



# Increasing Safety Net Antibiotic Prescriptions for Acute Otitis Media in Urgent Care Clinics

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**Objective** To evaluate the effectiveness of multifaceted interventions in improving the use of safety net antibiotic prescriptions (SNAPs) for nonsevere acute otitis media (AOM).

**Study design** We used quality improvement methodology to develop iterative Plan-Do-Study-Act cycles to increase the use of SNAP for nonsevere AOM in 3 pediatric urgent care centers from October 2021 to June 2023. Interventions included education, electronic health record changes, audits and feedback, and a time-limited financial incentive. We measured the percentage of eligible patients with AOM offered SNAP as our primary outcome. Our secondary outcome measured the percentage of SNAPs accepted. Our process measure evaluated the percent of SNAP eligibility documentation. Our balancing measure evaluated the percent of return visits for AOM within 14 days of initial diagnosis. We used control charts to evaluate special cause variation.

**Results** We reviewed 29 316 encounters. SNAP eligibility rates ranged from 27.6% to 45.5% over time. The percentage of eligible patients offered SNAP had 2 center line shifts, increasing from 7.2% to 49.7% as the rate of SNAP eligibility documentation had similar center line shifts increasing from 5.7% to 52.7%. There was no change in the rate of return visits for AOM of 4.3%. The number of SNAPs accepted each month had a center line shift increasing from a mean of 20 to 139.

**Conclusions** The offering of SNAPs to patients with nonsevere AOM increased as clinician documentation of SNAP eligibility increased. This strategy could be implemented broadly to improve antibiotic stewardship. (*J Pediatr* 2024;14:200122).

Judicious use of antibiotics is necessary to effectively treat infections while minimizing patient harm and antibiotic resistant organisms.<sup>1,2</sup> Acute otitis media (AOM) is the most common reason for antibiotic prescribing in children,<sup>3</sup> yet studies have shown that 70%-80% of AOM cases will self-resolve without antibiotics.<sup>4-10</sup> The American Academy of Pediatrics encouraged offering a period of observation before beginning antibiotics for nonsevere cases of AOM in its policy statement in 2004 and again in 2013.<sup>11,12</sup> Despite this recommendation, clinicians still prescribe immediate antibiotic treatment for most children diagnosed with AOM.<sup>10,13</sup> A study of patients diagnosed with AOM in the outpatient setting reported antibiotics were prescribed for >98% of patients with AOM, with only 4.5% of those offered a period of observation.<sup>13</sup>

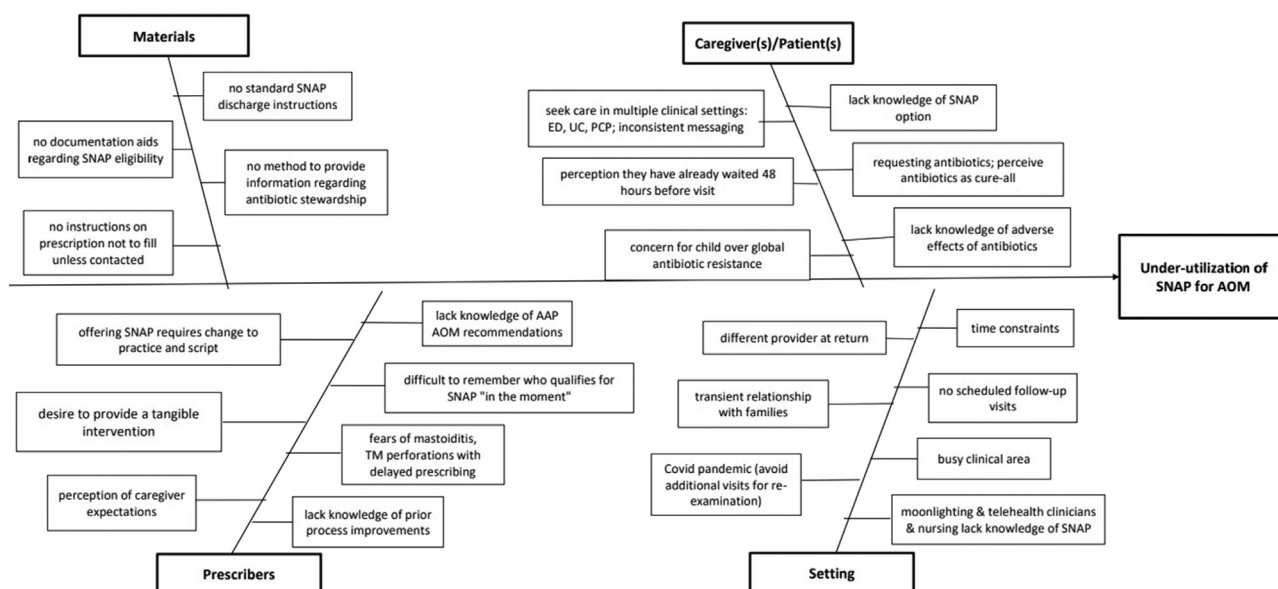
Urgent care (UC) clinicians have been shown to prescribe antibiotics at higher rates compared with clinicians in other care settings.<sup>14</sup> A survey of UC clinicians reported perceived family expectations and concern for lack of follow-up as barriers to following national guidelines for antibiotic prescribing.<sup>15</sup> One method of implementing a period of observation for AOM that addresses the reported barriers for UC clinicians is a safety net antibiotic prescription (SNAP). A SNAP is an antibiotic prescribed at the time of visit; however, the family is instructed to only administer the medication if symptoms worsen or do not improve after a period of observation. The use of SNAPs has been associated with a 50%-88% decrease in antibiotic use for patients with AOM.<sup>4,5,7-9</sup>

We assessed the use of antibiotics for AOM in our UC clinics and found that 97.7% of patients with AOM in our UCs received an antibiotic prescription, either a SNAP (3.4%) or an immediate (96.6%) prescription. UC clinicians offered SNAP to only 7.2% of eligible patients with nonsevere AOM. We developed this quality improvement (QI) project with the aim of increasing the percent of eligible patients with AOM offered SNAP from our baseline of 7.2% to 40% over 21 months.

AOM	Acute otitis media
EHR	Electronic health record
QI	Quality improvement
SNAP	Safety net antibiotic prescription(s)
UC	Urgent care

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**Figure 1.** Ishikawa diagram identifying barriers to offering SNPs in the UC setting. AAP, American Academy of Pediatrics; tympanic membrane (TM).

## Methods

### Context

The study took place at 3 freestanding pediatric UCs associated with a large academic medical center in a mid-western metropolitan area with >100 000 encounters a year. The UCs are staffed by board-certified general pediatricians, advanced practice registered nurses, and moonlighting pediatric subspecialists.

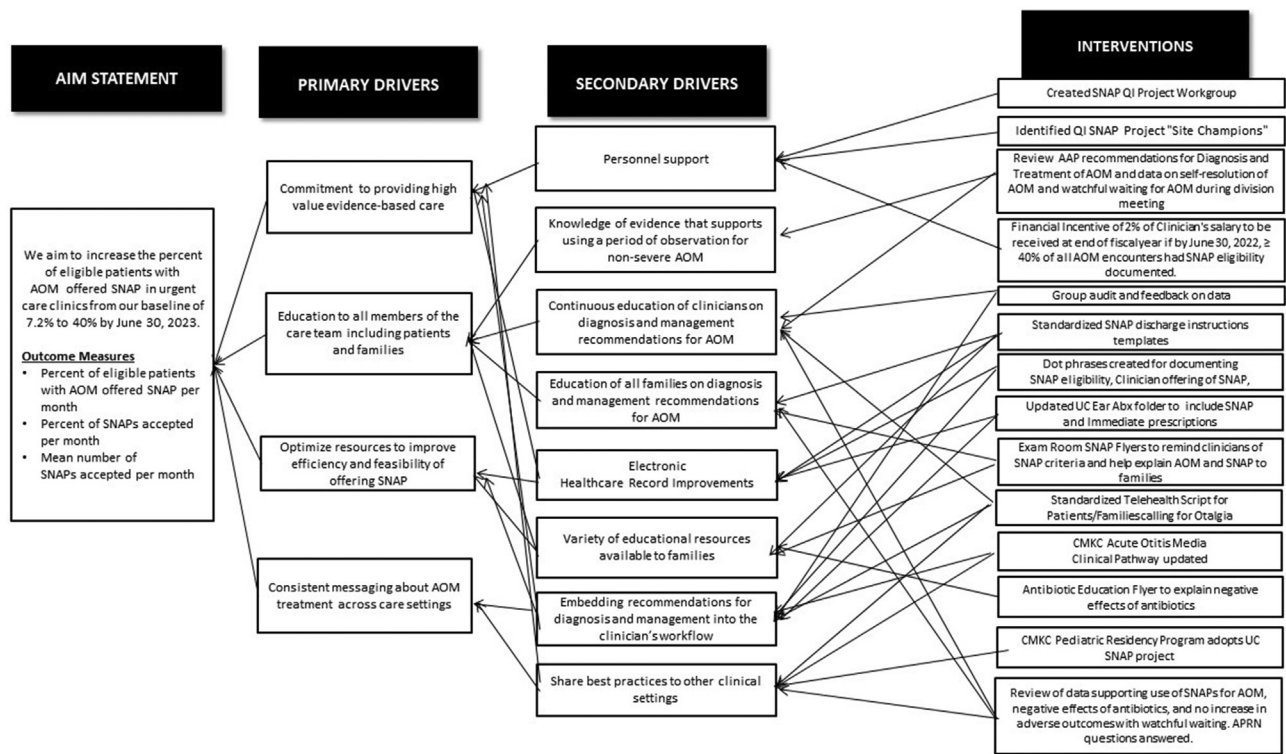
### Project Design

In September 2021, we developed a multidisciplinary QI workgroup composed of UC clinicians, an infectious diseases physician, and a biostatistician to implement a QI initiative. The workgroup used the Institute of Healthcare Improvement's Model for Improvement<sup>16</sup> to identify barriers to offering SNPs to patients with AOM who met criteria (Figure 1), including transient relationships between UC clinicians and families, time constraints in the UC setting, perceived family expectations, technical barriers, and variations in clinical practice. We created a key driver diagram to identify primary drivers that would encourage clinicians to offer SNAP, including commitment to providing high-value evidence-based care, education of all care team members, optimization of resources, and consistent messaging across the care continuum (Figure 2). From these drivers, we devised interventions such as clinician and family education, a standardized process for offering SNAP, electronic health record (EHR) tools to aid in documentation and prescribing, and a preliminary, time-limited financial incentive for UC physicians. We incorporated lessons learned from a similar QI project performed in our institution's emergency department to inform our project and develop interventions.<sup>17</sup>

We created a monthly EHR report of all encounters of patients between 6 months and 18 years seen in our 3 UCs with a discharge diagnosis of AOM. We collected patient characteristics including age, weight, concomitant diagnoses, maximum reported temperature, duration of otalgia, and any return visits for AOM symptoms within 14 days of the index visit.

We considered patients SNAP eligible if documentation of the encounter met the following conditions: nonsevere AOM symptoms, no chronic ear conditions, underlying anatomical abnormalities, otorrhea, antibiotic use in the last 30 days, or concomitant diagnoses that required an antibiotic, and patients ≤24 months old must have only unilateral AOM. For this project, we defined nonsevere AOM symptoms as otalgia for ≤48 hours and fever <39°C. Owing to inconsistent documentation of patients' otalgia severity, we did not include this as a SNAP eligibility criterion. We considered SNAP eligibility documented if the clinician either explicitly documented that a patient did or did not meet SNAP criteria or if the clinician documented discussing or offering SNAP during the encounter. Examples of a clinician documenting SNAP offered include, "I discussed the use of SNAP with this family," "SNAP was discussed," or "SNAP was declined."

We considered SNAP accepted if documentation reflected caregivers agreed outright to a SNAP or if caregivers stated they would monitor symptoms and begin the antibiotic based on recommendations. Examples of documented accepted SNPs included, "Family agrees with SNAP," or "A SNAP has been sent to the pharmacy." A caregiver who accepted a SNAP either received a printed antibiotic prescription to take home and fill if needed or had an antibiotic prescription sent electronically to the patient's pharmacy with instructions to the pharmacist to fill only upon request.



**Figure 2.** Key driver diagram.

Members of our QI workgroup manually reviewed the documentation of all AOM encounters from October 2020 to September 2021 to evaluate whether each patient was SNAP eligible, if the clinician offered a SNAP, and if offered, if the family accepted or declined the SNAP. This work established our baseline data and identified temporal trends. Thereafter, our workgroup continued to review the EHR of each newly diagnosed AOM encounter manually by month during the intervention period from October 2021 through June 2023. Six months after the conclusion of our intervention period, we reviewed all encounters with a diagnosis of AOM manually in December 2023 to evaluate sustainability.

### Interventions

During the study period, we implemented iterative multifaceted interventions through Plan-Do-Study-Act cycles (Table 1). We included all clinicians at all 3 UC sites and introduced interventions at all sites simultaneously. The process for offering and documenting SNAP eligibility and SNAP acceptance or refusal was the same at all sites.

In October 2021, we began our intervention period by asking all UC clinicians to document the SNAP eligibility status of every patient diagnosed with AOM. We shared baseline data and provided a virtual 30-minute didactic session for all UC clinicians. Education topics included the natural course of untreated AOM; the influence of vaccination on the incidence, etiology, and complication rates of AOM; the American Academy of Pediatrics recommended

guidelines for AOM treatment; and guidance on how to counsel families about the option of using a SNAP. Additionally, we encouraged the use of AOM prescription order sets that had been developed previously.<sup>16</sup> These prewritten orders allowed clinicians to easily choose a SNAP AOM prescription option which included a prefilled comment to only fill upon request, thereby saving clinicians' time.

During the first 9 months of this study (October 2021 to June 2022), core UC physicians participated in our Department of Pediatrics' long-standing annual QI incentive program. This program allowed each division to select an improvement goal to earn  $\leq 2\%$  of the physician's individual base salary. UC clinicians who documented SNAP eligibility status for  $\geq 40\%$  of encounters with AOM were eligible for a financial incentive. The act of offering SNAP was not incentivized. The financial incentive concluded on June 30, 2022.

Beginning in November 2021, and throughout the project, we provided feedback monthly in the form of sharing division-level data on the rates of SNAP eligibility documentation, SNAP offering, and SNAP acceptance through virtual division meetings or via email. In later months, we celebrated clinicians who offered SNAP most frequently with a note of acknowledgement during these feedback sessions.

In December 2021, we provided templates for documentation of SNAP criteria in the EHR and standardized SNAP discharge instructions. These interventions targeted the concern that documenting patients' SNAP eligibility would take more time. This documentation served as a reminder

**Table I. Implementation strategies used during the intervention period**

SNAP QI implementation strategies								
Month	Actor	Action/intervention	Intervention type	Action target	Temporality	Dose	Goal	Method
April 2021	Division QI Director (physician)	Created SNAP QI Project Workgroup	Organizational	UC Clinicians (APRNs and Physicians)	Start of Project (1)	1-Hour monthly virtual meeting held through entire project	Include stakeholders from all 3 UC sites, both APRN and physicians	Email and word-of-mouth invitation to participate
April 2021	SNAP QI Workgroup	Identified QI SNAP Project "Site Champions"		UC Clinicians	Start of Project (2)	Available to UC clinicians at all sites throughout duration of the project and afterward	These physician/APRN clinicians would be available onsite to answer questions/concerns about the project and relay information back to SNAP Workgroup	In-person contact
Sept 2021	SNAP QI Workgroup	Brainstormed barriers to practice of offering SNAPS in UC (created fishbone diagram)		UC Clinicians	Start of Project (3)	1-2 Meetings to create then shared at UC division meeting	To discuss reasons for the gap in recommended vs local practice of delayed antibiotic prescribing for AOM	Workgroup meeting; fishbone shared at UC division meeting
Sept 2021	SNAP QI Workgroup	Created driver diagram to identify effective interventions		UC Clinicians	Start of Project (4)	1-2 Meetings to create then shared at UC division meeting	To discuss drivers that would help us reach our aim	Workgroup meeting; Driver diagram shared at UC division meeting
Oct 2021	Physician Division QI Director/SNAP Project Leader	Power point review of AAP recommendations for diagnosis and treatment of AOM and data on self-resolution of AOM and watchful waiting for AOM	Education	Education for UC clinicians	Given at start of intervention period	30-Minute presentation at division UC meeting	Remind/educate clinicians re: AAP recommendations and recent literature supporting use of watchful waiting to improve antibiotic stewardship	UC division meeting
Oct 2021	Physician Division QI Director/SNAP Project Leader	Request of all UC providers to document whether patients diagnosed with AOM met SNAP eligibility criteria or not	Documentation - process measure	UC clinicians	Start of intervention period	Challenge given at start of study period and reminders and data updates given monthly	To reinforce SNAP eligibility criteria in clinicians' minds and increase the likelihood clinicians would offer SNAP to eligible patients	UC division meeting and monthly updates
Oct 2021	Department of Pediatrics, Division of Urgent Care	Financial incentive of 2% of clinician's salary to be received at end of fiscal year if by June 30, 2022, $\geq 40\%$ of all AOM encounters had SNAP eligibility documented	Financial Incentive	UC Core Physicians	Introduced at start of intervention period, Oct 2021; Incentive ended in June 2022; Paid in Oct 2022	One-time bonus based on 10 months of physician documentation	To encourage physician clinician participation in project and transition to practice of offering watchful waiting which was new to most Clinicians	Info presented at UC division meeting and reminder emailed in Jan 2022

(continued)

Table I. Continued

## SNAP QI implementation strategies

Month	Actor	Action/intervention	Intervention type	Action target	Temporality	Dose	Goal	Method
Nov 2021	Physician Division QI Director/SNAP Project Leader	Report given on data at division level: % of patients with AOM with SNAP eligibility documented, % patients eligible for SNAP, % eligible patients offered SNAP, % patients who accepted SNAP	Group audit and group feedback	UC clinicians	Begun first month after intervention period started	Monthly	To share data and progress with all UC Clinicians, and to remind and encourage them to document SNAP eligibility To offer clinicians opportunity to actively participate in the project by discussing barriers, questions, or suggesting new interventions	Division-level data either presented at division meeting every other month, or emailed
Dec 2021	UC Division SNAP QI Work group	EHR shortcuts - dot phrases created for documenting SNAP eligibility, Clinician offering of SNAP, and standardized SNAP discharge instructions (see Supplement 2); updated UC Ear antibiotics folder to include SNAP plus Immediate prescription	Structural - EHR additions	UC clinicians	Made available 4 months after start of intervention period for ongoing use thereafter	Permanent additions made to EHR	To help clinicians save time documenting project information and standardize discharge instructions to facilitate Clinicians' use of SNAP	Info presented at UC division meeting and reminder emailed
Jan 2022	UC Division SNAP QI Work group	Examination room SNAP flyers	Clinical aid for clinicians, education for families	UC clinicians and families	Made available 4 months after start of intervention period for ongoing use thereafter	Present in examination rooms as a visual aide for clinicians from Jan 2022 through present Later uploaded to our external website for community pediatricians	Remind clinicians of inclusion/exclusion criteria for SNAP and give clinicians photos to show families when explaining SNAP	Flyers placed in all patient examination rooms; Info presented at UC division meeting and reminder emailed
May 2022	UC Division SNAP QI Work group	Standardized telehealth script for patients/families with otalgia	Clinical aid for clinicians, education for families	UC clinicians and families	Shared with UC clinicians at division meeting in May 2022, then posted in UC telehealth resource guide for ongoing use thereafter	Available reference in UC telehealth resource guide (continuous)	Keep messaging about otalgia and when to seek care consistent between telehealth and in-person UC clinicians	Script was posted as a reference in the telehealth resource guide; info presented at UC division meeting and reminder emailed

(continued)



Table I. Continued

## SNAP QI implementation strategies

Month	Actor	Action/intervention	Intervention type	Action target	Temporality	Dose	Goal	Method
May 2022	Physician Division QI Director/SNAP Project Leader	List of UC clinicians who had the highest numbers of SNAP prescriptions accepted posted	Individual audit and feedback	UC clinicians	Begun 8 months after intervention period began	Every other month after May 2022	Recognize clinicians who successfully offered SNAP to patients; encourage other clinicians by demonstrating others' success; allow clinicians not having patients accept SNAPS to ask questions of clinicians having success	Data either presented at division meeting or emailed
June 2022	Physician Division QI Director/SNAP Project Leader	Any email updates or messages related to UC SNAP QI project now also sent to clinicians "moonlighting" in UC	Education	Moonlighting clinicians	Started 8 months after intervention period began then continued	Monthly after June 2022	Educate and encourage clinicians outside our division of UC to update their treatment of AOM to recommended guidelines and be consistent with UC clinician practices	Email to clinicians who moonlight in UC
August 2022	UC Division SNAP QI Work group	Online SNAP education module created	Education	UC clinicians; moonlighting clinicians	Released 11 months after intervention period began	Remains available on external website (continuous)	Remind and educate clinicians about the negative effects of antibiotics; improve antibiotic stewardship through use of SNAPS	Module info shared with UC division via email then posted online
August 2022	UC Division SNAP QI Work group	Article about SNAP published in regional monthly newsletter	Education and collaboration	Community pediatricians	Published 11 months after intervention period began	One time publication	To share project information and use of SNAP practice with local community pediatricians/clinicians to help with consistency and continuity of patient care	Published in locally read, monthly, online and printed regional publication
August 2022	Division Director and Division QI Director	Information about practice of SNAP use for AOM was added to onboarding materials for newly hired UC clinicians	Education and structural change to UC division orientation information	UC newly hired clinicians	Added 11 months after intervention period began	Orientation material to remain until next CPG update	To communicate current UC group practice of use of SNAP for treatment of AOM to standardize care in our UCs	Included in UC orientation material for newly hired clinicians

(continued)

Table I. Continued

## SNAP QI implementation strategies

Month	Actor	Action/intervention	Intervention type	Action target	Temporality	Dose	Goal	Method
Oct 2022	Division of Evidence Based Practice with contributors from UC, Primary Care Clinics, Infectious Disease, ED, and Pharmacy (3 from SNAP Workgroup)	AOM clinical pathway updated	Education and structural change to AOM clinical pathways	All clinicians	1 Year after intervention period began	This AOM clinical pathway update will continue for 2 years until next update (continuous)	To update our organization's AOM clinical pathway to include use of SNAP and other methods of observation when appropriate and to specify maximum antibiotic doses	Posted on external website for clinical pathway and in outpatient antibiotic handbook used in multiple care settings
Nov 2022	UC Division SNAP QI Work group	Antibiotic education flyer	Education	Caregivers of UC patients	11 months after intervention period began during National Antibiotic Awareness Week	Continuous for 12 months	To educate patients' caregivers the negative effects of antibiotics and the importance of wise antibiotic use	Flyer was posted in all UC examination rooms and remained there for 12 months
Jan 2023	Pediatric Residency Program	Pediatric residency program adopts UC SNAP project	Education/QI	Pediatric residents	Adopted 16 months after intervention period began	Continuous through present	To create consistent messaging for patients and to improve pediatric residency training and exposure to QI work	UC SNAP QI project was shared with pediatric residency director who then adapted it to their setting
April 2023	UC Division SNAP QI Work group	Power point review of data supporting use of SNAPs for AOM, negative effects of antibiotics, and no increase in adverse outcomes with watchful waiting APRN questions answered	Education	UC APRN Clinicians	Given 19 months after start of intervention period	One-time presentation	To increase APRN use of SNAP by reviewing data in literature that supports watchful waiting and answer their concerns and hesitations	Presentation at UC APRN meeting

AAP, American Academy of Pediatrics; APRN, advanced practice registered nurse.

to clinicians of SNAP criteria and as a learning tool through repetition (**Figure 3**).

In January 2022, we developed a SNAP educational flyer (<https://www.childrensmc.org/siteassets/media/health-care-providers/pediatric-guides/antimicrobial-stewardship/visual-aid-for-safety-net-antibiotic-prescriptions.pdf>) and placed laminated copies in all UC examination rooms. This intervention helped clinicians to explain the AOM diagnosis to families visually and provided a framework for discussing the option of SNAP. Clinicians also used this flyer as a quick reference of SNAP criteria while in the examination room with families.

In May 2022, anecdotal reports identified that UC clinicians providing care via telehealth appointments often recommended a same-day UC in-person evaluation for otalgia. Then, during the in-person UC visit, UC clinicians recommended a period of observation for AOM before starting an antibiotic. This contradictory messaging caused frustrations for families. To address this challenge, we developed a scripted template for telehealth clinicians to offer patients with nonsevere symptoms the option of watchful waiting at home with instructions to seek in-person evaluation if symptoms worsened or did not improve in 2-3 days (**Figure 4**).

In June 2022, we expanded our UC clinician monthly project updates to include our moonlighting clinicians. In August 2022, we introduced an online module (<https://rise.articulate.com/share/sKnxoA9MDLmrq5Oel8t4eGUO4J1iRRqt>) to provide asynchronous education to all UC core clinicians, moonlighters, rotating medical students, and residents. We added this education to the UC onboarding materials for all core and moonlighting clinicians to embed the process into our practice. Also in August 2022, we wrote a commentary in our regional newsletter to educate community clinicians about the option of using SNAPs to help standardize the practice throughout the region. To provide a more consistent practice across our institution, we worked with our Office of Evidence Based Practice and a multidisciplinary group to update the institution's AOM clinical pathway,<sup>18</sup> emphasizing the use of a period of observation for patients with nonsevere AOM. This change took several months and was released in October 2022.

In November 2022, we posted information on antibiotic awareness in patient examination rooms to supplement the AOM and SNAP information by explaining the adverse effects of antibiotics and the individual and global impacts of antibiotic use. This information was targeted to families and clinicians who preferred immediate antibiotic treatment when observation was appropriate. We posted this flyer in English and Spanish, the 2 most common primary languages of our UC patients.

## Measures

We measured the percentage of SNAP eligible patients with AOM who were offered SNAP as our primary outcome. Secondary outcome measures evaluated the percentage of SNAPs offered that were accepted by families, as well as the

average number of SNAPs accepted per month. Before our QI project, we hypothesized that clinicians did not include documentation of offering a SNAP unless a SNAP was accepted. We hypothesized that, as offering SNAP increased, the percentage of SNAPs accepted may decrease owing to the substantial increase in the denominator, SNAPs offered. Therefore, we also measured the average number of SNAPs accepted per month to detect a change in absolute numbers of SNAPs accepted.

For our process measure, we evaluated the percentage of encounters with a discharge diagnosis of AOM in which clinicians documented patients' SNAP eligibility. We evaluated the percent of patients initially diagnosed with AOM who had return visits for AOM symptoms within 14 days of their index visit as a balancing measure to monitor for unintended negative effects of increased offering of SNAP. We also hypothesized that, as more families received education about the option of observation for nonsevere AOM symptoms, they may wait to present until symptoms warranted treatment. This change in behavior would potentially decrease the number of opportunities to offer SNAPs to patients with AOM. Therefore, a second balancing measure evaluated the percent of patients with AOM who were eligible for a SNAP each month.

## Data Analysis

We used QI Macros 2019 (KnowWare International, Inc Denver, CO) to create control charts of process, outcome, and balancing measures. We used standard Shewhart rules to move the center line and control limits at the beginning of a shift or trend when a special cause variation was noted (shift:  $\geq 8$  points in a row above or below the center line; trend: 6 consecutive points increasing or decreasing).<sup>19</sup>

## Ethical Considerations

Our institutional review board determined this project was not human subjects research and thus was exempt from review.

# Results

## Demographics

We reviewed 6322 patient encounters for AOM that occurred during our baseline period (October 2020 to September 2021) and 22 994 encounters during our intervention period (October 2021 to June 2023). Demographics of the patient population in our baseline and study periods are listed in **Table II**. The lower number of encounters for AOM during our baseline period compared with our intervention period reflected months with decreased incidence of viral respiratory infections related to social distancing during the COVID-19 pandemic.<sup>20</sup> Our UC patient volumes normalized during the summer of 2022.

## Immediate Antibiotics vs SNAP

At baseline, UC clinicians prescribed antibiotics for 97.7% of patients with AOM, of which 96.6% received immediate prescriptions and 3.4% received SNAPs. This 97.7% prescribing rate of antibiotics for AOM encounters remained unchanged



## How to discuss Watchful Waiting with Families:

- [https://bit.ly/SPUC20\\_AOM](https://bit.ly/SPUC20_AOM)

## SNAP Documentation Aids:

### .uccsnapeligibility

[Patient first name] is eligible for a SNAP. Their symptoms are not severe ( I.e. Fever < 39 (102.2) and pain < 48 hours), they do not have PE tubes, a history of taking antibiotics for AOM in past 30 days, a history of resistant AOM, underlying conditions or concomitant diagnoses that warrant immediate treatment with systemic antibiotics.

### .uccsnapdiscussion

I counseled the family on the option of a period of observation before starting antibiotic therapy for treatment of AOM.

The family {agrees with the SNAP treatment plan} {would like an immediate antibiotic prescription}. A(n) {SNAP} {immediate antibiotic prescription} has been sent to the pharmacy. Family counseled on continuing supportive care with weight-based dosing of ibuprofen and acetaminophen for pain management, encouraging fluid intake and monitoring for worsening.

## SNAP Discharge instructions:

### .uccsnapaom

Your child has a middle ear infection (otitis media) in the {left ear} {right ear} {both ears}. As we discussed, many ear infections will get better on their own without antibiotics. See attached information on waiting to start antibiotics (ED/UCC AOM SNAP/Watchful Waiting). A prescription has been sent to the pharmacy if you decide to start antibiotics. Give your child ibuprofen XX mg (XX mL Children's Motrin/Advil) every 6 hours as needed for pain/fever and/or acetaminophen XX mg (XX mL Children's Tylenol) every 4 hours as needed for fever/pain. Encourage fluid intake. Return to your doctor, the Urgent Care, or the Emergency Room if your child has worsening symptoms even after starting the antibiotic, a persistent fever > 100.4 for longer than 5 days, or if you have any concerns.

**Figure 3.** Documentation templates created for this project.

throughout our study period, but the proportion of immediate prescriptions decreased to 87.9% and SNAPs increased to 12.1%.

## Outcome Measures

At baseline, clinicians offered SNAP to 7.2% of patients who met criteria. This datapoint had 2 upward shifts of the center line during the intervention period. The first shift (34.3%) occurred in November 2021 after the introduction of the

project and the financial incentive. The second shift (49.7%) occurred in August 2022, after the financial incentive had concluded but educational interventions continued. This second center line shift was maintained through the end of the study period (**Figure 5**). As a secondary outcome measure, we evaluated the percentage of SNAPs offered that were accepted. At baseline, 80.2% of SNAPs were accepted when offered. This percentage saw a downward shift of the center line during the study to 64.0% (**Figure 6**,

## Telehealth Verbiage for Children with Otolgia

Use this for previously healthy children > 24 months of age without ear tubes in place or AOM in the past 30 days, who have had ear pain < 48 hours and do not have severe pain or fever over 102.2.

### First: review the physical exam findings and give the diagnosis:

"Your child's ear pain may be due to an ear infection"

### Next: deliver the treatment recommendations starting with the negative:

"I am not able to diagnose an ear infection via telehealth because I cannot look in your child's ear. However, based on your child's history, your child does NOT need an in-person visit at this time. MOST EAR INFECTIONS GET BETTER WITHOUT ANTIBIOTICS.

### Followed by positive supportive care measures:

"The BEST treatment for your child currently is pain control with Motrin or Tylenol. Based on your child's weight, you-should give your child xxxx mg(mL) of Motrin or xxxx mg (mL) Tylenol."

### Finally, review the contingency plan of when to have your child evaluated:

"We recommend you have your child seen by your provider in-person if your child:

1. Complains of ear pain for more than two days or is crying with ear pain that is not better with Motrin or Tylenol
2. Has fever over 102.2
3. Has drainage from one or both ears
4. Has a bad cough, trouble breathing, starts vomiting, or has less urine output. "

### Use Teach Back to verify the parent's understanding of the visit:

"I want to make sure that I explained things well, so can you tell me how much medicine you are going to give your child?

When will you know if your child needs an in-person visit?"

**Figure 4.** Standardized verbiage for telehealth guidance for patients with nonsevere otalgia.

A); however, the number of SNAPs accepted per month had an upward shift in the center line from 20 to 139 (Figure 6, B). During the 21-month study period, clinicians offered 4388 SNAPs and families accepted 2815 SNAPs.

### Process Measure

At baseline, the process measure of documenting SNAP eligibility for all patients with a diagnosis of AOM was 5.7%. During the intervention period, we saw 2 upward shifts in the center line. Like our outcome measure, the first shift (42.7%) occurred

in November 2021 after the start of the intervention period and physician financial incentive for documentation. The second upward center line shift (52.7%) began in July 2022 and was maintained for the duration of the study period despite the discontinuation of the physician financial incentive in July 2022. (Figure 7).

### Balancing Measure

Beginning in October 2022, 12 months after interventions began, we saw a downward shift in the percent of patients

**Table II.** Patient demographics by site during baseline and study periods

	Baseline (n = 6139)				Study period (n = 22651)			
	Site A (n = 1753)	Site B (n = 2089)	Site C (n = 2297)	Overall (n = 6139)	Site A (n = 6887)	Site B (n = 7540)	Site C (n = 8224)	Overall (n = 22 651)
Age, months	24.8 [15.0-45.7]	26.3 [14.7-54.9]	23.8 [13.6-45.1]	25.0 [14.4-48.1]	34.9 [17.3-63.8]	38.8 [18.3-72.2]	36.7 [17.7-68.7]	36.7 [17.8-68.6]
Sex								
Female	808 (46.1)	996 (47.7)	1021 (44.4)	2825 (46.0)	3274 (47.5)	3679 (48.8)	3940 (47.9)	10893 (48.1)
Male	945 (53.9)	1093 (52.3)	1276 (55.6)	3314 (54.0)	3613 (52.5)	3861 (51.2)	4283 (52.1)	11757 (51.9)
Unknown			1 (0.0)	1 (0.0)			1 (0.0)	1 (0.0)
Race/ethnicity								
American Indian or Alaska Native	2 (0.1)	4 (0.2)	2 (0.1)	8 (0.1)	10 (0.1)	20 (0.3)	40 (0.5)	70 (0.3)
Asian	81 (4.6)	6 (0.3)	48 (2.1)	135 (2.2)	334 (4.8)	65 (0.9)	168 (2.0)	567 (2.5)
Black or African American	137 (7.8)	212 (10.1)	230 (10.0)	579 (9.4)	490 (7.1)	761 (10.1)	949 (11.5)	2200 (9.7)
Hispanic	216 (12.3)	320 (15.3)	292 (12.7)	828 (13.5)	1103 (16.0)	1309 (17.4)	1245 (15.1)	3657 (16.1)
Multiracial	88 (5.0)	154 (7.4)	127 (5.5)	369 (6.0)	266 (3.9)	453 (6.0)	398 (4.8)	1117 (4.9)
Native Hawaiian or Pacific Islander	1 (0.1)	10 (0.5)	22 (1.0)	33 (0.5)	9 (0.1)	48 (0.6)	84 (1.0)	141 (0.6)
Other	21 (1.2)	21 (1.0)	50 (2.2)	92 (1.5)	101 (1.5)	58 (0.8)	132 (1.6)	291 (1.3)
Unknown/refused	20 (1.1)	13 (0.6)	26 (1.1)	59 (1.0)	124 (1.8)	80 (1.1)	101 (1.2)	305 (1.3)
White	1187 (67.7)	1349 (64.6)	1500 (65.3)	4036 (65.7)	4450 (64.6)	4745 (62.9)	5107 (62.1)	14302 (63.1)
Preferred language								
English	1710 (97.5)	2037 (97.5)	2212 (96.3)	5959 (97.1)	6610 (96.0)	7267 (96.4)	7908 (96.2)	21785 (96.2)
Spanish	29 (1.7)	46 (2.2)	27 (1.2)	102 (1.7)	191 (2.8)	238 (3.2)	145 (1.8)	574 (2.5)
Other language	14 (0.8)	6 (0.3)	58 (2.5)	78 (1.3)	86 (1.2)	35 (0.5)	171 (2.1)	292 (1.3)
Insurance								
Commercial	1173 (66.9)	856 (41.0)	1130 (49.2)	3159 (51.5)	4376 (63.5)	3055 (40.5)	4092 (49.8)	11523 (50.9)
Medicaid	518 (29.5)	1082 (51.8)	1018 (44.3)	2618 (42.6)	2248 (32.6)	4070 (54.0)	3642 (44.3)	9960 (44.0)
Other insurance	36 (2.1)	91 (4.4)	97 (4.2)	224 (3.6)	108 (1.6)	226 (3.0)	298 (3.6)	632 (2.8)
Self-pay	26 (1.5)	60 (2.9)	52 (2.3)	138 (2.2)	155 (2.3)	189 (2.5)	192 (2.3)	536 (2.4)

Values are median (IQR) or number (%).

eligible for SNAP from 41.5% to 33.9% (**Figure 8, A**). We did not see a shift in the center line (4.3%) of all patients with AOM returning for AOM-related complaints within 14 days of the index visit (**Figure 8, B**).

### Maintenance Period

We reviewed 1643 encounters after 6 months of our maintenance period (December 2023). The percentage of SNAP eligible patients offered SNAP remained near our goal at 39.9%. The percentage of AOM encounters with SNAP eligibility documented remained above baseline at 42.7%. The percentage of families who accepted SNAP was 70.0% (n = 203).

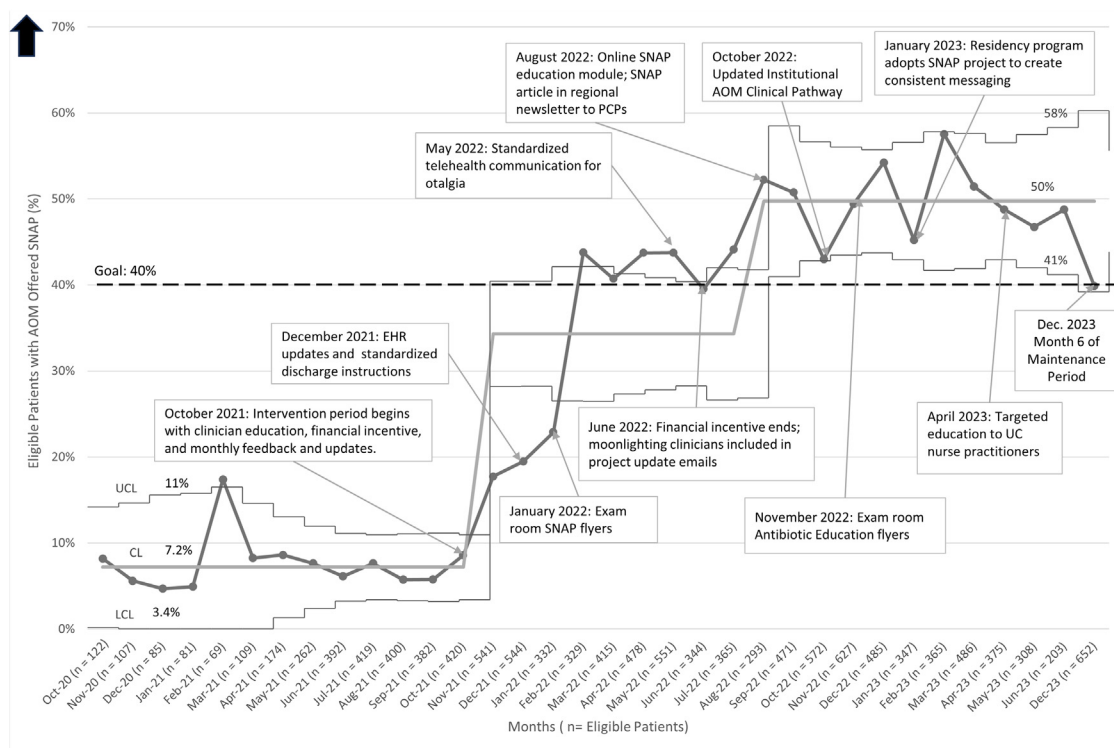
## Discussion

We used QI methodology to increase the percentage of SNAP eligible patients with AOM offered a SNAP. Offering SNAP to eligible patients increased as documentation of SNAP eligibility for all patients with a diagnosis of AOM increased without an increase in return visits. Of the families who were offered SNAPS, >50% accepted them throughout our study period. Our high rate of antibiotic use for the treatment of AOM was consistent with previously reported prescribing rates in outpatient settings with similarly low rates of SNAP use.<sup>13</sup> Although the overall rate of antibiotic prescribing for

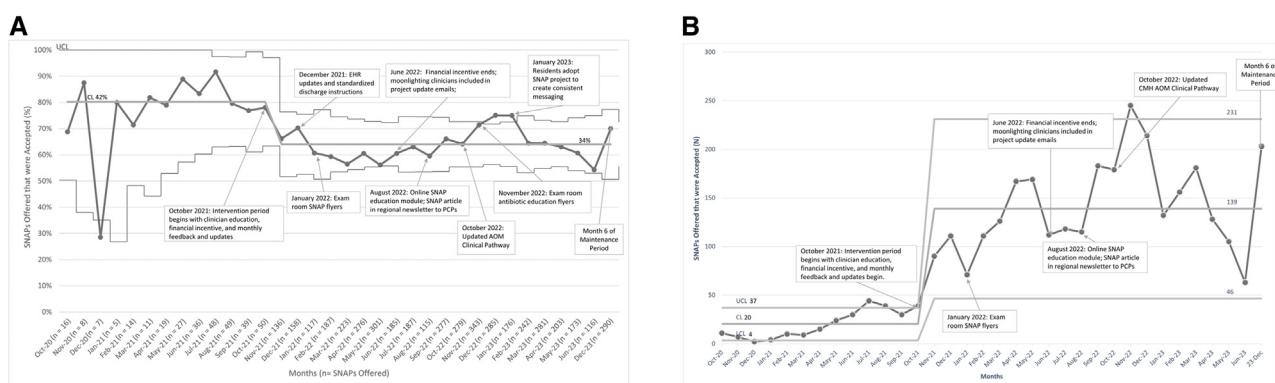
AOM remained unchanged throughout our study period, the proportion of SNAPS to immediate antibiotics increased.

Although the financial incentive likely influenced physicians' documentation of SNAP eligibility at the onset of the study, we designed the incentive to be independent of offering SNAP to patients. Even after the incentive period concluded at the end of June 2022, we continued to see an increase in offering SNAP. We maintained this level of improvement above baseline for several months after the incentive period concluded. In addition to asking UC clinicians to document SNAP eligibility, we used a multipronged approach of education and EHR changes. Although education has lower reliability for sustaining changes in behavior, we tried to increase the effect of our education by embedding it into onboarding materials for new hires and moonlighting clinicians. The changes to the EHR provide moderate reliability. However, we plan to continue monitoring and providing intermittent feedback to sustain this practice of offering SNAP for AOM.

Toward the end of our study period, we saw a sustained decrease in the percentage of patients with AOM eligible for SNAP. This may have been due to better documentation by clinicians. However, it may have been that, after repeated exposure to education about SNAP, families began monitoring nonsevere symptoms at home before bringing their children to the UC for evaluation. This decrease in SNAP



**Figure 5.** P chart of the percent of eligible patients with AOM offered SNPs with interventions annotated. AAP, American Academy of Pediatrics; CL, center line; LCL, lower control limit; PCP, primary care physicians; UCL, upper control limit.

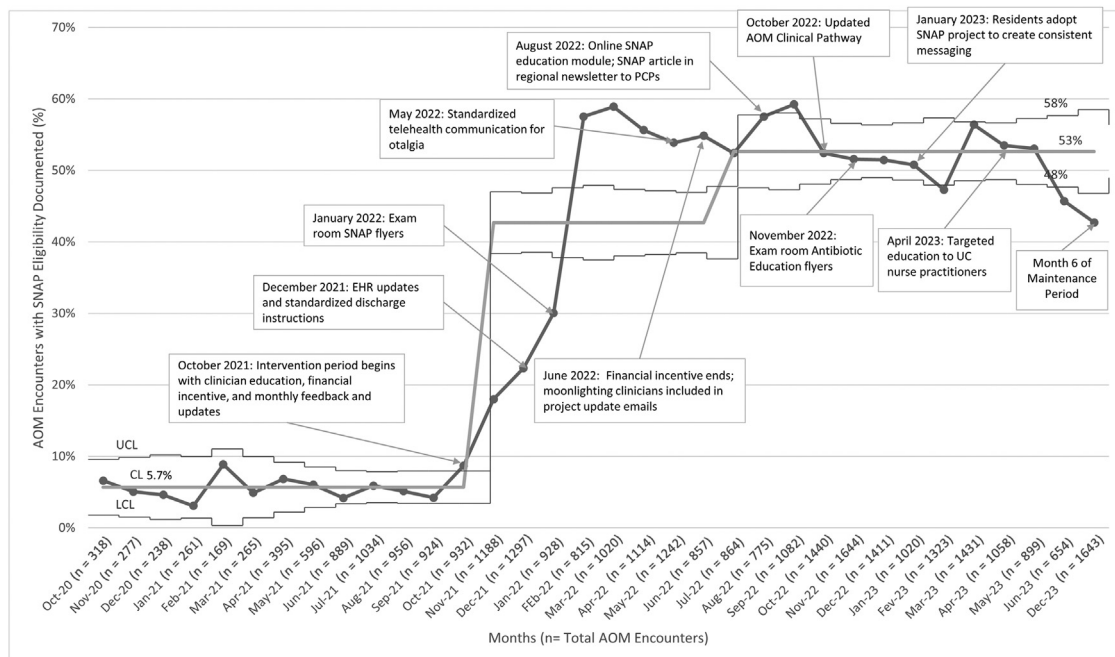


**Figure 6.** A, P chart of the percent of SNPs offered that families accepted. B, C chart of the number of SNPs accepted. CL, center line; LCL, lower control limit; PCP, primary care physicians; UCL, upper control limit.

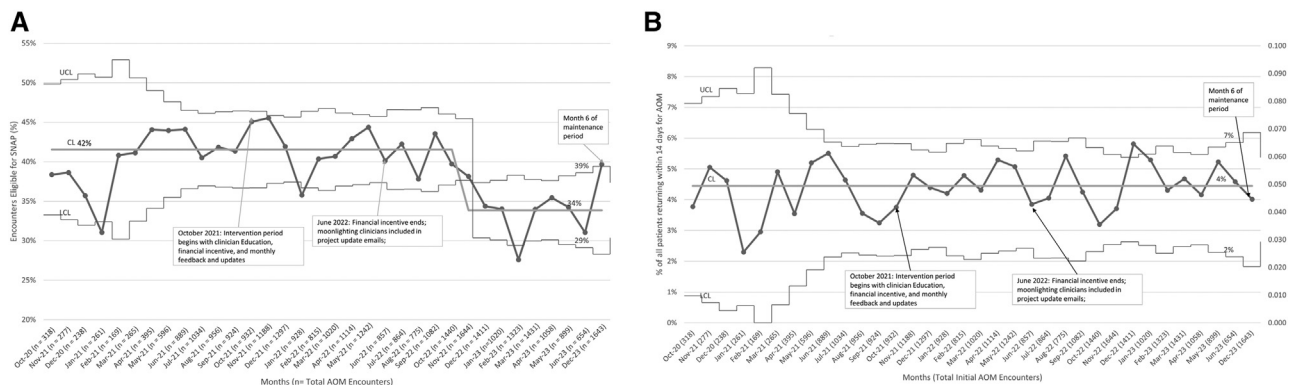
eligibility was not associated with a specific intervention, rather was more likely due to an additive effect of the interventions over time. We also saw a decrease in the overall percentage of SNAP acceptance. This trend coincided with a significant increase in the percent of eligible patients who were offered SNPs. Additionally, the seasonality of respiratory viruses and variation in prevalence of AOM may have impacted families' willingness to accept a period

of observation before starting antibiotics. Overall, the total number of families who were offered and accepted SNPs increased substantially.

Previous studies have demonstrated that QI efforts increased the offering and acceptance of SNAP in pediatric primary care<sup>21</sup> and emergency department settings.<sup>17</sup> Our study demonstrated comparable results in a pediatric UC setting. We also demonstrated an association between



**Figure 7.** P chart of the percentage of encounters with a diagnosis of AOM with SNAP eligibility documented. CL, center line; LCL, lower control limit; PCP, primary care physicians; UCL, upper control limit.



**Figure 8.** **A**, P chart of the percent of patients who met criteria for receiving a SNAP. **B**, P chart of the percentage of encounters with AOM that had a return visit for AOM-related complaint within 14 days of the index visit. CL, center line; LCL, lower control limit; PCP, primary care physicians; UCL, upper control limit.

clinician documentation of SNAP eligibility and offering of SNAPS to eligible patients. Anecdotally, clinicians reported they often had families respond positively to the option of monitoring symptoms before starting an antibiotic. These statements support prior results that clinicians are not good predictors of families' expectations for antibiotics.<sup>22</sup>

We attempted to evaluate the percent of patients who accepted SNAPS and avoided antibiotics by surveying families who accepted a SNAP within 4-6 weeks of their index visit. However, we were not able to interpret the

data owing to an extremely low survey response rate. Although examining pharmacy claims data would demonstrate the percentage of families who filled the SNAP, we felt that it would not provide reliable data on antibiotic administration. Many families who agreed to monitor symptoms also stated they planned to fill the SNAP to have available if symptoms worsened when pharmacies were unavailable. Despite this limitation to our study, other investigators have reported lower fill rates of delayed antibiotic prescriptions compared with immediate antibiotic prescriptions.<sup>4,5,7-9</sup>



Owing to the limitations of a retrospective chart review, we were unable to stratify patients by pain severity when determining SNAP eligibility. Because of this factor, we likely overestimated the percentage of patients eligible for a SNAP as some likely had moderate to severe otalgia. Additionally, although we evaluated return visits as a balancing measure, we do not know how many additional patients were seen outside of our institution. However, we would expect the proportion of patients who seek care outside our system vs within our system to remain stable over time. Another limitation is that our UCs are affiliated with an academic center and have significant antibiotic stewardship resources available. Our results may not be generalizable to other UC settings.

Our work can serve as a model for other clinical settings to use low-cost interventions to encourage clinicians to document SNAP eligibility to increase the use of SNAP for patients with AOM. Because AOM is the most common diagnosis for which antibiotics are prescribed in the UC,<sup>23,24</sup> if even a small percentage of families who agree to a SNAP avoid antibiotics, the reduction in total antibiotic days would be meaningful. Leveraging payors to incentivize documentation of medical decision making related to best practices for common pediatric conditions and antibiotic stewardship may encourage clinicians to implement these best practices. ■

### CRedit authorship contribution statement

**Jennifer McKinsey:** Writing – original draft, Visualization, Methodology, Investigation, Conceptualization. **Brian R. Lee:** Writing – review & editing, Software, Methodology, Data curation, Conceptualization. **Donna Wylly:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Holly Austin:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Dinah Dosdos:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Emily Murdock:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Aimy Patel:** Writing – review & editing, Visualization, Software. **Rana E. El Feghaly:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization. **Amanda Nedved:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Conceptualization.

### Declaration of Competing Interest

A.N. received grant support from Pfizer to study antibiotic stewardship with the American Academy of Pediatrics. A.N. and R.E.E.F. receive grant support from Merck to study differences in antibiotic prescribing.

The authors declare no conflicts of interest.

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