Final Grant Report

Social Media as a Tool for Antimicrobial Stewardship

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Abstract

Purpose: To increase the visibility and reach of our Antimicrobial Stewardship Program (ASP), we used social media platforms, Facebook and Twitter, to disseminate educational material to Internal Medicine Residents (IMRs).

Methods: IMRs consented to a pre/post intervention knowledge-based survey and to follow our ASP on social media. Over 6 months, IMRs received daily posts/tweets of basic Abx and ID trivia while promoting use of educational tools and CP on our ASP website. Categorical variables were analyzed using McNemar test and Stuart -Maxwell test and continuous variables were used paired t-test or Wilcoxon signed rank sum test. Mann-Whitney test was used for group difference in post-intervention scores.

Results: In total, 55 IMRs participated in the intervention, 39/55 (71%) completed both pre/post surveys. 96% and 40% of our IMRs use Facebook and Twitter. 41% (n=23) of IMRs had $\geq$1 interaction with our ASP, 18% (n=10) had >5 interactions. Median scores (interquartile) for Abx knowledge increased from 12 (8-13) vs. 13 (11-15), p=0.048 when pre and post intervention scores were compared. IMRs knowing how to access the ASP's internal website increased from 70.3% to 94.6%, p=0.012. IMRs indicating they used ASP-sponsored CP as a part of clinical care increased significantly (27% vs. 61%, p≤0.01).

Conclusions: Social media is a valuable tool for education and outreach to IMRs to reinforce ASP initiatives while encouraging the use of CP and educational tools to promote antimicrobial mindfulness and improve patient care.

Key words: Antimicrobial Stewardship; Social Media

Purpose

By using the Antimicrobial Stewardship Program's (ASP) Facebook, Twitter, and intranet web pages we attempted to engage internal medicine trainees on Twitter and Facebook by hosting daily medical trivia contests rewarding both participation as well as timely correct answers in order to disseminate educational information, increase awareness of antimicrobial stewardship tools available to providers and increase the use of stewardship-sponsored treatment pathways for common infections and order sets by to Internal Medicine house staff. Through a pre and post intervention survey we collected data on what educational resources residents used to make decisions on antibiotics and the significance of antibiotic resistance and their confidence with antibiotic prescribing.

Scope

Antibiotic stewardship is an important tool for improving the antimicrobial use, optimizing treatment for or prevention of infection, preventing bacterial resistance, decreasing antibiotic-related toxicity and reducing the cost of care[1]. Education of primary prescribers is an essential part of antimicrobial stewardship to promote optimal use of antimicrobials and potential educational tools include the development of pathways, ordersets, didactic lectures, and prescriber feedback. Guidelines to treat common infections including community acquired pneumonia[2] and hospital acquired pneumonia[3] exist, but despite their availability and the best intentions by physicians, are not consistently utilized by health care providers[4]. Widespread utilization of standardized order sets has been shown to increase adherence to guidelines and additionally have a mortality and cost benefit in the treatment patients with both community acquired pneumonia (CAP)[5] and hospital-acquired pneumonia (HAP)[6]. Despite the considerable

effort that goes into education and the development of ordersets and pathways, it is sometimes difficult to get primary providers to use the created pathways and ordersets for many reasons, including being unaware that they exist or difficulty changing current practice habits.

Antimicrobials are very diverse and complex and treatment guidelines and institution-specific bacterial epidemiology is ever changing. Antibiotics are also commonly prescribed by almost all clinicians despite inconsistent education and systems based-practices sometimes leading to, overuse, potential resistance and avoidable errors. Education of house staff in particular is complicated by frequent turnover and work hours restrictions that limit time for clinical experiences and traditional didactic sessions[7,8] and the use of innovative strategies for healthcare provider education regarding antibiotic use are needed to supplement teaching beyond the lecture hall and the medical wards. In the hands of physicians and at the bedside, technology has the potential to bridge the gap in educational opportunities. Social Media, including Facebook (Menlo Park, CA) and Twitter (San Francisco, CA) has proven to be very successful in consumer education and advertising[9] and, with the help of reputable experts, could be utilized to provide needed medical education as well.[10]

Why is social media an important platform for teaching busy house-staff? 66% and 16% of on-line adults in the United States use Facebook and Twitter. 83% of Facebook users are 18-29 and 27% of Twitter users are between the ages of 18-29; the majority of use is on mobile devices.[20] The use of social media is growing, especially among the age group that comprises the vast majority of medical trainees (medical school and residency). At the University of Chicago

Medicine, Internal Medicine (IM) house staff use Apple iPads (Cupertino, CA) in their daily work and are part of the key demographic for social media use.

The institution review board-approved study was conducted at the University of Chicago Medicine, a 568-bed acute care hospital located on Chicago's South Side that serves a diverse adult and pediatric population. In addition to routine medical and surgical services, the medical center offers highly specialized care, including solid-organ and bone marrow transplantation. In the adult hospital there are 7-subspecialty medical and surgical ICUs with a total of more than 80 critical care beds.

55 Internal medicine residents consented to participate in the intervention, representing 50% of the residency program. Distribution across the years was as follows: 13 (23%) of PGY1, 21(38%) of PGY2 and 21(38%) of PGY3 residents. 39/55 (71%) of consenting residents completed both pre and post intervention surveys.

Methods

Internal Medicine Residents were consented to follow our ASP on Twitter and Facebook as part of our Social Media Project (SMP) for a 6-month time period (August 1, 2013 to January 31, 2014) and complete a pre/post survey evaluating social media use, knowledge, attitudes and beliefs regarding antimicrobial use and antibiotic resistance and awareness of our ASP and its resources. Surveys were created and data was collected through the use of the REDCap database. The REDCap project at the University of Chicago is hosted and managed by the Center for Research Informatics and funded by the Biological Sciences Division and by the Institute for Translational medicine, CTSA grant number UL1 TR000430 from the national Institutes of Health (cite).

Daily infectious diseases/antibiotic knowledge trivia questions both derived from the knowledge-based portion of the survey to reinforce content and topics in infectious diseases and antimicrobial use were posted on Twitter and Facebook each day. Participants were encouraged to respond via the social media platform or email (if did not want answers to be public). Posts to promote our internal ASP website, the use of our existing ASP treatment pathways (i.e. *Staphylococcus aureus* bacteremia, Neutropenic Fever, Candidemia and others), with a focus on encouraging the utilization of our community-acquired pneumonia pathway, and the use of infection-specific order sets were interspersed with trivia questions. Trivia questions were answered the next business day and teaching articles or links to internal content on the antimicrobial stewardship website were incorporated into answers whenever possible.

To incentivize participation, one $5 coffee card was rewarded daily to a respondent chosen at random. All respondents were entered into a monthly drawing (once for each day of participation) for a $100 Amazon gift card.

After the intervention period had ended, residents were contacted by email once a week for four weeks and once at eight weeks post-intervention to elicit post-intervention survey responses. Resident participation on Facebook and Twitter was tracked prospectively.

In analyzing pre and post-intervention survey responses, McNemar and Stuart-Maxwell tests were used to compare categorical variables when applicable. The Wilcoxon signed rank test was

used to compare pre and post continuous variables. Mann-Whitney test was used for group difference in post-intervention scores.

Results

55 Internal medicine residents consented to participate in the intervention, representing 50% of the residency program. Distribution across the years was as follows: 13 (23%) of PGY1, 21(38%) of PGY2 and 21(38%) of PGY3 residents. 39/55 (71%) of consenting residents completed both pre and post intervention surveys. A significant number of residents who had not had ID consult rotation completed an ID consult rotation by the end of the 6 month time period, 23.1% (p=0.004).

The majority of the respondents indicated plans to pursue a subspecialty fellowship after residency (70.9%, n=39). 90.9% of participating residents anticipated having a strong base knowledge of antibiotic use will be important to their future career and 89.1% indicated that they would like more feedback on their antibiotic use. 98.2% of residents believed that antibiotic resistance is a problem in general and 76.4% believe it is a serious problem at UCM. While 89.1% of residents believed that antibiotics are overused in general, 52.7% agreed that antibiotics are overused at our institution and only 38% believe that they overuse antibiotics themselves. When asked about the most frequent sources of information used when unsure about an antibiotic choice were ID fellows (80.0%), Uptodate (85.5%) and more senior residents (70.9%) (Table 1).

Perceived overall confidence in antibiotic choice did not increase after the intervention, however increases were seen when asked about choice and duration in the inpatient and outpatient setting (Table 2, Figure 3). Residents were more aware of our stewardship program and the tools and information available on our internal antimicrobial stewardship website after the intervention time period (p=0.012). More residents indicated that they used the community acquired pneumonia pathway "always" after the intervention, there was no significant change in the proportion of respondents that used the community acquired pneumonia order set (5.4% vs. 13.5%, p=0.259), Figure 2. 96% and 40% reported using Facebook and Twitter respectively on a daily basis and the majority of interactions with social media were via smartphone (61.8%, n=34), followed by desktop computer (32.7%, n=18).

Knowledge-based test scores significantly improved [12 (8-13) vs. 13 (11-15), p=0.048] as a result of the intervention. 41% (n=23) of IMRs had ≥1 interaction with our ASP via social media and 18% (n=10) had >5 interactions. A trend toward improvement on knowledge based test scores in residents that interacted with the platforms was seen but did not reach significance (p=.06). Participants who completed an ID consult rotation during the intervention time period did not have significantly better scores on the knowledge-based portion of the survey 10.55 vs. 11.94 (p=0.47).

Discussion

50% of all antibiotic use is inappropriate (CDC) and unnecessary antibiotic exposure can lead to unintended consequences including antibiotic toxicity, increasing antimicrobial resistance and

infections with C. difficile. Antimicrobial stewardship programs are now mandated through CMS as a way to improve antibiotic use practices across the country. The core elements of antimicrobial stewardship programs (CDC) include education of primary prescribers and promoting initiatives to ensure optimal use of antibiotics when treating the most common infections (ie. community-acquired pneumonia and urinary tract infections) (CDC core elements, http://www.cdc.gov/getsmart/healthcare/pdfs/core-elements.pdf). As antibiotic stewardship programs create tools, including pathways and order sets, based on the national guidelines and their hospital's own formulary and epidemiologic data, they must be able to share these tools with their primary prescribers and ensure they are used effectively to improve antibiotic prescribing and patient care.

Studies have shown that patients who received inappropriate initial antimicrobial coverage have greater in-hospital mortality rates than did patients who were appropriately covered.[13,14,15] Guidelines and order sets can help guide appropriate antibiotic use regardless of the healthcare provider's level of experience when caring for complex patients. When the impact of the use of an adult pneumonia standardized order set to aid in clinical care has been previously studied, not only was core measure compliance increased, but mortality and costs benefits were shown as well.[6] At UCM, order sets for community acquired pneumonia and pneumonia in the hospitalized/ICU patient (based on ATS/IDSA guidelines)[2,3] continue to be underutilized and reinforcement during this intervention unfortunately did not increase their use. General antibiotic/infectious diseases knowledge and clinical pathway use was reported to

have increased, however, and future study will explore if increased pathway use resulted in improved clinical care for patients with community acquired pneumonia.

Two popular social media platforms, Facebook and Twitter, were used in this study and the majority of residents participating, used Facebook, while a lesser number used Twitter. Engagement with the residents was higher on Twitter than Facebook, however. And may be because more of the residents programmed their account with push notifications every time a question was posted to the account so were able to answer quickly from wherever they were. Anecdotally, overall Twitter was more engaging and was easier to reach a broader audience. Using hashtags, or using the # prior to a key word, i.e. #antibiotics or #meded, to mark a post allowed it to be searchable by twitter users across the world and through the account we interacted with other individuals on topics important to stewardship as well as discussed management of infections that we had highlighted in our questions.

Social media was also a very valuable tool to interact with our primary prescribers and through these contacts we were able to elicit input regarding other stewardship-related categories from this group of residents. The benefits of the intervention reached beyond those that interacted with our program directly through social media, however. Many others followed our program, without interacting and were still able to view the posts and answers and able to get benefit from them as well as indicated in comments received after the study was complete. We are unable to quantify this effect.

Our institution has made a commitment to being at the cutting edge of bringing technology to the bedside and this project may not have been feasible at institutions that did not have as

broad access to mobile devices. One limitation however, is the restriction of Facebook on the hospital internet network. Twitter was initially restricted but taken off restriction prior to this project. As tweets and posts were made on both Twitter and Facebook simultaneously during both traditional and nontraditional hours, it is unclear how this affected participation in the intervention. Furthermore, many residents use smartphones (over 50% in our study) to access social media and are able to use their own data networks outside of the wireless hospital network to view social media that may be blocked by the institution.

We believe social media has the capacity to reach medical trainees to disseminate and reinforce important information regarding antibiotic use criteria and other educational/patient safety tools, including the use of order sets and pathways in a uniquely timely, far-reaching fashion and at the point of care.

Conclusions

Social media is a valuable tool to reach resident trainees and reinforce the use of pathways and tools the ASP would like to support as part of clinical care. Further work needs to be done to explore the most effective uses of social media in imparting knowledge to trainees and how it can impact health outcomes.

Tables/Figures

Source of information	If I have a question about making an antibiotic choice I use the following resources:	I received my antibiotic education from:
	Frequently/very frequently	Strongly Agree/agree
A more senior resident	39/55 (71)	52/55 (95)
A resident at my same level	28/55 (51)	23/55 (42)
A non-ID attending	29/55 (53)	45/55 (82)
An ID attending	11/55 (20)	36/55 (65)
An ID fellow	51/55 (93)	44/55 (80)
An ID pharmacist	13/55 (23)	19/55 (34)
The Sanford Guide	15/55 (27)	28/55 (51)
The Johns Hopkins antibiotic guide	3/31 (7)	5/55 (9)
Uptodate	47/55 (85)	48/55 (87)
Literature search	8/55 (15)	25/55 (45)
Google	4/55 (7)	20/55 (36)
Social Media outlets	0/55 (0)	1/55 (2)
Antimicrobial Stewardship Website	10/55 (18)	24 (43)

Table 1. Education and resources utilized by residents in making antibiotic choices.

Figure 1. Significant (*) increases in the number of residents knowing how to access the website (p=.01), pathways (p<.01), drug dosage reference (p<.01), and antibiotic use criteria (p<.01) were seen as a result of the intervention.

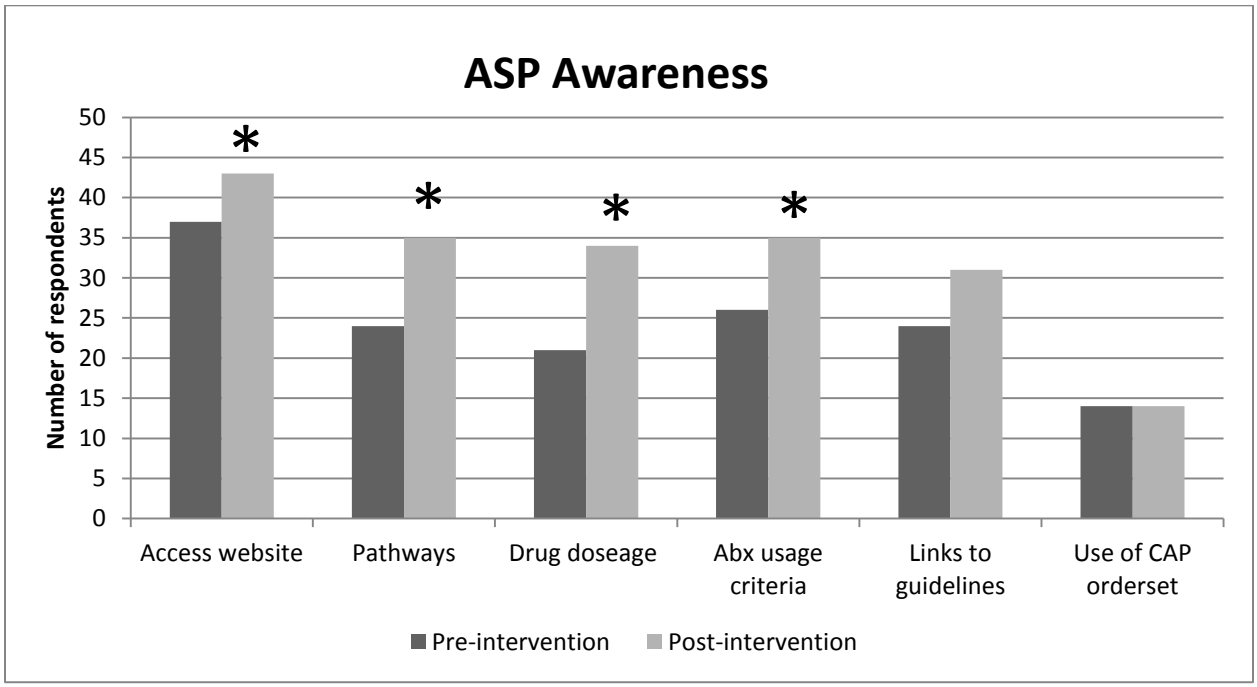


Figure 2. Reported pathway use increased as a result of the social media project (p<.01)

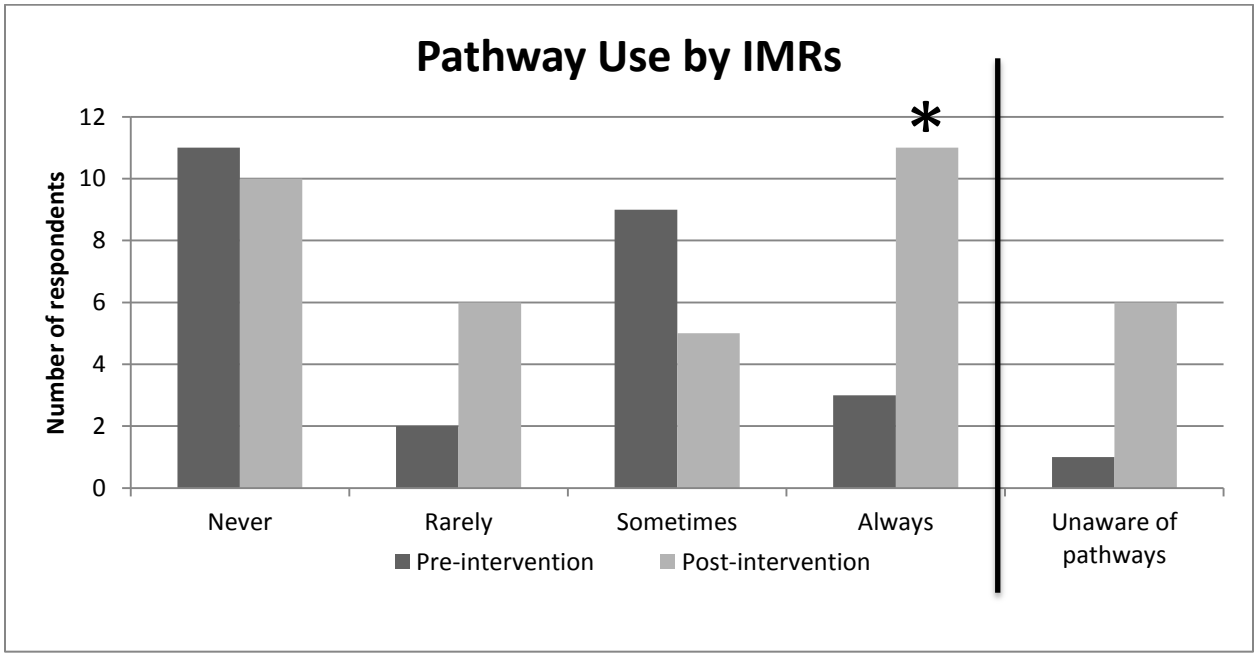
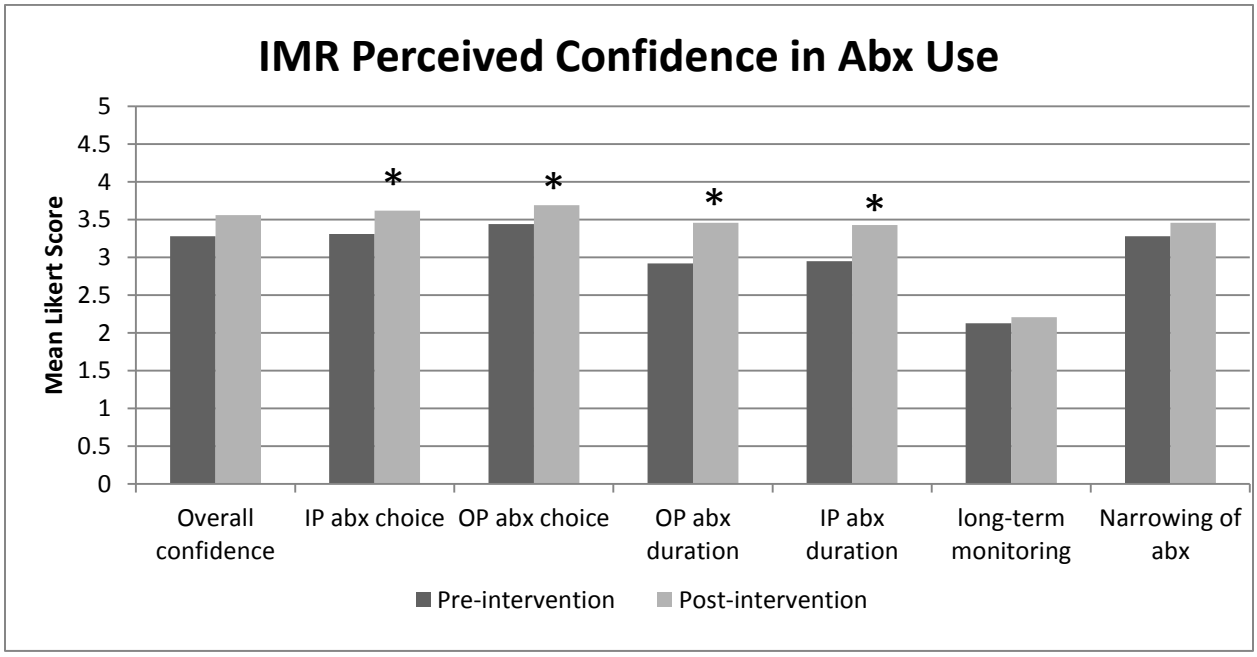


Fig 3. Confidence in antibiotic choice and duration in outpatient (p=.05 and p<.01) and inpatient (p=.05 and p<.01) areas significantly improved after the intervention period.



List of Publications and Products

Pisano J, Pettit N, Bartlett A, Bhagat P, Brielmaier B, Han Z, Landon E. Social Media as a Tool for Antimicrobial Stewardship. IDSA, Abstract #214, October 2014.

UCM ASP @chicago abx. (August 1 2013 to January 31 2014). [Study-related daily Tweets]. Retrieved from https://twitter.com/chicagoabx.

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