ADVANCES IN PEDIATRICS

Advances in the Diagnosis and Management of Febrile Infants
Challenging Tradition

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Key points

- Changes in the epidemiology of organisms responsible for bacteremia and meningitis in febrile infants include, *Escherichia coli* becoming the most common pathogen, whereas *Listeria* is rarely seen; GBBS is now uncommon in early onset disease but persists in older infants.

- Evidence from office practice and emergency departments suggests that a selective approach to diagnosis and management can safely avoid some invasive procedures and hospitalizations.

- The most frequent bacterial infection in febrile infants in the first 3 months is urinary tract infection (UTI) occurring in 10% overall but 20% in uncircumcised boys and about 5% in girls; bacteremia and meningitis occur in 0.5% and 2.0% to 3.0%, respectively, with decreasing frequency from 2 to 12 weeks.

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INTRODUCTION

The management of febrile infants in the first few months of life continues to be extensively investigated and passionately debated. There has been reluctance by academic institutions to abandon support for longstanding models of care that recommend extensive diagnostic testing and hospitalizations. The iatrogenic consequences of this approach were documented in a classic article by

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- Advances in diagnostic testing indicate urine leukocyte esterase is greater than 95% sensitive; procalcitonin has emerged as the most accurate inflammatory marker, and automated blood culturing systems and multiplex polymerase chain reaction platform are capable of reducing the times to identify pathogens.
- Clinical prediction rules and models that include evaluation of clinical appearance, urinalysis, and inflammatory markers are now more than 95% sensitive in detecting UTIs, bacteremia, and bacterial meningitis.

DeAngelis and colleagues [1] 35 years ago, followed by an extensive body of work seeking a less intensive approach for low-risk infants [2–20]. There is growing evidence that physicians in office practices and emergency departments (EDs) are not adhering to the older models [11,21–23]. Although fewer invasive procedures and hospitalizations have been documented, there have been no reports indicating adverse consequences.

The authors' aims are to identify the inherent challenges in addressing this clinical problem; summarize advances in the epidemiology of and testing for concerning infections; provide estimates of the risks of illness under varying circumstances; and discuss how risk tolerance and informed parental involvement impact clinical decision-making. Providing information on advances in diagnosis and management should enable clinicians to individualize and optimize care for each febrile infant.

This article addresses the evaluation and management of fever in full-term infants without other medical risk factors in the first 3 months of life, excluding newborns aged 0 to 7 days. This choice reflects the selection criteria of studies completed over the past 40 years.

The infections

The authors focus on infections for which early identification and treatment are considered important to prevent further disease progression and morbidity. Where available, the authors provide separate information on the incidence and detection of meningitis, bacteremia, and urinary tract infections (UTIs) rather than use the term *serious bacterial infection* (SBI). The term *SBI* includes all 3 infections. The term *invasive bacterial infection* (IBI) refers to bacteremia and bacterial meningitis. Fig. 1 was created from population data in Northern California and is representative of other contemporary studies [24]. As Fig. 1 indicates, most bacterial infections are due to a UTI. Consequently, studies using SBI as an outcome variable have the potential to overestimate the value of prediction models sensitive for detecting UTIs that might do poorly in detecting meningitis. Using the term *SBI* is misleading, as it lumps heterogeneous infections with vastly different levels of morbidity and mortality, that is, UTI and bacterial meningitis. Readers should cautiously interpret studies using SBI as an outcome measure. The authors recommend the term *SBI* be retired and no longer used in research.