Reviewer’s report

Title: The cost of diagnostic uncertainty: A prospective economic analysis of febrile children attending an NHS Emergency Department

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Reviewer: Christopher J. Stille

Reviewer's report:

This paper is a very comprehensive observational study of the management of fever in a large group of children of all ages at a single institution in the UK about 6 years ago. It is unusually detailed compared to many observational studies of its type, including variables such as triage category of children, time spent in their management, clinician type and level of training, and costs. While these are strengths of the paper, they are also weaknesses, as space limitations and limitations of most readers' capacity to absorb data make it difficult to adequately discuss and understand the different comparisons that are important to inform future improvement work. Additionally, it is incorrect to group older children and adolescents with babies in an analysis of this type, as causes and appropriate management of fever differ greatly between age groups. Results are divided by age, but analyzing all groups together is not appropriate. It may be that more than one paper with greater focus on a smaller quantity of data is needed to adequately describe the results of this ambitious study. Moreover, the age of the data combined with recently changing epidemiology of bacterial infections due to improvements in vaccines, especially pneumococcal and meningococcal vaccines, is a significant limitation of the work.

Specific comments follow.

1. Background. The authors assert from the start that viral, bacterial, and serious bacterial infections (SBIs) often result in similar presentations in children. This is incorrect; it is likely true among young infants, especially those under 1 month of age, but not at all true in ages older than 3 years, and controversial in those between 3 and 36 months of age. The authors cite the prevalence of occult bacteremia as 1 in 400, but these data are now 10 years old and were collected in children younger than 36 months of age. These problems propagate throughout the paper. Young infants, children 3-36 months of age, and children older than 3 years have different causes of fever.

2. Background. The authors discuss how sufficient observation time, repeated blood and urine investigations and clinical judgement are needed for accurate diagnosis and treatment. While the first and third of these are absolutely true, the second (at least in the experience of this US reviewer) is no longer the case except in very special populations such as very young infants, those with immunodeficiency, and oncologic patients. Other than young infants, these two groups were excluded from this study. Moreover, the importance of outpatient followup is not discussed at all, a common problem with US studies of ED populations.

3. Methods. Subject selection: It would be interesting to briefly describe characteristics of the roughly 25% who were ineligible for the study, to be able to put study subjects in context with
those not included.

4. Methods. It would be interesting, if data are available, to know the number of children who were not febrile at presentation and compare their management and outcomes. Often they are managed less aggressively and it would be good to know how appropriate that is.

5. Methods. It is important for non-UK readers to understand the MTS criteria, even if they are as useless as the data seem to indicate.

6. Methods. Were any data on symptoms or physical exam signs gathered? Broad description of these as a variable would help.

7. Methods, table 1 (staff time). A couple of variables seem unrealistic, specifically time to insert an IV cannula and time to interpret results of lab investigations, which are quite long.

8. Methods, analyses. These appear quite comprehensive generally.

9. Results: Half of all children were less than 3 years of age. This would make it easy and informative to conduct a stratified and perhaps comparative analysis of management, which is more appropriate than what was done given my comment above.

10. Results: It would be helpful to know why so many children who were eventually treated as if they were not particularly ill received orange-red and red MTS classifications. The system may be terrible but we need to know why.

11. Results: It is striking that very few children were treated by consultants. Did some who were treated by more junior clinicians receive help from a consultant? In the US, most if not all children who are admitted to hospital require a consultant's input before the decision is made. This has implications for the Discussion and may inform practice improvement greatly.

12. Results: Many older children received lab testing, including roughly 15% who gave a urine sample. This is not typical of older children treated for fever in the US. Description of symptoms, if available, would help.

13. Discussion: The huge impact of involvement of a consultant in care on decreasing costs is discussed very little. It would seem that this would be a relatively inexpensive way to improve quality and decrease cost.

14. Discussion: Again, a stratified analysis by age (and perhaps a separate paper) would be more clinically relevant and make the data easier to interpret, especially if the goal is to improve knowledge as compared with previous studies that excluded older children.

Are the methods appropriate and well described?

If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?

If not, please specify which controls are required in your comments to the authors.

Not applicable

Are the conclusions drawn adequately supported by the data shown?

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