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Evaluation of Programmatic Changes to an Antimicrobial Stewardship Program with House Officer Feedback

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Abstract

Rationale, aims and objectives—A collegial relationship between prescribers and antimicrobial stewards, along with an appreciation of the importance of antimicrobial stewardship, is essential for optimal functioning of an antimicrobial stewardship program (ASP). Programmatic adjustments based on feedback may be beneficial to the success of ASPs. The objective of this study is to assess the experience of house officers with the antimicrobial stewardship program (ASP) and the effect of programmatic improvements.

Methods—A survey of house officers at an academic medical center was conducted assessing their experience with the ASP before (2008) and after (2010) programmatic interventions were instituted.

Results—Of 225 house officer surveys sent, we received 97 responses (88% from MD's). The majority indicated that ASP was either very or somewhat important in fighting antibiotic resistance (100%), improving patient care (97%), preventing medication errors (91%), and

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containing healthcare costs (89%). Ninety-one percent indicated either a very good or good educational experience with the ASP. The ASP often reminded respondents of a patient's allergy (31%), to adjust for renal function (78%), and 38% were prevented from making a medication error. Comparing 2008 and 2010, a higher proportion of respondents in 2010 said they had a very good or good educational experience with ASP (84% vs 98%, OR=8.40, P=0.022) and a lower proportion of respondents reported confusion about ASP procedures (59% vs 39%, OR=0.43, P=0.048).

Conclusions—House officer feedback resulted in ASP policy changes which improved the ASP experience.

Keywords

Antimicrobial Stewardship; Quality improvement; House Officer Feedback

1. INTRODUCTION

Previous studies have shown that hospitalized patients frequently receive unnecessary and inappropriate antimicrobial therapy (1). These findings, combined with the widespread dissemination of multi-drug resistant organisms have led to the development of antimicrobial stewardship programs (ASPs). The goal of antimicrobial stewardship is to optimize clinical outcomes while minimizing toxicity, emerging resistance, and healthcare costs (2). Ultimately, an effective ASP will limit unnecessary antibiotic usage while improving therapy for patients. Clear communication between the ASP team and prescribers, collegial relations, and an appreciation of the importance of the ASP are all critical to successful programs (3,4).

The ASP at Tufts Medical Center was established in 2003 and consists of an infectious disease pharmacist and two infectious disease physicians. The program utilizes antimicrobial restriction (using a dedicated pager to receive requests for approval) and concurrent review of active antimicrobial orders to achieve improvements in the appropriateness of antimicrobial usage. A Tufts Medical Center Antimicrobial Treatment and Dosing Guide booklet is published annually and provided to all house officers. This manual outlines the antibiotics which require approval, dosing information, appropriate empiric regimens, and clinical pathways. Other elements that of the program include order sets and educational initiatives. Furthermore, as Tufts Medical Center is an academic teaching hospital, the ASP serves as an important education tool. Many house officers, as well as attending physicians, rely on the ASP team for help with a variety of clinical scenarios ranging from Intensive Care Unit patients to outpatient clinical questions and antimicrobial dosing. Thus, open communication between the ASP and house officers is crucial to the success of the program.

The objective of this study were to assess the experience of house officers with the ASP, carry out programmatic improvements based on the results of this survey, and evaluate the effects of these interventions. These interventions to simplify and improve the ASP experience included: improvement of ASP house officer orientation, clearer instructions on the antimicrobial order form, and an "ASP question of the week" via email. ASP house officer orientation was improved by instituting additional ASP reinforcement sessions early in the year to accompany the general hospital orientation session. The "ASP question of the week" provided simply stated answers to commonly encountered questions in regards to antimicrobial usage such as, "When and what should I prescribe to cover atypical bacterial pathogens in a patient with community-acquired pneumonia?" or ASP process questions such as, "I just started my internship and I am confused. When do I need to call ASP?" Answers were based on published guidelines and the clinical expertise of the ASP staff and written in concise and simple language. The Tufts Medical Center Antimicrobial Treatment

and Dosing Guide was also adapted to maximize its helpfulness to house officers choosing antibiotics for their patients.

2. METHODS

We conducted an anonymous web-based survey of house officers (residents, physician assistants and nurse practitioners) at Tufts Medical Center about their experience with the ASP before (2008) and after (2010) programmatic interventions were instituted. The group surveyed was made up of the primary group of medical staff interacting and utilizing the services of the ASP.

Survey Instrument

The identical survey instrument was utilized in 2008 and 2010 for valid comparison. The survey instrument consisted of the following themes: background information about the respondents and their specialties; respondents' perceptions of the importance of ASP; and respondents' experience with and understanding of ASP procedures. Most questions were Likert items with additional open-ended questions.

Respondents' perceptions of the importance of ASP were elicited from 5 questions: (1) "How important is ASP in hospital operations?" (2) "How important is ASP in the fight against antimicrobial resistance?" (3) "How important is ASP in the containment of healthcare costs?" (4) "How important is ASP in improving patient care?" (5) "How important is ASP in the prevention of medication errors?" A 4-item Likert scale from "very" to "not at all" was applied in the structured statements.

Respondents' understanding of ASP procedures was elicited from the question: "Are you ever confused about ASP procedures?" with an open-ended question asking what they were confused about. Two questions asked whether or not they remembered ASP procedures being presented at orientation and whether or not it was helpful.

Respondents' experience of ASP procedures was elicited from the questions (1) "How has your overall experience been with ASP calls?"; (2) "How satisfied are you with the speed of ASP calling back?"; and (3) "How has your educational experience been with ASP calls?" A 4-item Likert scale from "very good" to "bad", was applied in the structured statements. One question was asked to assess respondents' perception of the percentage of calls in which the requested antibiotic was approved. A set of 3 "yes", "no" structured questions were used to investigate if interactions with ASP ever resulted in being reminded of a patient allergy, adjusting for a patient's renal function, or preventing a medication error. Two open-ended questions were asked to assess barriers to calling ASP for antibiotic approvals and suggested improvements to the ASP process.

At the end of the 2010 survey instrument, two additional questions were asked: whether or not respondents read the ASP question of the week emails, and whether or not they found the question of the week helpful.

The survey instrument was reviewed for face and content validity by a group of 4 members of the ASP team. Following the comments of the group members, minor revisions were made to the survey instrument.

Data collection

The target population consisted primarily of interns and residents, physician assistants and nurse practitioners, from all services at Tufts Medical Center, the primary teaching hospital of Tufts University School of Medicine. The sample size was influenced by the number of

medical staff at Tufts Medical Center and the response rate. An anonymous web-based survey instrument was emailed to 111 medical staff in November 2008 and 114 medical staff in November 2010 for a total of 225 surveys. The email detailed the aim of the study and emphasized the confidentiality of responses. Recipients were instructed to click on a link in order to participate, which was considered equivalent to informed consent. Reminder emails were sent to non-respondents after 2 weeks. Prospective respondents were told that if they provided their names in a separate email they would be eligible to win a coffee shop gift card in a random drawing.

Data analysis

We compared the survey responses before and after programmatic implementation (2008 vs. 2010). For each survey item (except for open-ended questions), chi-square test of independence was performed to assess for differences in responses.

3. RESULTS

Combined results from the 2008 and 2010 surveys

Of the 225 house officer surveys sent, we received 97 responses (response rate: 43%), 51 in 2008 and 46 in 2010. The characteristics of the survey participants are summarized in Table 1. The majority of the responses came from medical doctors, and most of the responses were from the Medicine service.

In both the 2008 and 2010 survey, the majority of participants thought an ASP was either very or somewhat important in hospital operations, the fight against antibiotic resistance, containing healthcare costs, improving patient care, and preventing medication errors (Table 2).

In regards to understanding of ASP procedures 59% of respondents in 2008 stated that they were always or sometimes confused about ASP procedures. Reasons for confusion with ASP procedures included: whom to call for approval, when to call, what forms to use, what to do at night and on weekends, which antibiotics need approval, how long antibiotics are approved for, whether antibiotics will be automatically discontinued, and how to get stat medications overnight or for sick patients. When asked whether or not ASP procedures were presented during their hospital orientation, only 60% of respondents in 2008 replied “yes” despite the fact that all MD respondents did have an ASP presentation during orientation (Table 2).

In regards to experience with ASP, a large majority of respondents had either a very good or good overall experience with ASP calls, were very or somewhat satisfied with the speed of ASP calling back, and had either a very good or good educational experience with the ASP (Table II). 31% of the responses indicated that the respondent had had interactions with ASP that resulted in being reminded of a patient’s allergy, 78% had been reminded to adjust for renal function, and 38% were prevented from making a medication error (Table 3).

The barriers identified to calling ASP for antibiotic approval included: time constraint, difficult work load, forgetting, difficulty in contacting ASP (contact information), not knowing ASP procedures, response time of ASP, concern about differences in opinions between their attending physician and ASP staff, fear of bothering ASP staff after hours, concern about not getting desired antibiotic, and fear of having to justify antibiotic choice. The suggested improvements to the ASP process included: improvement in orientation, improved communication with the healthcare provider, reminder notes of expiring antibiotics, improved communication with pharmacy about approved antibiotics, antibiotics to be released without approval at certain times and situations, simplification of approval

forms, and clarification of ASP procedures such as when and whom to call and for what antibiotics.

Comparison between results from 2008 and 2010 surveys

Comparing the results from the 2008 and the 2010 survey, we did not find any significant changes to respondents' perceptions of the importance of ASP (Table 2). However, there was a non-significant upward trend in the proportion of respondents who said ASP is very or somewhat important for hospital operations from 92% to 100%, $P=0.055$; containment of healthcare costs from 86% to 91%, $P=0.435$; and in those who said ASP improves patient care from 94% to 100%, $P=0.098$. However, respondents' understanding of ASP procedures was significantly improved. Those who said they were always or sometimes confused about ASP procedures decreased from 59% to 39%, $OR=0.43$, $P=0.048$. There was a non-significant trend towards improved recall about ASP procedures being presented at orientation from 60% to 67%, $P=0.501$. Again it is important to note that all MD respondents received an ASP presentation at orientation. Respondents' experience of ASP procedures was also significantly improved. Those who stated that they had a very good or good educational experience with the ASP improved from 84% to 98%, $OR=8.40$, $P=0.022$.

In the 2010 survey, when asked about the use of the programmatic intervention, 84% of respondents stated that they always or sometimes read the ASP question of the week. And from those who read the ASP question of the week, 87% found it very or somewhat helpful.

4. DISCUSSION

This study was conducted at Tufts Medical Center as a quality-improvement initiative in order to assess the experience of house officers with the ASP, make programmatic improvements based on feedback, and determine its effects if any. Questions were grouped into three general categories: respondents' perceptions of the importance of ASP, respondents' understanding of ASP procedures, and respondents' experience of ASP procedures.

Respondents had a favorable perception of the importance of ASPs in general with the majority believing ASPs were very or somewhat important for hospital operations, the fight against antibiotic resistance, improving patient care, preventing medication errors and the containment of healthcare costs. These perceptions may reflect the emphasis placed on the importance of antimicrobial stewardship in recent years due to the rise of antimicrobial resistance among clinically relevant bacterial pathogens such as *S. pneumoniae*, *S. aureus*, and the Enterobacteriaceae resulting from widespread and indiscriminate use of antimicrobials (4–13).

In both 2008 and 2010, we found a general appreciation for the importance of ASP and satisfaction with the ASP program at Tufts Medical Center. 2008 survey results informed policy changes instituted to simplify and improve the ASP experience, including improvement of ASP orientation, simplification of antimicrobial order forms, reminders about expiring antibiotics, and an ASP question of the week via email. Results from 2010 show that these programmatic changes made a significant difference in the house officer educational experience compared to two years prior, and significantly decreased confusion about ASP procedures.

Lack of understanding of ASP procedures may be a source of frustration to healthcare providers, and may result in delay of important treatment and/or lead to medication errors. In regards to understanding of ASP procedures, we found a significant percentage of respondents who stated that they were always or sometimes confused about ASP procedures.

The Tufts ASP team responded to these concerns by strengthening ASP introductions during the general hospital orientation and instituting additional ASP reinforcement sessions early in the year. An ASP question of the week email with tips on how to navigate the ASP program was also instituted. Following these programmatic interventions, there was a non-significant trend towards improved recall about ASP procedures being presented at orientation. Importantly, following programmatic interventions, respondents' understanding of ASP procedures was significantly improved with fewer house officers stating that they were always or sometimes confused about ASP procedures.

ASP can provide many benefits to healthcare providers and patients by providing education on the appropriate choice of antimicrobials and appropriate dosing, reminders about patient allergies, assistance with renal dosing adjustments, and prevention of medication errors. Assessments of healthcare providers' experience with ASP procedures are important in order to foster collegial working relationships and improve the overall functioning of the ASP. We found that respondents generally had a very good or good experience with the ASP, being very or somewhat satisfied with the responsiveness of the ASP in timely calls back, and receiving a very good or good educational experience. The ASP was also found to have made a beneficial impact on patient care in reminding house officers of patient's allergies, reminding house officers to adjust for renal function, and preventing medication errors. After the programmatic interventions, the educational experience with the ASP was reported as significantly improved.

We believe that the ASP question of the week emailed to all house officers may have contributed significantly to the improvement of the understanding of ASP procedures and the improvement in the educational experience. Most respondents in the 2010 survey stated that they always or sometimes read the ASP question of the week, and most respondents who read the question of the week found them very or somewhat helpful. The simplicity in which the emails were written allowed house officers to learn about the ASP process and important clinical pearls about antibiotics at their own pace. The email format allowed for house officers to save this information easily for future reference. This mode of teaching is especially important given the fact that respondents continued to state that they do not remember receiving information about ASP during their orientation. It is not surprising that, with all of the information presented to new house officers during their first few days in the hospital, little is retained. We learned from this survey that any educational initiative should not rely on orientation week as a forum for delivery of information.

One potential limitation of this study was the response rate (43%). However, our response rate is consistent with mean e-mail survey response rates in other published studies (14). A sampling bias consisting of respondents who had more favorable opinions about the ASP is possible. However, response rates for the two time points in the survey did not differ and this potential limitation would not be expected to influence the different results that were found between the two time points in the survey. Another limitation may be the relatively small number of respondents. We believe this sample to be representative of our institution. However, these data cannot be generalized outside of our institution. The relatively small number may not have given us enough power to find other significant differences between the two survey points.

Two-way communication between ASPs and healthcare providers is a critical component of ASPs which can increase the effectiveness of the program. This study indicated a need to clarify ASP procedures and to improve the educational experience for the healthcare providers. Programmatic adjustments to the ASP resulted in significant improvements in the healthcare providers' experience with the ASP. More studies are needed to evaluate the

impact of improved communication and quality-improvement initiatives in decreasing antimicrobial resistance, decreasing medication errors and decreasing costs.

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Table 1

Characteristics of survey participants

	2008	2010
SPECIALTY		
Medicine	30 (60%)	33 (72%)
Surgery	13 (26%)	7 (15%)
Cardiothoracic Surgery	6 (12%)	4 (9%)
Neurosurgery	0 (0%)	1 (2%)
Bone Marrow Transplant	1 (2%)	1 (2%)
Orthopedic Surgery	1 (2%)	0 (0%)
Degree		
MD	44 (86%)	41 (89%)
DO	0 (0%)	0 (0%)
PA	6 (12%)	4 (9%)
NP	1 (2%)	1 (2%)
POST-GRADUATE YEAR		
1	17 (35%)	15 (33%)
2	18 (37%)	15 (33%)
3	7 (14%)	12 (27%)
4	7 (14%)	3 (7%)

Table 2

Survey participants' perceptions regarding ASP

Question	2008	2010	P-value
How important is ASP in hospital operations? (very/somewhat)	92%	100%	0.055
How important is ASP in the fight against antimicrobial resistance? (very)	75%	76%	0.857
How important is ASP in the containment of healthcare costs? (very/somewhat)	86%	91%	0.435
How important is ASP in improving patient care? (very/somewhat)	94%	100%	0.098
How important is ASP in the prevention of medication errors? (very/somewhat)	96%	85%	0.060
Were ASP procedures presented during orientation? (yes)	60%	67%	0.501
Are you ever confused about ASP procedures? (always/sometimes)	59%	39%	0.048
How was your overall experience with ASP calls? (very good/good)	96%	98%	0.620
How was your education experience with ASP? (very good/good)	84%	98%	0.022

Table 3

ASP impact on patient care 2008 and 2010

Have you ever had an interaction with ASP in which they...		
	Yes	No
Reminded you of a patient allergy?	30 (31%)	66 (69%)
Reminded you to adjust for renal function?	75 (78%)	21 (22%)
Prevented a medication error?	37 (38%)	60 (62%)