Characteristics and Management of Febrile Young Children Seen in a University Family Practice

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A cohort of 311 children registered with the University of Washington Family Medical Center was retrospectively identified and followed until the age of 2 years. Analysis of all encounters for which a temperature of 37.7°C (100°F) or above was noted revealed 438 such encounters among 189 patients. Only 30 encounters involved patients aged under 3 months, and in 74 percent of the encounters the temperature was below 38.9°C (102°F). The most common diagnoses were otitis media (34 percent), upper respiratory tract infection (19 percent), fever without a source (14 percent), and acute gastroenteritis (7 percent). While antibiotic usage, follow-up, and laboratory utilization all increased with increasing temperature, the latter was unrelated to a child's age. Laboratory evaluation of children considered at high risk for occult illness did not adhere to published guidelines. A more aggressive laboratory approach is recommended for such children, as is follow-up contact. Further studies to evaluate the risk of occult illnesses in febrile children seen in family medicine settings would be helpful in refining and improving management strategies in these settings.

There has been a recent proliferation of articles in the pediatric literature concerning the consequences and management of febrile illness in young children.[1-17] Despite the clinical importance of this topic, there are very few examples of research concerning febrile children seen in family practice settings.[18,19] Sample selection influences the apparent natural history of disease,[20] and the population of febrile children presenting to family medicine settings may be different from that presenting to pediatric settings. Furthermore, management strategies may differ between physicians

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in pediatric and family medicine settings.

This study examined a cohort of children followed in a university family practice clinic. Demographic and clinical characteristics of the children were described, as were diagnostic and therapeutic strategies of the physicians. Specific research questions included (1) what relationships could be found between age, diagnosis, and temperature, (2) how did diagnostic and therapeutic strategies vary with a child's age and temperature, (3) what practice patterns concerning febrile children existed in the Family Medical Center at the University of Washington, (4) how did these patterns compare with suggested protocols from the pediatric literature, and (5) what was the frequency of adverse outcomes in the cohort, and how might such outcomes have been related to practice patterns?

Methods

The Network Information Mangement System (NIMS), a computer system, was used to identify children registered with the Family Medical Center at the University of Washington. Charts were obtained for 311 of the 323 patients recorded by NIMS who were born between January 1, 1979, and December 31, 1980 (96 percent). Upon review of these charts, all encounters between January 1, 1979, and December 31, 1982, were considered for analysis if the patient was 0 to 24 months of age at the time of encounter and the temperature was at least 37.7° C (100° F) or an elevated tactile temperature was reported. Temperature was defined as the temperature recorded in the chart for a given encounter. Of the 311 patients whose charts were reviewed, 108 had no encounters with the Family Medicine Center meeting these criteria. Among the remaining 203 patients, there were 438 encounters (427 Family Medicine Center and 11 emergency room) among 189 febrile children aged 0 to 24 months. (Fourteen patients had only telephone encounters with the Family Medical Center for which they were febrile and were excluded from analysis.) These 438 encounters were the units of analysis for this study. For each encounter information was abstracted regarding demographic, clinical, laboratory, treatment, and outcome variables.

Computer-assisted analysis was undertaken of all variables. Stratification of variables of interest was undertaken to facilitate approaching the previously mentioned research questions. In assessing outcome, a patient was considered to have recovered uneventfully following an encounter if (1) there was a later clinic visit at which the patient was afebrile and there was no notation of any illness or problem that could reasonably be presumed to relate to the previous encounter or (2) a telephone call or postcard by the investigator to a parent or relative determined that the child had recovered uneventfully without residual problems.

Results

Demographic Characteristics by Encounter

Encounters were equally divided between male and female patients. The predominant ethnicity was white (80 percent), and insurance was the most common payment source (60 percent). Over 70 percent of patients were born at the University of Washington Hospital, and 80 percent of encounters involved patients aged over 6 months. The mean age was 12.1 months (standard deviation 6.1 months). Over 90 percent of encounters represented the first encounter for a given episode of illness. There were no significant differences in demographic variables between cohort members who did and did not have in-person encounters for febrile illness.

Clinical Characteristics by Encounter

Three fourths of all encounters were for temperatures below 38.9° C (102° F), and only 58 encounters (13 percent) involved temperatures above 39.4° C (103° F). Otitis media was the primary diagnosis in 34 percent of encounters, while upper respiratory tract infections accounted for another 19 percent. For 18 percent of encounters,

Table 1. Rates for Laboratory Tests Commonly Recommended in Evaluation of Highly Febrile Children

Laboratory Test	Temperature < 39.4°C (N = 380) No. (%)	Temperature ≧ 39.4°C (N = 58) No. (%)	P Value* Comparing Previous 2 Columns	Temperature ≧ 39.4°C With FUO** (N = 14) No. (%)	Temperature ≧ 39.4°C Without FUO** (N = 44) No. (%)	P Value* Comparing Previous 2 Columns
Complete blood count	18 (5)	7 (12)	.069	4 (29)	3 (7)	.102
Erythrocyte sedimentation rate	2 (.5)	2 (3)	.173	2 (14)	0 (0)	.110
Chest radiograph	14 (4)	5 (9)	.183	1 (7)	4 (9)	> .5
Blood culture	11 (3)	7 (12)	.01	4 (29)	3 (7)	.102
Urine culture	7 (2)	3 (5)	.268	3 (21)	0 (0)	.024

*All P values are two-sided and computed utilizing Fisher's exact test
**Fever of undetermined origin

the diagnosis was coded as "undetermined," meaning that the progress note gave no indication that the physician even noticed the temperature. This situation generally occurred in the context of a well-child visit and a lower fever (only one of the 77 such encounters involved a temperature of 38.9° C [102° F] or greater). For 14 percent of encounters the evaluation did not reveal a source for the fever (fever of undetermined origin). There were 23 such encounters involving a temperature of 38.9° C (102° F) or greater, 14 of which involved a temperature of 39.4° C (103° F) or above.

There were 29 cases of acute gastroenteritis and 12 skin infections. The nine lower respiratory tract infections included six cases of pneumonia.

Laboratory Utilization and Outcome

Table 1 illustrates the use of five laboratory tests commonly recommended for the evaluation of highly febrile children, especially when no source for fever has been identified. Although all of these tests were utilized more commonly when the temperature was at least 39.4° C, the difference was statistically signficant only for blood cultures. Given a temperature that high, all of the tests except chest radiographs were more commonly ordered when the diagnosis was fever of undetermined origin. Among 19 female patients with temperatures of 38.3° C (101° F) or greater and a diagnosis of fever of undetermined origin, six (32 percent) urinalyses and five (26 percent) urine cultures were obtained among a total of seven of the patients.

Nine of the 19 chest radiographs were indicative of acute illness (all nine patients were treated as outpatients and recovered uneventfully), 2 were equivocal, and 8 were negative. Only 1 of 18 blood cultures was positive, and 1 of the 10 urine cultures was positive, 3 were equivocal, and 6 were negative. The single lumbar puncture performed was negative for bacterial meningitis.

Treatment Modalities

Use of supportive care (defined as counseling, antipyretics, fluids, or reassurance), antibiotics, and follow-up all increased significantly with tem-

peratures of at least 39.4° C. With temperatures in this range, a notation of supportive care was more likely, while antibiotic use was less likely, if the diagnosis was fever of undetermined origin. All hospitalizations occurred when the temperature was below 39.4° C.

Relationships Among Age, Temperature, and Diagnosis

There was a weak positive association between age under 6 months and lower temperatures, with higher temperatures being more common in older children. (Spearman correlation coefficient = .08; P = .09, two-sided.) Otitis media was more common in older children, and the cause of fever was more commonly undetermined in younger children. Temperatures tended to be lower when the diagnoses were upper respiratory tract infection or undetermined, and higher when the diagnoses were otitis media, fever of undetermined origin, and lower respiratory tract infection.

Relationship of Management Strategies to Temperature

Increasing temperature was generally associated with increased use of laboratory tests. When the total number of laboratory tests ordered in each category of temperature were compared, there was a highly significant relationship between increasing temperature and laboratory utilization ($P < .001$ by analysis of variance). In addition, antibiotics and follow-up were more often utilized for encounters involving higher temperatures.

Relationship of Management Strategies to Age

A child's age was generally not associated with any particular pattern of laboratory use, except that throat cultures were ordered more commonly in older children. When the total number of laboratory tests ordered in each category of age were compared, there was no relationship between age and laboratory utilization ($P > .5$ by analysis of variance). There was an increased use of follow-up and antibiotics in encounters involving children aged over 6 months.

Outcome

Four hundred seven of the 438 encounters were followed by a further clinic encounter at a later date, which indicated that the patient had an uneventful recovery on follow-up (see Methods). Of the remaining 31 encounters, it was possible to contact relatives in all but three cases to determine whether the children had recovered uneventfully. Thus, in all 435 cases for which follow-up information was obtained, the outcome seemed to be good.

Discussion

Several findings from the current study require discussion. The major points to be discussed are (1) a few clinical diagnoses accounting for the great majority of fever-related encounters, (2) the relationship between temperature and age, (3) the relationship between certain diagnoses and age, (4) the rarity of encounters involving children at high risk for occult illness, and (5) the relative lack of aggressive evaluation for potential occult illness in children at risk for such illnesses.

Upper respiratory tract infection, otitis media, fever of undetermined origin, and acute gastroenteritis accounted for 74 percent of all encounters. These four diagnostic categories have appeared on other lists of common diagnoses among children seen in family medicine settings,[18,21] though not with the same relative frequencies. The data have implications regarding pediatric training for family medicine residents. The evaluation of febrile illness in children aged under 2 years is difficult, and expertise in the overall evaluation, as well as a focus on these specific areas, could simplify the task.

The trend toward increasing temperature with increasing age has been alluded to and may relate to the relationship between diagnosis and age. Otitis media was more commonly diagnosed in older patients, and the diagnosis was more commonly undetermined in younger patients. Besides

the undetermined group, the other diagnosis associated with low-grade fevers was upper respiratory tract infections. Conversely, otitis media, lower respiratory tract infection, and fever of undetermined origin were all more commonly associated with higher temperatures.

The paucity of visits by febrile infants aged under 3 months is notable. Only 30 encounters concerned children aged under 3 months, and only seven of these concerned children aged under 3 months with temperatures of 38.3° C (101° F) or above. Febrile children aged under 3 months are known to be at high risk for serious and occult illness,[6,13] and aggressive management, including hospitalization, sepsis evaluation, and parenteral antibiotics, has been recommended for this group.[10,13,22] Such strategies could conceivably place a large burden on family physicians. Most of the 311 patients were at risk for having an encounter for a febrile illness before the age of 3 months, since over 60 percent were born at the University of Washington on the Family Medicine Service.

There were approximately 17,500 encounters in the Family Medical Center in 1980, 15 of which involved infants aged under 3 months with a temperature of at least 37.7° C. Thus it took 1,163 encounters, on the average, to generate one such visit. A recent article found that the average office-based generalist or family physician who worked a complete week averaged 129 outpatient encounters per week.[23] If these data are applied to such a practice, it would take nine weeks of full-time practice to come up with a single visit. If one considered only infants aged under 3 months with a temperature of at least 38.3° C, similar logic would indicate that 45.6 weeks of practice would be needed to generate a single such visit. Some authorities[13,22] feel that aggressive management is particularly indicated in this group.

The great majority of encounters (74 percent) involved temperatures under 38.9° C (102° F). The rates of occult illness (especially bacteremia) are quite low when the temperature is this low and become fairly high at temperatures of 39.4° C (103° F) and above.[2,4,5,22] Only 58 (13.2 percent) of the encounters involved a temperature in the latter range, and only 14 of these (3.2 percent of all visits) involved a diagnosis of fever of undetermined origin. This latter group is at especially high risk for occult bacteremia for which the management would be changed by knowledge of the occult bacteremia.[17,22] Using the same logic as previously, it would take 9.6 weeks of full-time practice to generate one child with a temperature of at least 39.4° C and a diagnosis of fever of undetermined origin.

Although increasing temperature was associated with increasing laboratory utilization, the lack of aggressive evaluation for children with high fevers is notable, especially for children at high risk for so-called "occult" bacteremia. The 14 children with temperatures of 39.4° C (103° F) and above who had diagnoses of fever of undetermined origin would have had a risk of bacteremia of at least 10 percent.[2,5] Only 4 of these 14 children had blood counts done, 2 had an erythrocyte sedimentation rate (both of these tests have been recommended as screening tests to see which febrile children should have blood cultures done), and 4 had blood cultures. Although 12 of these 14 patients received supportive care, only 8 had follow-up care arranged (according to the charting).

That all of these children are known to have had a good outcome is no cause for placing confidence in the observed management strategies. Occult bacteremia is known to be associated in many instances with devastating consequences,[7,24] and the efficacy of early recognition and presumptive antibiotic therapy in children with occult bacteremia has been demonstrated in a prospective, randomized, clinical trial.[24] The number of children at risk in this study is small enough that the failure to observe poor outcomes due to possibly suboptimal management strategies is to be expected. Febrile young children at high risk for occult illness require close follow-up. The failure to note in the chart the plan for a follow-up visit in six of 14 children with temperature of at least 39.4° C (103° F) and diagnosis of fever of undetermined origin is disappointing. Even if this lack of notation is an artifact of charting, the possible medicolegal implications are significant.

The risk of occult urinary tract infection in febrile girls under 2 years of age with an unexplained temperature of 38.3° C (101° F) or above has been studied. A recent collaborative study in nine centers found a rate of 7.4 percent in 193 such girls, compared with a rate of 0.7 percent in asymptomatic girls.[25] In the current study, urine cultures were obtained in only six out of 19 (32 percent)

girls with temperatures of 38.3°C (101°F) or greater and the diagnosis of fever of undetermined origin. Given the current state of knowledge, all girls in this category should have urine cultures obtained.

There are several limitations to the current study. Data collection depended on the charting behavior of the clinic physicians; although charting is generally considered to be thorough, it is certainly possible that charting errors occurred. The charting of emergency room visits, which virtually all occur after hours, is particularly suspect as only 11 emergency room visits for febrile children aged under 2 years were noted in this study.

Another possible limitation of this study concerns the stability of this cohort of children. Telephone interview with the parents of 15 randomly selected children revealed that nine patients had no visits to other health care facilities during their period of registration at the Family Medical Center. Five patients were seen one or two times yearly by other sources of care, and one patient was seen three or four times yearly by other sources. Visits to other facilities typically concerned immunizations or minor illnesses, and in only one instance did such a visit concern a significant illness.

Finally, caution must be exercised when interpreting the apparent lack of aggressive evaluation for occult illness in young children with high fevers for which there was no known source. Although occult bacteremia has been shown to be fairly common in febrile young children in several settings,[2,3,7,17] occult illnesses in general have not been studied in family medicine settings. There is no compelling reason to believe that febrile young children seen in family medicine settings are exempt from occult illness, but one cannot be dogmatic about the need to identify occult illnesses in patients seen in these settings.

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