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Concise Communication

Experiences from the Missouri Antimicrobial Stewardship Collaborative: A mixed methods study

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Abstract

We performed a mixed-methods study to evaluate antimicrobial stewardship program (ASP) uptake and to assess variability of program implementation in Missouri hospitals. Despite increasing uptake of ASPs in Missouri, there is wide variability in both the scope and sophistication of these programs.

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The Centers for Disease Control and Prevention (CDC) Core Elements of Antibiotic Hospital Antibiotic Stewardship ("Core Elements") allows healthcare systems to select specific elements from a list of tracking metrics and interventions.[1] This recommendation leaves room for flexibility in program implementation, but it also allows hospitals to satisfy all Core Elements while still having an ineffective antimicrobial stewardship program (ASP). This concern is greatest for resource-limited rural community hospitals.[2]

In this study, we evaluated the implementation of ASPs in Missouri using a survey, and we assessed facilitators and barriers to ASP implementation through semistructured qualitative interviews.

Methods

Survey

A 93-question, online survey based on the CDC Core Elements was developed by our research team of infectious diseases physicians, ASP pharmacists, and dissemination and implementation scientists to assess the characteristics of ASPs in Missouri (Qualtrics, Provo, Utah; see the Supplement online).

We distributed the survey to ASP leadership in all 125 hospitals in Missouri. Only 1 survey was accepted per hospital. Incomplete surveys were excluded from the analysis. Stewardship pharmacists covering >1 hospital were instructed to complete the survey for each hospital supervised. Survey responses were collected from April 9, 2019, to July 31, 2019. No incentives for participation were offered.

Statistical analysis was performed using SAS version 9.4 software (SAS Institute, Cary, North Carolina). Statistical testing was performed with the Fisher exact test and the Mann-Whitney U test. A P value <.05 was considered significant.

Semistructured interviews

An interview guide based on the Core Elements was also developed by our research team to assess facilitators and barriers of implementing ASPs. We recruited ASP pharmacists from smaller, rural, and critical access hospitals to take part in 30–60-minute semistructured interviews. We conducted interviews from April 4, 2019, to July 11, 2019, until we reached thematic saturation.

Interviews were recorded, transcribed, and then coded by 2 independent coders using NVivo version 12 software (QSR International, Melbourne, Australia). The code book and themes were piloted, revised, and approved by the research team.

Results

Survey

In total, 45 completed surveys were received from the 125 eligible Missouri hospitals (response rate, 36%). For survey respondents, hospital size ranged from 12 to 1,378 beds, with a median of 113 (interquartile range [IQR], 55–242). Nonresponding hospitals were smaller, with a median number of 58 beds (IQR, 32–155; P = .04). Of responding hospitals, 16% were critical access hospitals (CAHs) compared to 34% of nonresponding hospitals (P = .04). Also, of responding hospitals, 67% reported fulfilling all 7 Centers for Disease Control and Prevention (CDC) Core Elements (Supplementary Table 1 online). Only 3 of 7 CAHs (43%) had implemented all 7 Core Elements, compared to 27 of 38 non-CAHs (71%; P = .19).

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Table 1. Comparison of Antimicrobial Stewardship Interventions Implemented at Missouri Hospitals Stratified by Critical Access Hospital Status

Type of Intervention	Critical Access Hospitals (n=7), No. (%)	All Other Hospitals (n=38), No. (%)
Requiring a defined duration for antibiotic prescriptions	2 (29)	12 (32)
Requiring indication for antibiotic prescriptions	3 (43)	27 (71)
Developing and implementing facility specific treatment guidelines/recommendations based on national guidelines	5 (71)	27 (71)
Antibiotic "time outs"	5 (71)	17 (45)
Prior authorization—pharmacy or physician approval for select antibiotics	3 (43)	11 (29)
Formulary restrictions	6 (85)	30 (79)
Prospective audit and feedback	2 (28)	24 (63)
Automatic or actively suggested conversion from intravenous to oral antibiotic therapy for certain antibiotics[a]	3 (42)	32 (84)
Pharmacist dose adjustments for organ dysfunction	7 (100)	35 (92)
Pharmacist dose optimization	6 (86)	34 (89)
Automatic alerts for duplicative therapy	2 (29)	24 (63)
Time-sensitive automatic stop orders for certain antibiotics orders	2 (29)	21 (55)
Electronic or manual detection and prevention of antibiotic-related drug–drug interactions	6 (86)	29 (76)

[a]This result was statistically significant, with $P = .03$.

Leadership commitment

All but 1 responding hospital reported a hospital leadership commitment to antimicrobial stewardship. Only 57% reported that leadership ensured that relevant staff were given sufficient time for stewardship activities.

Accountability and drug expertise

Moreover, 59% of responding hospitals reported appointing a single pharmacy leader dedicated for the ASP. Of these programs, 91% reported having no protected time for stewardship activities. Only 29% of the CAHs reported having a dedicated pharmacist leader.

Policies and interventions to improve antibiotic use

All respondents reported performing some type of stewardship intervention (Table 1); however, the number of interventions varied widely, from 2 to 12 (Supplementary Table 2 online).

Tracking and reporting antibiotic use and outcomes

Also, 61% of responding hospitals reported submitting data to the National Healthcare Safety Network (NHSN) Antibiotic Utilization and Resistance (AUR) module, and 29% of hospitals utilized the NHSN standardized antimicrobial administration ratios for antimicrobial tracking.

Education

Hospitals provided stewardship education in a variety of ways; the most popular was facility-specific feedback on antibiotic prescribing trends (Supplementary Table 3 online). Targets of education were commonly physicians, pharmacists, and nurses. However, 16 hospitals involved patients in their educational efforts.

Table 2. Resources Used By Responding Hospitals

Description of Resource	Hospitals Using Resource, No. (%)
State-based antimicrobial stewardship collaboratives	20 (44)
Antimicrobial stewardship toolkits	20 (44)
Regional or national antimicrobial stewardship collaboratives	13 (29)
Commercial telehealth support for antimicrobial stewardship	3 (7)
None of the above	14 (31)

Tracking outcomes

Tracking of antimicrobial-associated outcomes was performed by 93% of responding hospitals, and 1–4 measures were tracked (Supplementary Table 4 online).

Stewardship resources

The most commonly used resources for ASPs were state-based collaboratives and ASP tool kits (Table 2). Of the respondents using state-based collaboratives, 45% found them very or extremely useful, whereas only 23% of those using regional and national collaboratives rated them similarly. The CDC ASP tool kit was used most frequently, and 85% found it very or extremely useful.

Semistructured interviews

We interviewed 8 pharmacists from 8 hospitals. Hospital size ranged from 55 to 496 beds, and 6 hospitals had <150 beds. Overall, 14 codes were used to thematically analyze the interviews (Supplementary Table 5 online). The 5 key themes (Supplementary Table 6 online) are discussed below.

Theme 1: Stewardship is highly collaborative but pharmacy driven. Everyone interviewed noted that their ASPs were led by pharmacists with other disciplines collaborating, often with semiregular team meetings. Pharmacists felt underprepared for ASP responsibilities, and these responsibilities were often uncompensated.

Theme 2: There is need for internal resources and support. Pharmacists typically agreed that insufficient internal resources, including staffing, time, and salary support, were provided to the ASP. This factor hindered the pharmacist's contribution to the ASP. Pharmacists noting low leadership support also lacked resources to support the ASP.

Theme 3: Resistant physicians hinder program success. Interviewees noted that stewardship activities often strained relationships between ASP pharmacists and practicing physicians, which harmed educational efforts.

Theme 4: Importance of proper tracking tools. The sophistication of tools, their user-friendliness, and staff comfort with them were commonly linked to tracking and reporting. Pharmacists with difficult tools compiled reports on paper or used Excel software (Microsoft, Redmond, WA) for workarounds.

Theme 5: Common desire for networked relationships and platforms. Most pharmacists wanted a way to share resources by connecting to other hospitals and pharmacists. Common requests included sharing educational materials and tools, learning from hospitals of similar sizes, and sharing other stewardship information.

Discussion

The survey and interview results show that despite broad ASP uptake, there was significant variability in ASP implementation. Programs varied in the scope and complexity of their interventional and tracking efforts, as well as in the degree of support and resources afforded to them. Programs that are more involved tend to be more effective. Stenehjem et al[3] showed that stewardship programs that promoted daily engagement with the stewardship team achieved a significant reduction in antibiotic usage.[3]

Leadership support and dedicated resources remain substantial barriers to effective stewardship in many hospitals. Although most ASPs had documented support statements, minimal dedicated time was allotted to ASP pharmacists. CAHs may be of particular concern because pharmacy ASP leadership was largely not available among CAHs and none compensated pharmacist time for stewardship activities. The new recommended ASP staffing guidance from CMS may help improve resource allocation in the future.[4]

A major limitation of this study was its low response rate despite aggressive reminders. The large proportion of smaller hospitals and CAHs among nonparticipants highlights the difficulty of disseminating stewardship resources to more rural facilities. Although respondents represented a large geographic and size distribution of hospitals in the state, the data capture for CAHs was inadequate to fully evaluate unique issues in the state's most resource-limited hospitals. Other limitations included self-reporting bias and possible duplication due to multiple hospitals using the same system ASP resources.

In conclusion, continued barriers to implementing ASPs in community settings are related to inadequate leadership commitment, resource allocation, and the need for improved physician communication.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2020.318

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Conflicts of interest. The authors report no relevant conflicts of interest.

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