determine when a chest radiograph is required in a febrile child aged older than 3 months. I think the same standard should be applied to all febrile children: there is no need for chest radiograph if there are no signs or symptoms of pulmonary infection. The committee did not comment on pulse oximetry, but the routine use of triage pulse oximetry should result in the detection of most clinically occult pneumonias, as well as other occult pulmonary diseases.<sup>16</sup> Most pneumonias in non-toxic-appearing febrile children are viral in origin and do not need antibiotics. The widespread use of the pneumococcal conjugate vaccine has further decreased the incidence of pneumococcal pneumonia with bacteremia in this population.<sup>17</sup>

#### FEBRILE NEONATES

The Committee recommended that infants between 1 and 28 days old with a fever should be presumed to have a serious bacterial infection. These neonates should have a full “sepsis workup” (ie, WBC count, blood culture, urinalysis, urine culture, lumbar puncture), receive antibiotic therapy in the ED, and be admitted. Many infants with cerebrospinal fluid pleocytosis in this age group will have viral meningoencephalitis including enteroviral and, rarely, herpes simplex encephalitis. The initial clinical and cerebrospinal fluid findings in infants with herpes encephalitis may be no different than in infants with other viral central nervous system infections (fever and lethargy), but most cases of herpes encephalitis evolve to demonstrate focal neurologic signs and symptoms including seizures. Acyclovir is the drug of choice for herpes simplex encephalitis and substantially reduces mortality and morbidity. The use of acyclovir should be considered, especially in those who have cerebrospinal fluid pleocytosis suggestive of viral meningoencephalitis, until a herpes polymerase chain reaction test on cerebrospinal fluid is negative.<sup>18</sup> Enteroviruses are the most frequent causes of viral meningitis in infants.<sup>19</sup> Most infants with viral meningoencephalitis will have an enteroviral infection with a benign outcome; however, acute neurologic complica-

tions, including complex seizures, increased intracranial pressure, and decreased consciousness, occur in approximately 10% of cases.<sup>19-21</sup> Although these complications generally are not associated with long-term sequelae, neurologic sequelae have been described after enteroviral meningitis and encephalitis.<sup>22</sup> In the future, pleconaril may play a role in these infections.<sup>23</sup>

#### YOUNG INFANTS 28 DAYS TO 3 MONTHS OF AGE

The committee did not address the issue of children 28 days to 3 months of age. These young infants may be treated as outpatients if they meet clinical and laboratory low-risk criteria. There are 2 different published low-risk criteria, the Rochester and Philadelphia criteria. There is one important difference between them: the Philadelphia criteria include a lumbar puncture and the revised Rochester criteria do not.<sup>24,25</sup> Of 872 low-risk infants in 5 studies evaluated using the Rochester criteria without a lumbar puncture, 10 (1.1%) had a serious bacterial infection. None had or developed bacterial meningitis.<sup>4</sup> Using the Philadelphia criteria, none of 548 low-risk infants had meningitis; however, one who met the WBC count and urinalysis criteria had pneumococcal meningitis diagnosed by lumbar puncture (personal communication, M. Douglas Baker, MD, August 4, 2003). When a lumbar puncture is done, 10% of febrile infants are diagnosed with aseptic meningitis.<sup>25</sup> Recently, Bonsu and Harper<sup>26,27</sup> conducted a retrospective review of all febrile infants, including those not well appearing and without fever without source, presenting to the Children’s Hospital, Boston ED during a 7.5-year period. They reported that neither bacteremia nor bacterial meningitis was reliably predicted by WBC count.<sup>26,27</sup> The WBC count is also not reliable as a screen for urinary tract infections.<sup>28</sup> The risk of bacteremia is higher in young infants with fever without source than in those with a viral respiratory source.<sup>29</sup> I still believe that for infants in this age group with fever without source who are to be managed as outpatients, there are 2 strategies: (1) a full sepsis workup including lumbar puncture with outpatient parenteral antibiotics or (2) if

the physician and parent are willing to accept the small risk of missed meningitis (approximately 1 in 1,000), a partial sepsis workup without a lumbar puncture.<sup>4,30</sup> I do not think antibiotics should be given if a lumbar puncture is not performed because their administration will make subsequent differentiation of bacterial from viral meningitis difficult.

In conclusion, I would like to reemphasize some of the important points regarding the management of febrile infants that I teach our emergency medicine and pediatric residents. Fever is defined as a rectal temperature greater than 38.0°C (>100.4°F). A recent documented fever at home should be considered the same as a fever in the ED and result in similar management. Fever and vomiting without diarrhea should generally not result in a diagnosis of "gastroenteritis." Other diagnoses should at least be considered, including central nervous system infections, urinary tract infection, appendicitis, intussusception, and Reye's syndrome.

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