**Project Title: Predicting Absence of Serious Bacterial Infection in Critically Ill Children**

**DOCTOR/APP VERSION**

**Principal Investigator: Blake Martin MD, COMIRB No: 18-2419**

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PEDIATRIC CRITICAL CARE CLINICIAN INTERVIEW GUIDE

INTERVIEWER INSTRUCTIONS:

• COLLECT INFORMATION ON HOW CRITICAL CARE PROVIDERS AND NURSES DECIDE WHETHER OR NOT TO ADMINISTER ANTIBIOTICS DURING THE FIRST 24 HOURS OF A CHILD’S PICU ADMISSION. WE ARE PARTICULARLY INTERESTED IN UNDERSTANDING THE TYPES OF DATA THAT CLINICIANS VALUE WHEN DECIDING WHETHER ANTIBIOTICS ARE INDICATED (E.G. PAST MEDICAL HISTORY, PATIENT SYMPTOMS, VITAL SIGNS, AND LAB TESTS).

• DETERMINE WHICH PIECES OF PATIENT DATA A CLINICIAN WOULD PREFER TO HAVE IMMEDIATELY AVAILABLE WHEN MAKING ANTIBIOTIC DECISIONS

• EXPLORE THE PREFERRED PRESENTATION OF RELEVANT DATA THAT WOULD BEST FACILITATE THESE DECISIONS

• EXPLORE THE CLINICIAN’S PRIOR EXPERIENCE WITH CLINICAL DECISION SUPPORT TOOLS IN THE ELECTRONIC HEALTH RECORD. WHAT ASPECTS OF THESE TOOLS HAS THE CLINICIAN FOUND HELPFUL AND IN WHAT WAYS ARE THEY LESS HELPFUL? IF WE DEVELOPED A TOOL TO HELP THE CLINICIAN IDENTIFY CHILDREN WITHOUT SERIOUS BACTERIAL INFECTIONS AND ENCOURAGE AVOIDING ANTIBIOTICS, HOW SHOULD THIS PREDICTION/RECOMMENDATION BE PRESENTED TO ENSURE IT IS USEFUL TO THE CLINICIAN?

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We are now going to begin the interview. We will be discussing how providers in the pediatric intensive care unit make decisions on whether to start antibiotics for children newly admitted to the PICU: specifically, during the first 24 hours of PICU admission. Later we will explore your thoughts on how the team should implement a predictive model that is able to identify children without bacterial infections. The goal of that model will be to help clinicians avoid unnecessary antibiotics and their adverse effects. Keep in mind there are no correct or incorrect answers to any of these questions. If at any point a question is not clear, please feel free to ask for clarification. In general, we would like to avoid using the names of patients, patient family members, or your colleagues to protect their privacy. If you accidentally say a person’s name, we can ask the transcriptionist to remove it from the recording later.

I will now turn on the recorder. Are you ready?

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[Turn on recorder]

State the date:

Time:

Location (Zoom)

Participant’s unique ID number:

EXPLORE WHEN AND HOW PICU CLINICIANS MAKE DECISIONS ABOUT ANIBIOTIC ORDERING:

1. To start off with, can you tell me your position at the Hospital?

ATTENDING PHYSICIAN,

CRITICAL CARE FELLOW,

CRITICAL CARE ADVANCED PRACTICE PROVIDER (NURSE PRACTITIONER OR PHYSICIAN ASSISTANT)

How long have you been in your current role? How many years of experience do you have working in critical care?

2. First I’d like to explore your approach to antibiotic discussions with other providers and with the patient’s family. When considering ordering antibiotics for a newly admitted PICU patient:

1. What are your priorities when discussing antibiotics with your team?
2. What do you perceive are the priorities of the other PICU team members regarding antibiotic ordering?
3. How quickly do antibiotic decisions need to be made for a new PICU admission who may have a bacterial infection but does not have sepsis or septic shock?
4. How is the antibiotic decision-making process different when a patient is being co-managed with another service (such as pediatric surgery). PROBE: What happens when the services disagree on antibiotics?
5. Do parents approach the need for antibiotics differently than you? What do you perceive are their values regarding antibiotic decisions?

3. Now let’s discuss the timing of antibiotic ordering for children admitted to the PICU.

1. Are orders for antibiotics to be given in the PICU ever placed before the patient arrives in the PICU? If so, for what types of patients and under what circumstances does this occur?
2. PROBE: Are orders for antibiotics ever placed by a provider not assigned to that patient?

1. If a bacterial infection is suspected, are antibiotics typically ordered right at the time of admission? Or does the team typically wait to discuss the decision with the fellow and/or attending?

4. Are there specific situations in which a bacterial infection is thought less likely however the PICU team decides to order antibiotics anyway?

a. **[IF YES]** What factors motivate the decision to order antibiotics in these situations?

b. **[IF YES]** Is there specific information that, if supplied, might persuade the PICU team to not order antibiotics in such cases?

5. Now we will discuss the various aspects of a patient’s history and presentation that you find helpful in deciding if antibiotics are appropriate for a new PICU admission. For the purposes of these next few questions, please consider a new admission without obvious sepsis or hemodynamic instability for whom the diagnosis of a bacterial infection is unclear.

1. What data helps you decide if antibiotics are warranted? Examples include patients symptoms, past medical history, vital signs, lab results, or imaging tests. Are there patient factors that help you rule-out a bacterial infection?
2. How easy is it for you to find the information from your electronic health record that you need to make an informed decision on whether to order antibiotics?
   1. Follow-up: what electronic health record does your institution use (e.g. Epic, Cerner)
3. How does the time of day affect the decision to start antibiotics? If the patient is admitted toward the end of a shift or in the middle of the night, is the care team more or less likely to order antibiotics? If so, why?
4. What do you see as the risks of not starting antibiotics in a patient who ends up having a bacterial infection?
5. What are the risks of starting antibiotics in a patient **without** a bacterial infection?
6. How certain do you need to be about the absence of a bacterial infection to withhold antibiotics in a new, stable PICU admission? 50%? 90%? 99%? [PAUSE FOR ANSWER AND EXPLANATION]
   1. Does this threshold change if the patient recently received a dose of antibiotics in the ED before their arrival to the PICU?
   2. How does the patient’s past medical history affect this threshold?

EXPLORE HOW CLINICIANS VIEW CLINICAL DECISION SUPPORT TOOLS AND HOW THEY WOULD PREFER THE PRESENTATION OF DATA WITHIN AN ANTIBIOTIC DECISION-MAKING TOOL:

6. Now I’d like to discuss your prior experience with clinical decision support tools (which I’ll refer to as CDS tools). A few examples of CDS tools include alerts sent to your phone or computer, published care paths, ordersets, pop-ups in the electronic health record (such as a reminder to remove a foley or central line or to prescribe VTE prophylaxis), and information displayed while placing orders (including dosing recommendations for medications).

1. What CDS tools have you seen or used in the past while working in the PICU?
2. Are there specific tools you have found helpful? PROBE: What about these tools did you like?
3. Are there CDS tools you did not like? PROBE: how could the tools have been better?

7. The research team has designed a predictive model that uses data from the electronic health record to accurately identify which children in the PICU are very unlikely to have a serious bacterial infection. This model uses 40 different variables from the patient’s chart including vital signs, lab values, and past medical history information. The team is planning on building a clinical decision support tool that can be integrated into the electronic health record that helps the PICU care team identify these low risk patients with the goal of avoiding unneeded antibiotics and their adverse effects. So, in designing such a tool, how should this prediction of low bacterial infection risk be communicated to the care team to maximize its impact and reduce the ordering of unnecessary antibiotics? [PAUSE FOR ANSWER]

1. Some other options include an icon in the patient’s chart that you could hover over with your mouse, a message sent to the provider when ordering an antibiotic, or a pop-up in the patient’s chart. Or what would you recommend?
   1. When should this tool’s predictions be displayed to the PICU care team? Continuously or only when a provider attempts to place an antibiotic order?
2. Would it be helpful if the tool displayed the data from the chart that the model is using to identify the patient as ‘low risk’ of bacterial infection? (For example, a normal c-reactive protein value, a normal average respiratory rate, or a trend toward improved heart rate).

1. Would it be helpful if the tool displayed the actual predicted probability of a bacterial infection being present? (For example, “There is a 1% chance of serious bacterial infection in this patient based on available data”). Or should it just state whether or not the patient is ‘low risk’?

e. Are there any other functions or abilities this antibiotic decision-making tool should have?

Thank you.

WE WANT TO UNDERSTAND THE POSSIBLE BARRIERS TO THE USE OF AN ANTIBIOTIC DECISION-MAKING TOOL. SPECIFICALLY, WHY WOULD A PICU CLINICIAN NOT TRUST THE RESULTS OF THE CDS TOOL?

8. Many of these decision support tools are not actually used by the clinicians they are designed for. Can you think of any reasons why a clinician would be hesitant to trust the predictions of this antibiotic decision-making tool? (*if needed:* that identifies a newly admitted PICU patient as being low risk for having a serious bacterial infection?)

1. *If specific patient examples are given, try to understand the motivation for why the CDS tool would not be followed in that case.*

9. Which of the following would help motivate clinicians to follow the advice of such an antibiotic decision-making CDS tool? (READ OPTIONS BELOW)

1. Displaying the accuracy of the tool, which would be the percent of patients it has so far correctly identified as not having a bacterial infection.

b. Displaying the estimated improvement in patient outcomes since roll-out of the tool such as:

i. The number of cases of C. diff prevented

1. The number of instances of acute kidney injury prevented
2. The number of hospital days reduced
3. A personalized email detailing the accuracy of the CDS tool

10. Finally, we want to understand how a patient’s social and demographic background influences antibiotic decisions. For the purposes of the below patient examples, consider an 18-month-old female who was admitted to the PICU with respiratory failure requiring non-invasive ventilation. She was presumed to have viral bronchiolitis per the referring physician. She is currently febrile, tachycardic, and tachypneic but otherwise non-toxic appearing with a normal blood pressure. Her chest X-ray shows findings of bronchiolitis and is borderline for pneumonia in the right middle lobe. Please describe, [*ask for each scenario]*

1. How would the following situation influence your decision to start or not start antibiotics?

2. Would you be more or less likely to follow the guidance of a decision support tool predicting the patient to be low risk for serious bacterial infection (which includes pneumonia and bacteremia)?

1. The family recently immigrated from central America, does not speak English, and an interpreter is not currently available for their language.
2. The patient and her family are currently unhoused and on Medicaid. They have been living in a homeless shelter for several weeks.
3. The patient comes from a multiracial family and both parents are weary of the healthcare system and doctors in general.
4. The child is Native American and was transported to your institution from an urgent care clinic on a reservation.

11. Is there anything we didn’t talk about that you think is relevant or anything else you would like to add?

Thank you so much for sharing your experiences and knowledge. Your contributions will be an important part of how we improve this process for clinicians, patients, and families.

The principal investigator on the project, Dr. Martin, will be conducting brief, under 30-minute follow-up interviews with a small number of clinicians. In these sessions you would get to participate in a virtual prototyping session and build your own version of the antibiotic clinical decision support tool we’ve been discussing. Your participation would help us understand what design would be most helpful and effective. Are you open to Dr. Martin reaching out to you to participate?