SUPPLEMENT

Strategies, staffing, and diversity of pediatric antimicrobial stewardship programs in the United States

Christina S. Manice, MD,[1,2,3] Alexander S. Plattner, MD, MBA,[4,5] Edan Leshem,[4] Jason G. Newland, MD, MEd,[6] Mari M. Nakamura, MD, MPH [1,2,3]

Affiliations:

[1]Division of Infectious Diseases, Boston Children's Hospital, Boston, MA, USA

[2]Antimicrobial Stewardship Program, Boston Children's Hospital, Boston, MA, USA

[3]Department of Pediatrics, Harvard Medical School, Boston, MA, USA

[4]Division of Infectious Diseases, Department of Pediatrics, Washington University School of Medicine, St. Louis, MO, USA

[5]Institute for Informatics, Data Science, and Biostatistics, Washington University School of Medicine, St. Louis, MO, USA

[6]Division of Infectious Diseases, Nationwide Children's Hospital and The Ohio State University, Columbus, OH, USA

Table of Contents

Survey, Part I

ASP Survey Start

Please complete the survey below to the best of your knowledges. Feel free to consult others, as needed.

If you have any questions, please contact Alex Plattner (aplattner@wustl.edu).

Thank you!

Full Name:
_____

Email:
_____

Hospital Demographics

Hospital name:
_____

Hospital location (city, state):
_____

What is your position within the hospital?
- ○ Physician
- ○ Pharmacist
- ○ Nurse Practitioner
- ○ Registered Nurse
- ○ Data Analyst
- ○ Infection Prevention Specialist
- ○ Other _____

Select the option that best describes your hospital.
- ○ Freestanding children's hospital (with or without affiliated pediatric clinics)
- ○ Children's hospital contained within a larger adult/pediatric healthcare system
- ○ Specialist Children's Hospital (e.g. Children's Cancer Center)
- ○ Pediatric/Neonatal Units within a Specialist Adult Hospital (e.g. cancer hospital) with a pediatric ward
- ○ Other _____

Total licensed hospital bed count (only pediatric beds if in a hospital that has adult beds):
_____

For the purposes of this survey we define an Antimicrobial Stewardship Program (ASP) as follows:
ASP a comprehensive program that functions continuously to monitor antimicrobial use, that includes fulltime equivalents (FTEs) dedicated for a clinical pharmacist and/or pediatric infectious disease specialist.

According to the definition above, does your hospital have a pediatric ASP?
- ○ Yes
- ○ No

You stated that your hospital does not currently have a pediatric ASP. Which of the following reasons best describe why? (Select all that apply.)
- ☐ Lack of support from hospital administration
- ☐ Lack of time
- ☐ Lack of personnel
- ☐ Lack of funding
- ☐ Program is currently in the development stage
- ☐ Other _____

What year was your formal pediatric ASP established?

_____

Was there informal ASP activity prior?　　　　　◯ Yes
　　　　　　　　　　　　　　　　　　　　　　　◯ No

When did this informal activity start?

_____

Provider FTE

Please complete the survey below.

Thank you!

The following questions refer to inpatient ASP settings.

Indicate whether your hospital has the following positions with dedicated FTE to inpatient pediatric ASP (select all that apply):

_____

Total Physicians: _____ Total Physician FTE: _____
Total Pharmacists: _____ Total Pharmacist FTE: _____
Total Registered Nurses: _____ Total Registered Nurse FTE: _____
Total Nurse Practitioners: _____ Total Nurse Practitioner FTE: _____
Total Data Analysts: _____ Total Data Analyst FTE: _____
Total Infection Preventionists: _____ Total Infection Preventionist FTE: _____
Total [inpatient_other]s: _____ Total [inpatient_other] FTE: _____

How many of your ASP physicians are Pediatric ID trained?

_____

You indicated that [pedidtraining_physician] ASP physician(s) are Pediatric ID trained. What are other ASP physician training types?

_____

The following questions are calculated based on your inpatient ASP.

How many total providers receive FTE for your inpatient ASP?

_____

How much total FTE is dedicated to your inpatient ASP?

_____

The following questions refer to outpatient ASP settings.

Does your ASP perform outpatient stewardship?
○ Yes
○ No

Does your ASP have dedicated FTE for outpatient stewardship works?
○ Yes
○ No

If your ASP does not have dedicated outpatient FTE, ignore this table.

If you answered "Yes" above for outpatient FTE, indicate whether your hospital has the following positions with dedicated FTE for outpatient ASP settings (select all that apply):

_____

Total Physicians: _____ Total Physician FTE: _____
Total Pharmacists: _____ Total Pharmacist FTE: _____
Total Registered Nurse: _____ Total Registered Nurse FTE: _____
Total Nurse Practitioners: _____ Total Nurse Practitioner FTE: _____
Total Data Analysts: _____ Total Data Analyst FTE: _____
Total Infection Preventionists: _____ Total Infection Preventionist FTE: _____
Total [outpt_other]s: _____ Total [outpt_other] FTE: _____

How many physicians are Pediatric ID trained?

_____

You indicated that [pedidtraining_physician]
physician(s) is Pediatric ID trained. What are other
physician training types?

_____

The following questions are calculated based on your outpatient ASP.

How many total providers receive FTE for your
outpatient ASP?

_____

How much total FTE is dedicated to your outpatient
ASP?

_____

6

CDC 2019 Core Elements

Please complete the survey below.

Thank you!

Hospital Leadership Commitment

To what part of hospital leadership does your ASP report stewardship activities and/or outcomes? (Select all that apply.)

☐ Hospital Quality and Safety Leadership
☐ Pharmacy Leadership
☐ Infection Prevention and Control
☐ Division of Pediatric Infectious Diseases
☐ Other _____
☐ None

How often do you report to hospital quality and safety leadership?

○ Weekly   ○ Monthly   ○ Quarterly   ○ Semi-Annually   ○ Annually   ○ Other _____

How often do you report to pharmacy leadership?

○ Weekly   ○ Monthly   ○ Quarterly   ○ Semi-Annually   ○ Annually   ○ Other _____

How often do you report to infection prevention and control leadership?

○ Weekly   ○ Monthly   ○ Quarterly   ○ Semi-Annually   ○ Annually   ○ Other _____

How often do you report to division of pediatric infectious diseases leadership?

○ Weekly   ○ Monthly   ○ Quarterly   ○ Semi-Annually   ○ Annually   ○ Other _____

How often do you report to [leadership_other]?

○ Weekly   ○ Monthly   ○ Quarterly   ○ Semi-Annually   ○ Annually   ○ Other _____

Does your ASP receive adequate financial resources for staffing from hospital leadership?

○ Yes
○ No

What additional staffing do you need?

_____

Does your ASP receive adequate financial resources for information technology from hospital leadership?

○ Yes
○ No

What additional information technology resources do you need?

_____

Accountability

Who leads or co-leads your ASP? (Select all that apply.)	☐ ID Physician ☐ Other Physician _____ ☐ Pharmacist ☐ Registered Nurse ☐ Nurse Practitioner ☐ Data Analyst ☐ Infection Prevention ☐ Other Non-Physician _____
Does your hospital have a multidisciplinary ASP committee? A multidisciplinary committee is defined by being composed of a combination of medical staff from different specialties, pharmacy services, nursing staff, infection prevention and control programs, data technicians/analysts, and/or quality improvement experts.	○ Yes ○ No
How frequently does the committee meet?	○ Weekly ○ Monthly ○ Quarterly ○ Semi-Annually ○ Annually ○ Other _____

Pharmacy Expertise

What is the training of the pharmacist(s) involved with ASP efforts? (Select all that apply.)	☐ Pediatrics (non-ID) ☐ Adult ID ☐ Pediatric ID ☐ Other _____
Has the pharmacist(s) involved with ASP efforts received any formal training in ASP (e.g., participation in a certificate program)?	○ Yes ○ No
Does the pharmacist(s) lead or co-lead antimicrobial stewardship implementation efforts?	○ Yes ○ No

Action

In which of the following hospital departments and services does your ASP perform stewardship activities? (Select all that apply.)	☐ In-patient, hospitalizations ☐ Emergency department ☐ Out-patient facilities within the hospital ☐ Other _____
Does your hospital ASP require pre-authorization of any antimicrobials?	○ All ○ Some ○ None

For antimicrobials on your formulary, which antimicrobials do you restrict? If an antimicrobial is not on your formulary, leave that option blank.

(Choosing "some" will expand that section for individual drugs in each class - please select all that you restrict from your formulary).

Antibiotics
Penicillins _____

_____

Cephalosporins _____

_____

Carbapenems _____

_____

Aztreonam _____
Aminoglycosides _____

_____

Macrolides and/or Derivatives _____

_____

Glycopeptides _____

_____

Polypeptides _____

_____

Fluoroquinolones _____

_____

Tetracyclines _____

_____

Oxazolidinones _____

_____

Rifamycins _____

_____

Clindamycin _____
Chloramphenicol _____
Metronidazole _____
Nitrofurantoin _____
Trimethoprim/Sulfamethoxazole _____
Daptomycin _____

Fosfomycin _____
Antivirals _____

_____

Antifungals _____

_____
Antiparasitics _____

_____

Who approves the antimicrobial? (Select all that apply.)	☐ ASP ☐ ID fellow or advanced practitioner (outside ASP) ☐ ID attending (outside ASP)
Do restricted antimicrobials require a formal ID consult for approval?	◯ Yes, All ◯ Yes, Some ◯ No
How is approval communicated? (Select all that apply.)	☐ From approver to ordering provider ☐ From approver to pharmacy ☐ Other _____
Does your ASP require approval to dispense overnight doses of restricted antimicrobials?	◯ Yes ◯ No
(Optional) Please include any other details that you feel are important to how your ASP handles restricted antimicrobials:	_____
Does your hospital ASP perform prospective audit and feedback of any antimicrobials?	◯ All ◯ Some ◯ None

For antimicrobials on your formulary, which antimicrobials do you perform audit and feedback?

(Choosing "some" will expand that section for individual drugs in each class - please select all that you audit and feedback from your formulary).

  Antibiotics
Penicillins _____

_____

Cephalosporins _____

_____

Carbapenems _____

_____

Aztreonam _____
Aminoglycosides _____

_____

Macrolides and/or Derivatives _____

_____

Glycopeptides _____

_____

Polypeptides _____

_____

Fluoroquinolones _____

_____

Tetracyclines _____

_____

Oxazolidinones _____

_____

Rifamycins _____

_____

Clindamycin _____
Chloramphenicol _____
Metronidazole _____
Nitrofurantoin _____
Trimethoprim/Sulfamethoxazole _____
Daptomycin _____
Fosfomycin _____
Antivirals _____

_____

Antifungals _____
_____
Antiparasitics _____
_____

Does your ASP utilize handshake stewardship?	◯ Yes ◯ No
How does your ASP perform audit and feedback? (eg: Who does audit? Who does Feedback?, Do you review data besides antibiotic orders? How are recommendations/feedback delivered?)	_____
Do you audit antimicrobials in all units?	◯ Yes ◯ No

Which units do you audit? (Select all that apply.)	☐ PICU (including all non-neonatal ICUs) ☐ NICU ☐ Oncology/BMT ☐ ER ☐ General Pediatrics ☐ Surgery ☐ Other _____
Does your ASP track and document recommendations to clinicians for audit and feedback? (Select all that apply)	☐ Tracked within the EHR ☐ Tracked outside the EHR ☐ Recommendations not tracked ☐ Documented within the EHR, visible to clinicians ☐ Documented outside the EHR, visible to clinicians ☐ Documentation not visible to clinicians ☐ Recommendations not documented
(Optional) Please include any other details that you feel are important to how your ASP performs audit and feedback:	_____
What does your ASP emphasize most?	○ Pre-authorization ○ Prospective audit and feedback ○ Combination of pre-authorization and prospective audit and feedback

Tracking

Does your hospital ASP monitor antibiotic use reports on a regular basis (e.g., monthly, quarterly, etc.)?	○ Yes ○ No
Do you monitor days of therapy per 1,000 patient days?	○ Yes ○ No
What other denominator do you use for reporting antibiotic use?	_____
Do you report data to the National Healthcare Safety Network (NHSN) Antimicrobial Use Option? (Select all that apply.)	☐ Yes, antibiotic use data ☐ Yes, antibiotic resistance data ☐ No
Do you use NHSN data for any ASP efforts?	○ Yes ○ No
Has your hospital ASP implemented evidence-based guidelines for prescribing antibiotic use for the following common indications? (Select all that apply.)	☐ CAP ☐ UTI ☐ SSTI ☐ C. difficile infections ☐ Surgical prophylactic antibiotics ☐ Other _____
Does your hospital ASP evaluate adherence to at least one of the guidelines selected above?	○ Yes ○ No

Which one(s) are evaluated? (Select all that apply.)

☐ CAP
☐ UTI
☐ SSTI
☐ C. difficile infections
☐ Surgical prophylactic antibiotics
☐ Other _____

Reporting

Does your ASP share antibiotic use data with the following? (Select all that apply.)

☐ Hospital administration
☐ Front-line clinicians
☐ Pharmacy and therapeutics (P&T) committee
☐ ASP committee
☐ Other _____
☐ None of the above

Does your hospital/microbiology lab develop an annual antibiogram?

○ Yes
○ No

Does your hospital/microbiology lab develop a separate pediatric antibiogram?

○ Yes, we make a separate antibiogram
○ No, we only have a shared adult/pediatric antibiogram
○ N/A, our ASP is a separate pediatric hospital with only one antibiogram

Education

Which of the following educational activities does your ASP perform? (Select all that apply.)

☐ Annual education to all prescribers (e.g., required online module)
☐ Lectures to trainees
☐ Grand Rounds
☐ Education targeting patients and families
☐ Other _____
☐ None of the above

Does your ASP offer rotations to any of the following trainees? (Select all that apply.)

☐ Medical Students
☐ Medical Residents
☐ Medical Fellows
☐ Pharmacy Students
☐ Pharmacy Residents
☐ Other _____
☐ None

Does your hospital/ASP provide education to prescribers as part of the prospective audit and feedback process?

○ Yes
○ No

13

REDCap®

Survey, Part II

Provider DEI

Please complete the survey below.

Thank you!

Please select your position:	○ Physician ○ Pharmacist ○ Registered Nurse ○ Nurse Practitioner ○ Data Analyst ○ Infection Preventionist ○ Other _____
Which of the following pharmacy training have you completed?	☐ Pediatric ID ☐ Adult ID ☐ Pediatric non-ID ☐ Other _____
Have you completed a formal ASP training (e.g., certificate program)?	○ Yes ○ No
What hospital do you work for?	_____
Do you participate in inpatient or outpatient ASP?	○ Inpatient ○ Outpatient ○ Both
What is your race? (Select all that apply.)	☐ American Indian or Alaska Native ☐ Asian ☐ Black or African American ☐ Native Hawaiian and Other Pacific Islander ☐ White ☐ Some other race _____ ☐ Prefer not to answer
Do any of the following also apply to you? (Select all that apply.)	☐ Japanese ☐ Filipino ☐ Chinese ☐ Korean ☐ Other Asian _____

Do any of the following also apply to you? (Select all that apply.)	☐ Native Hawaiian ☐ Pacific Islander ☐ Samoan ☐ Tongan ☐ Maori ☐ Fijian ☐ Chamarro ☐ Cuukese ☐ Kosraen ☐ Mashallese ☐ Palauan ☐ Pohnpeian ☐ Yapese ☐ Other Pacific Islander _____
Are you of Hispanic, Latino, or Spanish origin?	◯ No, not of Hispanic, Latino, or Spanish origin ◯ Yes ◯ Prefer not to answer
Do any of the following also apply to you? (Select all that apply.)	☐ Mexican, Mexican American, Chicano ☐ Puerto Rican ☐ Cuban ☐ Another Hispanic, Latino, or Spanish origin _____
Which term best describes your gender identity?	◯ Woman ◯ Man ◯ Non-binary ◯ Transgender man/Female-to-male (FTM) ◯ Transgender woman/Male-to-female (MTF) ◯ Gender non-binary/Genderqueer/Gender nonconforming ◯ Agender ◯ Bigender ◯ None of these (other) _____ ◯ Prefer not to answer
What was your assigned sex at birth?	◯ Male ◯ Female ◯ Prefer not to answer
How many years are you removed from completion of your highest level of training?	_____
How many total years have you worked in ASP, following completion of training?	_____