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

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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 48 HOURS OF A CHILD’S PICU ADMISSION. WE ARE PARTICULARLY INTERESTED IN UNDERSTANDING THE TYPES OF DATA THAT CLINICIANS USE TO DETERMINE WHETHER OR NOT ANTIBIOTICS ARE INDICATED (E.G. PAST MEDICAL HISTORY, PATIENT SYMPTOMS, LAB TESTS AND IMAGING 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 HOW THE CLINICIAN HAS INTERACTED WITH CLINICAL DECISION SUPPORT TOOLS IN THE PAST. WHAT ASPECTS OF THESE TOOLS HAS THE CLINICIAN FOUND HELPFUL AND IN WHAT WAYS ARE THEY LESS HELPFUL? IF AN ANTIBIOTIC DECISION SUPPORT TOOL WERE CREATED, HOW SHOULD THE RECOMMENDATION (AND THE BASIS FOR THE 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 clinicians in the pediatric intensive care unit make decisions regarding antibiotics for children who are newly admitted to the PICU: specifically, during the first 48 hours of their PICU admission. 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. If you feel a patient story would assist you in answering, please try to omit the patient’s name. 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:

This guide is meant to encompass many types of clinicians in the PICU. As such there may be questions you do not have any personal experience with or opinion about. When answering these questions, try to share with me your experiences based on the intersection of your role with the topics we’re talking about.

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

The overarching goal is to better understand how the PICU care team decides whether to order antibiotics for a child who has been recently admitted to the PICU.

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

ATTENDING PHYSICIAN,

CRITICAL CARE FELLOW,

CRITICAL CARE ADVANCED PRACTICE PROVIDER (APP),

CRITICAL CARE NURSE

How long have you been in your current role? How many years of experience do you have working in critical care? How common is it for PICU patients to be prescribed antibiotics? (IF NOT COMMON, ask them to take a moment to recall the most recent PICU patient for whom antibiotics were considered)

2. Thank you. I’d like to start by discussing what happens when a new patient is admitted to the PICU.

1. Is it usually known before the patient’s arrival whether a bacterial infection is contributing to their illness?
2. Is it typically clear whether the child has received antibiotics (or will have received antibiotics) prior to their arrival in the PICU)?

3. Who usually enters the orders for a new PICU admission? When are these orders typically placed relative to the patient’s physical arrival in the unit?

There are many reasons why clinicians choose to order antibiotics or not, at certain times and not others

1. Are orders for antibiotics to be given in the PICU ever placed prior to the patient’s physical arrival in the PICU? If so, for what types of patients and under what circumstances does this occur?

i. PROBE: Are orders ever placed by a provider not assigned to that patient? If so, does this often include orders for antibiotics?

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

i. PROBE: How does this process change if the patient recently received antibiotics (e.g., in the emergency room or at the referring facility)?

4. Tell me about your approach with other clinicians when you are considering ordering antibiotics for a newly admitted PICU patient.

1. What are your priorities when discussing antibiotics with your team?

1. What do you perceive are the priorities of the other team members (regarding antibiotic ordering)?

1. How does time affect the dynamics of antibiotic decision-making (both in terms of the timing of communication with the rest of the care-team and timing of patient physiology changes?

1. How is the antibiotic decision-making process different when a patient is being co-managed with other services (such as pediatric surgery).
2. How do you go about resolving disagreements when team members disagree on whether to order antibiotics?

5. Are there any frequently used protocols or care-paths that exist at your institution to guide when antibiotics are or are not recommended? Are any of these protocols specific to PICU patients?

**[IF YES TO 1ST QUESTION]:** Can you expand a bit on these protocols and for what types of patients they are used?

6. Are there specific situations in which a bacterial infection is thought to be of low likelihood 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 defer ordering antibiotics in such cases?

7. 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.

1. What patient signs or symptoms are particularly helpful in determining if a bacterial infection is present? Similarly, are there any signs or symptoms that help you rule-out a bacterial infection?
2. How does the patient’s past medical history affect antibiotic ordering decisions?

i. PROBE: How does immune system status (for example if a patient has a history of cancer or a bone marrow transplant) affect antibiotic ordering decisions?

1. Are there specific vital sign changes or lab tests that help determine the need for antibiotics?

In your opinion, what are a few of the most helpful pieces of patient data that you use when deciding if antibiotics are appropriate? This could include things like vital signs, lab results, imaging results, or past medical problems).

9. How does the time of day affect the decision to start antibiotics? PROBE: If the patient is admitted toward the end of a shift, is the care team more or less likely to order antibiotics?

10. Now I would like to discuss how you think about antibiotic decisions specifically when the presence of a bacterial infection is not clear.

a. How do you think about the risk of starting antibiotics in a patient without a bacterial infection?

1. How do you think about the risks of not starting antibiotics in a patient who ends up having a bacterial infection?
2. How certain do you need to be about the absence of a bacterial infection in a new PICU admission to withhold antibiotics? 95%? 99%?

1. How does this threshold change if the patient recently received antibiotics prior to their arrival in the PICU?

11. Tell me about your approach to parents/guardians (referred to as parents for the rest of the interview) when you are considering ordering antibiotics.

1. Do parents approach the need for antibiotics differently than you? Why or why not?
2. Do you feel that parents are most often relieved, upset, or indifferent if you order antibiotics for their child when the presence of bacterial infection is unclear?

EXPLORE HOW CLINICIANS WOULD PREFER THE PRESENTATION OF DATA WITHIN AN ANTIBIOTIC DECISION-MAKING TOOL:

The research team is planning on building a clinical decision support tool that helps the PICU care team identify newly admitted PICU patients who are at **low risk** of having a bacterial infection. A primary goal of this tool would be to support clinicians in identifying which children do not need antibiotics. We would like to discuss how to design such a tool so that it can be as helpful as possible for the PICU care-team.

12. To begin, what types of clinical decision support tools have you seen or used in the past while working in the PICU? A few examples of such Clinical Decision Support (CDS) tools include pop-ups in the electronic health record, alerts sent to your phone or computer, published care paths or protocols, condition-specific ordersets, and information displayed while placing orders (for example dosing recommendations for medications).

13. What is your overall impression of these tools? Have they improved the care that you have delivered patients in the PICU overall? If yes, what tools have you found helpful? If no, how could the tools have been better? (PROBE: have CDS tools interrupted their workflow?)

1. [LOOKING for them to mention reasons not to believe or follow a clinical decision support tool]

If an alert or tool was built to help clinicians identify PICU admissions at low risk for bacterial infection, how should this prediction be communicated to the care team to maximize its impact?

1. Would it be helpful if the tool displayed the main variables that lead to such predictions? (For example, a normal inflammatory marker in the blood, a normal respiratory rate, a recent trend toward improved heart rate). PROBE: What type of variables within the model would be most convincing to you to not start antibiotics? Some examples include vital sign trends, lab values, lack of a central line, level of respiratory support.

1. Would it be helpful if the tool displayed the 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”).
2. How should the alert be communicated to the PICU team? Possible strategies include a phone message, a pop-up in the patient’s chart, or a visualization on the central PICU monitors. If you have a different idea for how to present these predictions, please share.

1. When should this tool’s predictions be displayed to the PICU care team? Continuously if the tool predicts that a bacterial infection is unlikely, or only when a provider attempts to place an antibiotic order?

e. Are there any other functions or abilities this antibiotic decision-making tool should have? Is there any additional data or information that the tool should display or provide to the PICU care team?

LASTLY, 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?

14. Many clinical decision support tools are not utilized by the clinicians they are designed for. Can you think of any reasons why a clinician would be hesitant to trust the prediction of CDS tool telling them that a newly admitted PICU patient is at low likelihood of having a serious bacterial infection?

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

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

a. Displaying the number of antibiotic-days the tool has spared children thus far in a public location in the PICU

b. Displaying the number of patients correctly and incorrectly identified as not having a bacterial infection by the tool among all admitted patients.

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

i. The number of cases of clostridium difficile 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

16. 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 regarding antibiotic decision-making in the PICU. Your contributions will be an important part of how we can begin to improve this process for both clinicians, patients, and families.