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### Authors

Howard-Anderson, Jessica  
Schwab, Kristin  
Quinn, Roswell  
et al.

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## Choosing Wisely Overnight? Residents' Approach to Fever

Jessica Howard-Anderson,<sup>1</sup> Kristin Schwab,<sup>1</sup> Roswell Quinn,<sup>1,2</sup> and Christopher J. Graber<sup>1,3</sup>

<sup>1</sup>Department of Medicine, David Geffen School of Medicine, University of California Los Angeles; <sup>2</sup>Hospitalist Division of the Department of Medicine and <sup>3</sup>Infectious Diseases Section, VA Greater Los Angeles Healthcare System, California

We surveyed internal medicine residents regarding how they approach febrile patients in cross-cover settings. Residents frequently use the term “full fever work-up,” and rely on this for sign-out. Despite this, residents felt fever work-ups were not evidenced-based, and definitions of when and how to respond to a fever varied.

**Keywords.** diagnostic testing; high-value care; hospital medicine; fever; medical education.

Cross-covering patients overnight commonly occurs in academic medical centers. When providing sign-out instructions, resident physicians usually provide the cross-covering resident with anticipatory guidance on what to do if a patient has a fever [1, 2]. Despite this being a frequent clinical scenario, there is surprisingly little evidence-based guidance on how to approach a fever in a hospitalized patient. Prior literature investigating the fever work-up has focused primarily on when blood cultures should be obtained [3, 4]. As part of the 2012 *Rational Clinical Examination* series, Coburn et al [4] reviewed prior literature and found that while no single variable is specific for bacteremia, SIRS criteria and other decision support tools can be useful in identifying patients who do not need blood cultures. However, physicians are still likely ordering blood cultures too frequently. One study of a VA hospital in 2015 showed that the rate of true positive blood cultures was low (3.6% per order), almost approaching the rate of false positive blood cultures [5].

In addition to blood cultures, physicians frequently order a variety of other tests for febrile hospitalized patients, including urinalysis, urine culture, sputum culture and chest x-ray.

In order to ease cognitive burden, residents at our institution and others will combine some or all of these studies into a recommendation called a “full fever work-up” (FFWU). Residents designate whether a FFWU is indicated when they sign-out patients to a cross-covering resident, using criteria that may be informed more by institutional culture than evidence. In this study, we aimed to elucidate what residents order as part of the FFWU, how often this is performed, and how sign-out may influence resident ordering practices.

### METHODS

We conducted a prospective survey of internal medicine residents in our training program. In April 2016, each resident received an emailed link to participate in an optional survey. The residents had 2 weeks to complete the survey and we sent one reminder email. We used Research Electronic Data Capture (REDCap) [6] to administer the survey and store data anonymously. This project met institutional review board criteria for quality improvement activities and exemption from formal review.

The residents at our institution provide overnight cross-coverage at 3 hospitals: an academic referral center, a Veterans Affairs hospital, and a community hospital. Each hospital uses an electronic sign-out system that can automatically integrate data from the medical record. Residents frequently use a template for sign-out that includes guidance on what to do if a patient has a fever, labeled as the FFWU. Education on effective sign-out is provided to all first-year residents in a workshop during orientation. Instruction on what to specifically order for a febrile patient is not included.

The survey (Supplemental Material) consisted of 12 multiple-choice questions and covered definitions of fever and FFWU, how often and in what clinical scenarios tests are ordered, and residents' perceptions of sign-out and the FFWU. Given the paucity of available literature on this topic, we designed the survey primarily based on the study investigators' expertise in hospital medicine and infectious diseases. The areas of focus and answer selections were chosen based on the authors' knowledge of resident ordering practices and cross-cover routine. Two of the authors were third-year residents in this program when the survey was created and all are involved in resident education. The clinical scenario questions were based off of a similar patient presentation assessed by Coburn et al [4] where blood cultures were determined to be unnecessary. An expert in survey design as well as infectious diseases fellows provided feedback on the survey before it was distributed.

The data was analyzed descriptively for all categorical variables. The last question asked for optional comments, however

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Correspondence: J. Howard-Anderson, MD, 757 Westwood Blvd, Suite 7501, Los Angeles, CA 90095 (Jhanderson@mednet.ucla.edu).

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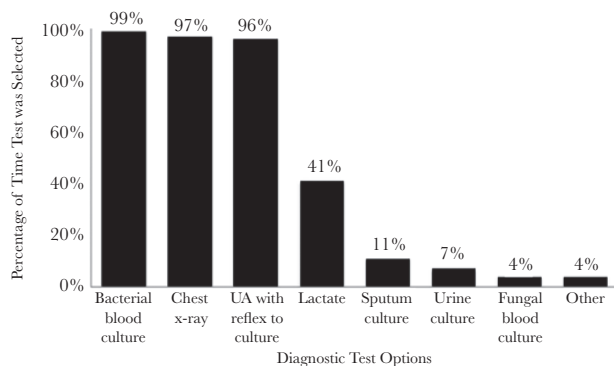
there were insufficient responses to perform qualitative analysis on this question.

## RESULTS

Seventy-three of 142 (51%) residents completed the survey (36% post-graduate year (PGY)-1, 36% PGY-2, 25% PGY-3, 4% PGY-4). The majority of respondents (96%) defined a FFWU as at least including blood cultures, a urinalysis, and a chest x-ray. However, approximately half of this majority (53%) included at least one additional test in their definition (Figure 1).

Questions also addressed the frequency of testing and evaluation. Forty-eight (66%) residents reported they “always” order blood cultures, 48 (66%) reported they “always” order a urinalysis, and 35 (48%) reported they “always” order a chest x-ray as part of their work-up when an immunocompetent patient they are cross-covering has a fever. Only 8 (11%) residents reported that they “always” evaluate the patient in-person when they are called overnight for a fever, and more than half of the respondents (53%) reported that they “sometimes” or “rarely” evaluate the patient in-person overnight for a fever. For recurrent fevers in a non-bacteremic patient, 15 (21%) reported they would repeat a FFWU on a patient with an additional fever after 24 hours and 52 (71%) would repeat this after 48 hours. Twenty-eight (38%) would repeat a FFWU for a change in clinical status.

The majority of residents endorsed relying on FFWU sign-out instructions. 66 residents (88%) reported “always” or “often” following the instructions on the sign-out. Yet, only 20 (27%) believed that sign-out instructions are “always” or “often” kept up-to-date. When asked to manage a febrile, clinically stable patient with known community-acquired pneumonia, 46 (63%) thought no additional work-up was indicated. However, when subsequently told that the sign-out indicated to do a FFWU, 40 (55%) respondents modified their orders. Eleven (15%) residents felt their approach to fever as a cross-covering resident was evidence-based and 13 (18%) thought it was cost-effective.



**Figure 1.** Tests included in the full fever work-up. These were the tests selected by residents for the survey question, “When the primary resident instructs you (the cross-cover resident) to order a “full fever work-up” in a patient who has a fever overnight, what do you think this means you should order? Check all that apply.” UA, urinalysis.

## DISCUSSION

Although residents at our institution frequently use the terminology FFWU as a cognitive tool when cross-covering patients, their definitions of when and how to respond to a fever are not uniform. Trainees often order blood cultures, urine studies, and chest x-rays in response to a fever, yet substantial variation in ordering practices exists. Although the FFWU terminology may be specific to our institution, other academic centers have similar terminology used to simplify the work-up of febrile patients. Common expressions such as “culture if spikes” or “pan-culture” may lead to analogous confusion among house-staff and variability in ordering patterns.

The majority of respondents stated that they order the same tests and repeat these tests irrespective of patients’ symptoms or changes in clinical scenarios. Tests are also frequently ordered without assessing the patient in-person. This finding echoes a recent study of hospitalized geriatric patients in which urine cultures were ordered on 75% of febrile patients, despite the patients having a known source of fever outside of the urinary tract [7]. Practices like this may lead to frequent unnecessary testing, unwarranted antibiotic prescribing and potentially harmful interventions. The American College of Critical Care Medicine and Infectious Diseases Society of America state in their guidelines [8], that a new fever in the ICU “should trigger a careful clinical assessment rather than automatic orders for laboratory and radiologic tests.” Given the tendency of our residents to always order the same set of diagnostic tests on febrile patients, perhaps these recommendations should extend beyond the ICU.

Lastly, residents endorsed depending on sign-out instructions while often questioning its accuracy. Despite relying on the term FFWU, residents believed their work-up of fevers was neither evidence-based nor cost-effective. This notion of superfluous testing is not specific to febrile patients. In one study at an academic medical center [9], 88% of internal medicine residents surveyed thought they ordered unnecessary laboratory tests. We hypothesize that the culture of sign-out and the volume of patients who residents cover overnight encourages residents to err on the side of ordering more tests for fear that they may disappoint the “primary team.” As our healthcare system strives to curb growing healthcare expenditures, more research is needed to determine what diagnostic testing physicians should order in febrile inpatients with specific clinical scenarios. Elucidating these necessary tests and creating diagnostic algorithms may allow residents to feel more confident in exercising diagnostic restraint overnight.

## CONCLUSIONS

The FFWU is a common tool that internal medicine residents use to simplify recommendations for overnight febrile patients, yet the definition of a FFWU is far from standardized.

A majority of cross-covering residents will order the same studies irrespective of patients' symptoms and are more likely to repeat the FFWU based on the number of hours passed than a change in clinical symptoms. Residents admit the sign-outs they follow are not up-to-date and believe their practices are neither evidence-based nor cost-effective. As our healthcare system continues to emphasize the need for high-value care, the fever work-up represents an area for improvement. Further studies are needed to define objective criteria of when to test hospitalized febrile patients and what tests are appropriate when those criteria are met. As echoed by the American Board of Internal Medicine's Choosing Wisely campaign, we need to shift resident education to not only include teaching on appropriate tests to order, but also on the potential adverse effects of unnecessary testing. A new culture of sign-out should be encouraged in which careful clinical assessment replaces the "shotgun" approach of the FFWU.

### Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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