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Thesis Title:	**Assessing the Need for Antimicrobial Use Guidelines among Staff at King Abdulaziz Medical City, Kingdom of Saudi Arabia, 2013**

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Seth Edmunds Date

Assessing the Need for Antimicrobial Use Guidelines among Staff at King Abdulaziz Medical City, Kingdom of Saudi Arabia, 2013

By

Seth Edmunds
MPH

Global Health

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Keith Klugman MD, PhD
Committee Chair

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Assessing the Need for Antimicrobial Use Guidelines among Staff at King Abdulaziz Medical City, Kingdom of Saudi Arabia, 2013

By

Seth Edmunds

Bachelor of Science
University of Wyoming
2007

Thesis Committee Chair: Keith Klugman

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Health
2013

Contents

Abstract

Assessing the Need for Antimicrobial Use Guidelines among Staff at King Abdulaziz Medical City, Kingdom of Saudi Arabia, 2013

By Seth Edmunds

Introduction:
Recent studies show antimicrobial resistance to be an emerging problem in the medical community. Evidence-based guidelines can improve antibiotic usage, but are difficult to construct and implement. Prioritization of current knowledge and practice habits can enhance efficient message delivery. To better understand which guidelines should be prioritized, we surveyed knowledge, attitudes, and practices (KAP) among the medical staff at King Abdulaziz Medical City (KAMC), Riyadh, Kingdom of Saudi Arabia (KSA).

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Between Jan 1 – Mar 1, 2013, a convenience sample of 759 physicians and medical residents at KAMC was contacted via email and they were requested to complete a 20-minute, web-based survey that included five vignettes for three practice settings (primary care, intensive care, and medical residents).

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Among 134 (49%) of 285 primary care physicians who responded, > 90% correctly answered vignette one (oral amoxicillin for uncomplicated Group A streptococcal pharyngitis) and vignette two (oral TMP-SMX for seven days for uncomplicated *E. coli* UTI). More than 70% of participants correctly answered vignette three (oral moxifloxicin for uncomplicated acute maxillary sinusitis) and vignette four (oral ciprofloxacin for complicated *S. pneumoniae* in a smoker). Approximately 50% correctly identified TMP-SMX as a better choice than ampicillin for acute bacterial prostatitis (vignette five). Correct answers on vignettes were not associated with age group, gender, or training status (resident or not). No significant associations ($p < 0.05$) were found between attitudes and performance on the vignettes.

Discussion:
Based on the vignette scores, guideline creation and dissemination can be prioritized. Vignettes one and two showed good awareness and correct action so inclusion within the guidelines may not be necessary. The most urgent gap in knowledge was for drug use in acute bacterial prostatitis (vignette five). Future studies should focus on methods to improve participation, to evaluate the value of vignettes as a guide to prioritization, and the knowledge and attitudes portions of the survey.

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Chapter 1:

Contribution of the student:

The team in Saudi Arabia was responsible for data collection. I, Seth Edmunds, wrote, analyzed, and interpreted all other aspects of the project.

Literature Review

KAP Questionnaire Research

Wester was one of the first to study prescribers' views on antimicrobial resistance. He began with Chicago-area hospitals and surveyed 490 internal medicine physicians concerning attitudes towards antibiotic resistance importance, prevalence, beliefs of causes, self-reported experience with antibiotic resistance, and attitudes about interventions. [1] Encouragingly, the response rate was 424/490 (87%) of physicians. This was without incentives but with pre-programmed reminders and re-mailings of surveys. Some of their findings: "…antibiotic resistance was perceived as a very important national problem by 87% of the respondents, but only 55% rated the problem as very important at their own hospitals. Nearly all physicians (97%) believed that widespread and inappropriate antibiotic use were important causes of resistance. Yet, only 60% favored restricting use of broad-spectrum antibiotics, although this percentage varied by hospital and physician group." This information showed that there may be underlying disparities within the subpopulations of physicians that could prove

detrimental to some interventions. Identifying these disparities and modifying the interventions for could greatly improve the impact of stewardship programs.

In 2004 Srinivasan working through the Get Smart Program at the Centers for Disease Control and Prevention conducted a KAP survey in the Johns Hopkins 1000-bed university hospital in Baltimore, MD. After this, a long series of KAP studies focused on antimicrobial resistance. Their 75-item survey was distributed to house staff physicians on non-pediatric services. They assessed knowledge through a 10-question quiz. They disseminated the survey via campus mail and electronic mail with a $3 gift certificate to the hospital coffee shop used as an incentive though whether participation in the survey was a perquisite for the incentive was not mentioned. A high response rate was achieved for a convenience sample with 179 (67%) of 269 house staff physicians. Reminders were sent every 2 weeks for 4 weeks. They found that 21% of non-ICU physicians and 25% ICU physicians used antibiotics optimally. Also, surgeons reported that they were regularly seeking input for antimicrobial selections significantly ($P<.001$) beyond other specialties. They reported "88% agreed antibiotics are overused in general, 72% agreed this was the case at their institution ($r = 0.56$; $P<.05$); 96% agreed that hospitals in general face serious problems with antibiotic resistance, 93% agreed that their hospital faces these same problems ($r = 0.57$; $P<.05$); 97% agreed that better use of antibiotics would reduce resistance; The mean antimicrobial quiz score was 28%, with medicine residents scoring significantly higher than others ($P =.04$). Upper-level residents did not perform better than interns."

This study revealed that despite having a lengthy survey, a high response rate can be achieved. Whether this was achieved due to the incentive or not could be an

area of future study. These results demonstrate that the physicians are aware of the growing problem facing institutions concerning antimicrobial resistance, and they believe better antimicrobial use will help the problem. The results also show the house staff at only 32% receiving formal education towards reducing antimicrobial resistance, 90% wanting further education, 67% wanting more feedback on antibiotic selection, and achieving low average score results show a need and desire for potential interventions from the antimicrobial stewardship team.

Guerra (2007) conducted a similar but substantially novel KAP survey assessing antimicrobial use and resistance. A response rate could not be determined as it was not reported. They had 310 respondents, 33 preceptors and 277 medical residents representing 75% of the 369 eligible medical residents. Mentioned as a limitation, preceptors are volunteers without record collection so a total population could not be assessed. Excluding preceptors and focusing on medical resident response rates may have strengthened this study. Incentives, reminders, and time periods are also not discussed. A unique quality in the study was the use of ranking for potential programs that may be an effective surrogate of assessing popularity of programs without actually spending money.

Some relevant results of the Guerra survey that are typically seen throughout KAP studies of antimicrobial resistance: 99% of respondents perceived antimicrobial resistance is a problem; 93.0% agreed or strongly agreed that it was a problem in their own practices; regarding antimicrobial resistance: 97.7% of respondents agreed or strongly agreed that inappropriate antimicrobial therapy was a cause, 90.0% agreed or strongly agreed that noncompliance with infection control precautions was a cause,

86.1% agreed or strongly agreed that physicians' lack of knowledge about antimicrobial use was a cause; 86.7% agreed that antimicrobials are overprescribed; and 2.9% rated "practicing antimicrobial control" as the most important strategy for preventing resistance. These results call into serious question the physicians beliefs about what are effective means of controlling antimicrobial resistance. Despite the limitations, this study provided a beneficial means of assessing antimicrobial resistance knowledge programs that should have further study.

Continuing the Get Smart KAP survey trend, Minen (2010) emailed 999 medical students at an urban medical school in the northeast United States an anonymous, self-administered a 35-item survey revised from the Srinivasan survey to include demographics, medical school year and the future specialty. There was incentive to participate in the survey and the period lasted for 1 week with no reminders. The study achieved a 30% response rate including 304 medical residents which was mentioned as a limitation and was thought to largely be a timing error for the third and fourth year medical students. They found typically high results similar to the Guerra study concerning global, institutional problems, etc… however an interesting survey item asked the difference between inpatient and outpatient medicine concerning antibiotic overuse and 53% of the third- and fourth-year medical students reported agreeing that antibiotics are overused in inpatient medicine and 84% agreed that antibiotics are overused in outpatient medicine showing a large perceived disparity that could be the target of an intervention and worth independently assessing at the hospital level.

A cross-sectional survey of physicians between September 2008 and April 2009 was conducted in the West Indies at the University Hospital. [2] The survey consisted of

a 28-item, self-administered questionnaire of which a high response rate was achieved, 73%, totaling 174 physicians. Unlike other studies reviewed, Tennant found only 55% of the physicians considered antimicrobial resistance to be an important global problem and even less (35%) considered resistance to be a major problem nationally. This would seem to be fertile ground for large awareness campaigns for the physicians and health staff. More typical of these surveys, Tennant found widespread use of antibiotics (91%), inappropriate empiric choices (79%) and use of broad-spectrum agents (70%) were considered important factors producing antimicrobial resistance. Surprisingly, only 45% of physicians would de-escalate to a narrow-spectrum antibiotic guided by a microbiology report which would encourage educational programs and institutional guidelines for antibiotic prescribing.

Abbo (2011) conducted a similar antimicrobial use and resistance KAP survey of faculty and residents at Jackson Memorial Hospital, a 1,500 bed hospital in Miami, FL in conjunction with the Get Smart program. Their study differed from the Srinivasan study by using a convenience sampling method with no incentive and a 2 week longer duration (6 weeks) with similar reminders at 2 week intervals. A total of 609 (329 faculty [66%] and 280 residents [40%]) completed the survey from a total population of 1,200 physicians (500 faculty and 700 residents). They found similar results to the other studies; antibiotics are overused (faculty 315 [94%], residents 271 [95%]); antibiotics are appropriately used in the ICU (290 faculty [40%] and 269 residents [50%]).There was a low response as to if they overprescribe antibiotics (329 faculty [66%] and 280 residents [40%]). Though they both believe that other doctors overprescribe antibiotics (311 faculty [63%] and 266 residents [61%]); faculty and residents had significant

agreement that they would like more education on antibiotics (309 faculty [77%] and 269 residents [87%] p= <.001); antibiotic resistance is a significant problem in their hospital (faculty 315 [98%]; residents 269 [95%]). This study had, despite being a convenience sample, quite high response rates and produced similar results to the Srinivasan study even without an incentive which makes it another good counterexample to incentive-based studies.

Following the Srinivasan study, Garcia adapted the 75 item survey and pared it down to 38 items and converted it to be both shorter and culturally appropriate. [3] They achieved a response rate of 82% for a total of 256 respondents. Concerning antimicrobial resistance and a global and national problem, this survey hit a middle ground between the Guerra study and the Tennant Study. Garcia found that participants considered resistance to be a global problem (70%) and nationally (65%), also similar to other studies doctors were more confident in their own prescribing, finding resistance to be considered less of a problem in their own practice (22%) but higher in both the community (96%) and hospital (90%) settings. Other studies have suggested patient pressure to be a potential causal factor to antibiotic over-prescription and this study agreed with doctors believing the pressure to be a concern in community (72%) and hospital (50%) settings. As an assessment for future interventions Garcia asked participants what they considered to successful future interventions and they found prescribing educational programs (96%) and local AM guidelines (92%) to be considered the highest.

In 2008, Pulcini surveyed 190 postgraduate doctors still in training at two university teaching hospitals, in Nice, France (76% response) and Dundee, Scotland,

UK (70%response) totaling 139 respondents with an average response rate of 73%. According to the study "…in Nice, the questionnaire was sent by E-mail and mail in January 2008, when the junior doctors had been working for 3 months and more, and could be returned by fax, E-mail or mail in the provided envelope." Whereas the 56-item self-administered questionnaire was distributed during a compulsory training session on sepsis management and prescribing in Dundee. Oddly enough, the compulsory training received the lower response rate suggesting convenience sampling may be a more effective means of collecting KAP information than targeting mandatory course-specific participants. Similar to other studies Pulcini found 95% of the junior doctors considered antibiotic resistance to be national problem and 63% thought the problem as important in their own daily practice. However, extended duration of antibiotic treatment and poor hand-hygiene practices were not considered to be important drivers for resistance. There was also a stark difference between Nice and Dundee concerning the consultation of pharmacists for antimicrobial courses which would be helpful for designing potential interventions and shows further that assessing physician's perceptions on programs may be valuable.

Vignette-Based KAP Questionnaires

The main study prompting the inclusion of vignettes in my research was the 2011 Lucet study analyzing the effectiveness of using vignettes as surrogates for assessing the knowledge of physicians through the comparison of appropriateness of their antibiotic prescriptions. [4, 5] They developed four randomly assigned case vignette sets and distributed them to physicians in 2 public teaching hospitals. They received 206 participants and were able to achieve a participation rate of 50% of physicians who

regularly prescribing antibiotics. Of those, 106 physicians completed both the case vignettes and prescribed antibiotics at least once leaving a minimal amount of participants in the study but still enough for a significant analysis. No incentive or reminders were provided. According to the study, “Curative antibiotic prescriptions were then evaluated using standard criteria for appropriateness at initiation (day 0), after 2-3 days of treatment (days 2-3), and at treatment completion.” Two relevant statistics from the study: “prescriptions were appropriate at all 3 time points in only 43% of patients [and] case vignette scores above the median were significantly and independently associated with appropriate antibiotic prescription on days 2-3 and at treatment completion.” This provides compelling evidence that vignettes should at least tried as surrogates to actually observing physicians practicing which is costly, unpredictable, and can be difficult to generalize.

Towards the beginning of the effort to address antimicrobial resistant, Mainous sought to assess clinical pharmacists' knowledge of appropriateness of antimicrobial therapy for upper respiratory infections (URI) following a recommendation from the Centers for Disease Control and Prevention that antibiotics be administered judiciously. [6] They randomly sampled 752 members of the American College of Clinical Pharmacy of which 460 were returned and included in the analysis yielding a response rate of 59%. The multiple-choice surveys were mailed out and reminders were sent after 4 weeks for non-responders, no incentive was provided. Mainous found that pharmacists recommended prescribing antibiotics for URI and acute bronchitis significantly more if the symptoms included discolored discharge perhaps harking back to the adage that discoloration equates a bacterial infection. They also found that board

certification was a protective effect against prescribing antibiotics in this fashion. This study though older and perhaps more simplistic than the more developed vignettes used in today's studies still offers valuable insight that popular knowledge can still influence prescriber practice but with more education the effects are minimized. Agree with their conclusion that pharmacists are significant clinical consultants to physicians, efforts should be made to educate them regarding appropriate prescription of antibiotics and to include them in any type of assessment.

Coming back to more modern times, in 2011, Falchi, *et* al. developed a clinical vignette to assess antimicrobial use knowledge through a description of typical symptoms for gonococcal urethritis. [7] They randomly mailed 1000 French physicians access to their electronic questionnaire and achieved a response rate of 35%. There was no mention of reminders or incentives in their publication. The study period was 3 months in duration. They found that 40% of the participating physicians prescribed antibiotics conflicting with guideline recommendations for treatment of uncomplicated male gonoccocal urethritis. They also found a significant association between younger physicians (< 10 years in practice) and better compliance to guidelines than the more senior physicians. A short survey of knowledge like this study provided can be an effective way of tailoring intervention efforts within the state or national level. Routine testing of physician knowledge may be an area of future study to see if compliance levels increase following education interventions.

The final vignette-based KAP study I will discuss is Patel 2011; they focused specifically on antibiotic prescribing practices in neonatal intensive care units. [8] This is probably the most robust study using vignettes yet published and will largely be the

basis for this thesis including design and analysis. They chose physicians from 4 tertiary care NICUs completed an anonymous survey containing 12 vignettes describing empiric, targeted, or prophylactic antibiotic use. Overall, 161 (59% of 271 eligible respondents) completed the survey, 37% of whom had worked in NICUs for 7 or more years. No incentive or compensation was used nor were there any reminders given. They found that attending status and ≥ 7 years of NICU experience significantly predicted the highest scores on the vignettes. They concluded that vignettes can measure quality or be used for training when clear guidelines are outlined such as in an antimicrobial stewardship program. In the absence of clear antimicrobial guidelines vignettes can assess variation in practice and be used to craft guidelines.

Conclusion

Antimicrobial resistance is indeed a real global threat and efforts have been made to realize and address the situation, however, to our knowledge there is currently no literature on understanding physicians' knowledge or an appropriate means of assessing that knowledge in Saudi Arabia. I have presented studies utilizing a quiz-based questionnaire format and a vignette-based questionnaire format. As neither have been implemented in Saudi Arabia a feasibility assessment as to their appropriate use should be conducted.

Justification

We studied antimicrobial resistance knowledge, attitudes, and perceptions (KAP) using surveys of general knowledge and a questionnaire to gather demographic data along with attitudes and perceptions concerning the importance of various antimicrobial resistance factors (e.g., global vs. national influence, prescribing behaviors). The

studies reviewed above have provided evidence that these may be effective tools for assessing the need for antimicrobial stewardship guidelines. We also used vignette-based KAP surveys as a surrogate for observation or auditing of practice as actual practice observance is can be quite costly but both methods suffer from similar biases. With the ever-increasing breadth and depth of antimicrobial resistance studies and similarly knowledge assessment studies, these were chosen based on their more specific focus combining both knowledge assessment and antimicrobial resistance.

Chapter 2:

Manuscript

Abstract

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Introduction:

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Introduction

Antimicrobial resistance is becoming an ever-growing concern worldwide as many broad-spectrum antibiotics and second- and third-line drugs are increasingly rendered obsolete.[9] Tragically, developing nations are hardest hit by antimicrobial resistance caused by transmissible plasmids spreading resistance now to even carbapenams. [10-12] Genetic mutation accelerated by the inappropriate use [13] and self-prescription of antibiotics [14] are factors that lead to antimicrobial resistance. And the recent dissemination of the NDM-1 plasmid [15] and growing prevalence of MDR, XDR, and TDR-tuberculosis (TB) [16] are examples of this concern. Clinical mismanagement and poor infection control practices are to blame [17]; socio-cultural and economic factors also play a role. [18] Stemming this spread of resistance has to be undertaken sooner rather than later as there are few new antibiotics in the development pipeline. [19, 20] One way to accomplish this is underway in many countries through physician-prescribing behavior change and judicious use of antimicrobials.[21-23]

Several European studies have examined the correlation between antibiotic use and resistance. One study drew a correlation between antibiotic sales and penicillin resistant, invasive *Streptococcus pneumonia* (PNSP) among the 11 states in the European Antimicrobial Resistance Surveillance System (EARSS). [24] Even with limitations, the authors concluded that there was a linear correlation between sales and resistance. They discussed several successful interventions lowering the rates of PNSP when physicians were targeted to avoid the inappropriate prescription of antimicrobials. Another European study examined the prevalence of penicillin non-

susceptible pneumococci between Germany and France. [18] In agreement with the Bronzwaer study, the French overused antibiotics, and 46% PNSP prevalence had much higher resistance rates when compared to Germany's 7% PNSP prevalence. They concluded that the German cultural avoidance of medications when sick was the driving force. This is difficult for developing nations with access to most antibiotics.

There have been a few studies done in the Kingdom of Saudi Arabia (KSA) concerning antimicrobial prescribing habits and resistance prevalence. A baseline study assessing antibiotic resistance was done at King Fahad National Guard Hospital (KFNGH) between January 2004 and June 2009 utilizing a retrospective analysis of all reports of Gram-negative isolates from the general adult ICU. [25] The authors found decreased susceptibility for all organisms and drugs analyzed including *A baumannii* susceptibility to imipenem (55% to 10%, 82% decline); *E coli* susceptibility to cefuroxime (74% to 36%, 51% decline); *Enterobacter* invitro susceptibility to ceftazidime (34% to 5%, 85% decline); cefotaxime (34% to 6%, 82% decline); and pipracillin-tazobactam (51% to 35%, 31% decline). Other studies in KSA shared similar results demonstrating that KSA is not immune to the global antimicrobial resistance trends and intervention is required to stem this tide. [26-32] In the KSA, antimicrobial resistance is increasing in hospitalized patients as well [13, 25, 33, 34]. And the significant influx of foreign travelers (especially during the Hajj) may be linked to this increasing prevalence. [13] It may also be increasing because of non-compliance with drug regimens [33, 34] and prior use of antibiotics. [35]

There is a need to identify and assess the knowledge and perceptions about antimicrobial resistance among residents and other physicians, as well as among

incoming patients. This understanding could promote targeted medical education efforts that yielded more efficient and effective clinical management and infection control measures to reduce antibiotic resistance and contain healthcare costs. [36]

The National Guard Health Affairs (NGHA) of the Kingdom of Saudi Arabia (KSA) is currently addressing this problem. This study aims to develop a tool designed to assess the knowledge and practices of physicians and in-house staff that would play a role in the development and implementation of a major antimicrobial stewardship program.

Methods

Survey Tool

Surveys were administered to all medical residents and intensive-care unit (ICU) and primary care physicians at King Abdulaziz Medical City in Riyadh, KSA. To assess the knowledge of antimicrobial resistance of ICU physicians and general practitioners two separate sets of medical vignettes were created. The time required to take these surveys was estimate to be approximately 30 minutes. The resident assessment consisted of a modified survey taken from the published Srinivasan study; the time required was approximately 90 minutes. The demographics in the three surveys included age, gender, and years of training. The attitudes section contained 5-point Likert scale ranging from “Strongly agree to “Strongly disagree” responses to various questions on perceptions of antimicrobial resistance.

Survey Dissemination

Survey links were distributed via email through a proprietary survey software tool at KAMC; hard copies were also distributed. A separate confirmatory email was sent.

No incentives were given for participation due to unforeseen logistical problems. A reminder email was sent once-a-week for eight weeks. Hard copies were also distributed to various clinics and either collected by hand or mailed to Infection Prevention and Control (IP&C) at KAMC. Names of hard copy participants were recorded, but data entry was done anonymously.

Statistical Analyses

All data were analyzed with SAS 9.3. Due to a poor response rate from the ICU and medical resident surveys, only the primary-care surveys were analyzed. We examined associations between attitude questions and performance on vignettes both for individual questions and combinations of performance (e.g., perfect, missed 1, missed 2). Gender, age, and years-in-practice were assessed similarly. We used the Mantel-Hansel $\chi 2$ test and the Fischer's exact test where appropriate. Assessing the relationship between responses to Likert scale items, we used the Pearson correlation coefficient. We analyzed vignette scores (0-5) and attitudes both on the full Likert scale (strongly agree-strongly disagree) and a collapsed scale (agree-neutral-disagree).

Results

A total of all 755 physicians (176 medical residents and 583 staff physicians and consultants) at KAMC were contacted by e-mail for participation. Thirteen ICU physicians, 17 residents, and 11 primary-care residents completed their respective surveys. This sample was too small to test for associations. 24 (29.5%) of 176 medical residents completed the demographics,attitudes, and knowledge survey. No associations were found between antimicrobial attitudes and demographic information.

***Table 1*. Distribution of Study Participants, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia, 2013**

	Population	Respondents (%)	Excluded*	Included (%)
Total Physicians	755	260 (34.4)	91	169 (22.4)
Medical Residents	176	52 (29.5)	24	28 (15.9)**
ICU Physicians	298	13 (4.4)	13	0**
Primary-care Physicians	285	139 (48.8)	4	135 (47.4)
Primary Care Physician Study Demographics				
Male	87	64.9%		
Female	48	35.1%		
Total	135	100.0%		
Age Group				
0-25	0	0.0%		
26-35	27	20.0%		
36-45	64	47.4%		
46-55	34	25.2%		
55+	10	7.4%		
Total	135	100.0%		

*Incomplete surveys

**Not included in analysis

***Table2. Relationship* between Vignette Performance and Primary Care Physicians, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia, 2013**

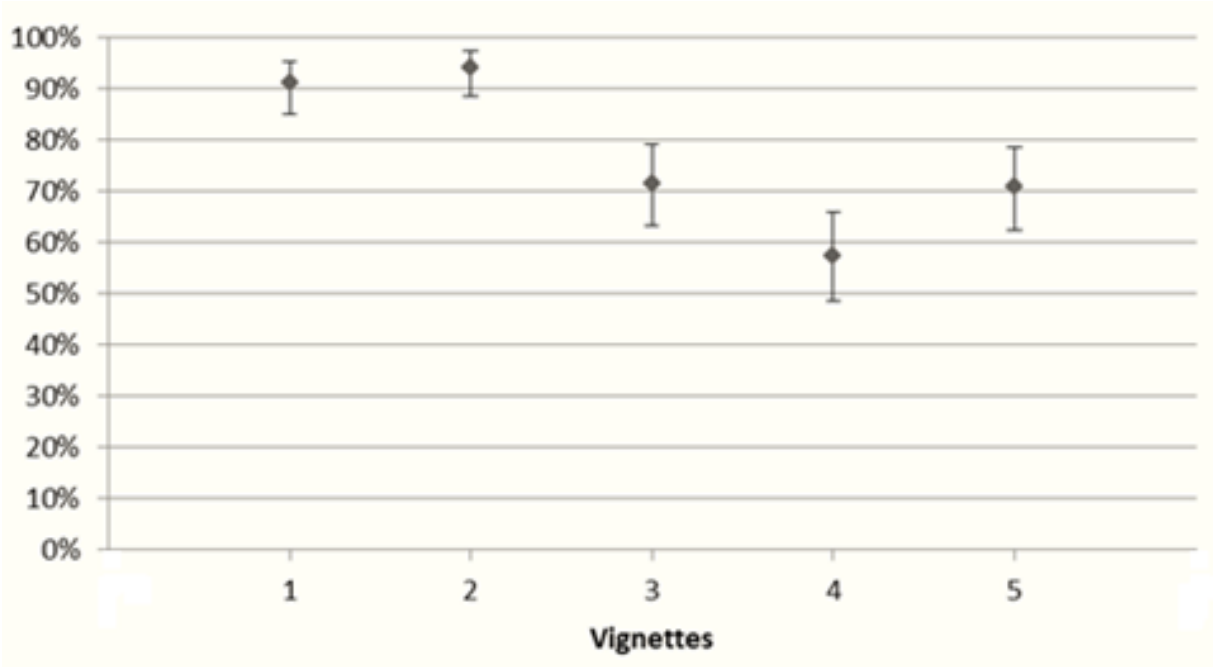
	X^2	DF	P-value
Vignette 1 x Age Group	10.505	3	0.015*
Vignette 2 x Age Group	1.191	3	0.755
Vignette 3 x Age Group	3.589	3	0.309
Vignette 4 x Age Group	0.749	3	0.862
Vignette 5 x Age Group	1.023	3	0.796
Vignette 1 x Gender			1.000
Vignette 2 x Gender			0.450
Vignette 3 x Gender	2.158		0.142
Vignette 4 x Gender	0.528		0.467
Vignette 5 x Gender			1.000
Vignette 1 x Years of Practice	18.388	3	0.000*
Vignette 2 x Years of Practice	1.117	3	0.773
Vignette 3 x Years of Practice	1.744	3	0.627
Vignette 4 x Years of Practice	2.520	3	0.472
Vignette 5 x Years of Practice	0.133	3	0.988

*not valid due to limited sample size

Among 139 of 285 primary care physicians responded to the survey, 4 were excluded due to incomplete surveys leaving 135 (47.4%) physician responses for analyses. More than 90% of primary care physician respondentsrespondents correctly answered vignette 1 (oral amoxicillin for uncomplicated Group A streptococcal pharyngitis) and vignette 2 (oral TMP-SMX for 7 days for uncomplicated E. coli UTI). Seventy percent correctly answered vignette 3 (oral moxifloxicin for uncomplicated acute maxillary sinusitis) and vignette 4 (oral ciprofloxacin for complicated S. pneumoniae in a smoker). Approximately 50% correctly identified TMP-SMX as a better choice than ampicillin for acute bacterial prostatitis (vignette 5). Correct answers on vignettes were not associated with age group, gender, or training status (resident or not). No significant association ($p < 0.05$) was found between attitudes and performance on vignettes.

Figure 1. **Primary Care Physicians' Vignette Performance**

in Saudi Arabia, KAMC 2013



Discussion

Based on vignette scores among participating primary care physicians at KAMC guideline creation and dissemination could be prioritized. The most urgent need was found for drug use in acute bacterial prostatitis (vignette 5). Next, priority within the guidelines for vignettes 3 and 4 were identified as lesser, but still necessary, and entities covered in the vignettes should be included. Vignettes 1 and 2 showed a good awareness and correct action so inclusion within the guidelines may not be necessary. Correct answers on vignettes were not associated with age group, gender, or training status (resident or not), indicating that educational guidelines should be disseminated to all prescribers. Physicians are regularly inundated with information and the introduction of antimicrobial stewardship guidelines only adds to that load, an effort should be made to streamline this process to allow for better assimilation of information and adoption and practice of appropriate antimicrobial usage.

There were limitations to this study. In addition to the lack of external validity due to convenience sampling, the participation rates were suboptimal and the knowledge and attitudes portions of the KAP survey produced no significant associations. Increased sample size may not alleviate the lack of association with attitudes as there was such a high degree of agreement possibly an effect of interview bias.

Further study should focus on methods to improve participation, to evaluate the value of further vignettes as a guide to guideline priority, and a more comprehensive evaluation of usefulness of the knowledge and attitudes sections. Opportunities to improve future studies involving physicians at KAMC were found through this study. We initially disseminated the online version of the surveys to ease the time commitment

needed from physicians, however it was the hard copies given directly at the clinics that accounted for the vast majority of completed surveys. Improving access to physicians via hospital email or rolling out a more intensive hard copy collection may improve future studies. The length of the survey proved an inhibitory factor for medical residents as only 17 of 109 actually completed it and after asked about the issues most commented that it was too long.

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Appendices

***Table 1*. Distribution of Study Participants, King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia, 2013**

	Population	Respondents (%)	Excluded*	Included (%)
Total Physicians	755	260 (34.4)	91	169 (22.4)
Medical Residents	176	52 (29.5)	24	28 (15.9)**
ICU Physicians	298	13 (4.4)	13	0**
Primary-care Physicians	285	139 (48.8)	4	135 (47.4)
Primary Care Physician Study Demographics				
Male	87	64.9%		
Female	48	35.1%		
Total	135	100.0%		
Age Group				
0-25	0	0.0%		
26-35	27	20.0%		
36-45	64	47.4%		
46-55	34	25.2%		
55+	10	7.4%		
Total	135	100.0%		

*Incomplete surveys
**Not included in analysis

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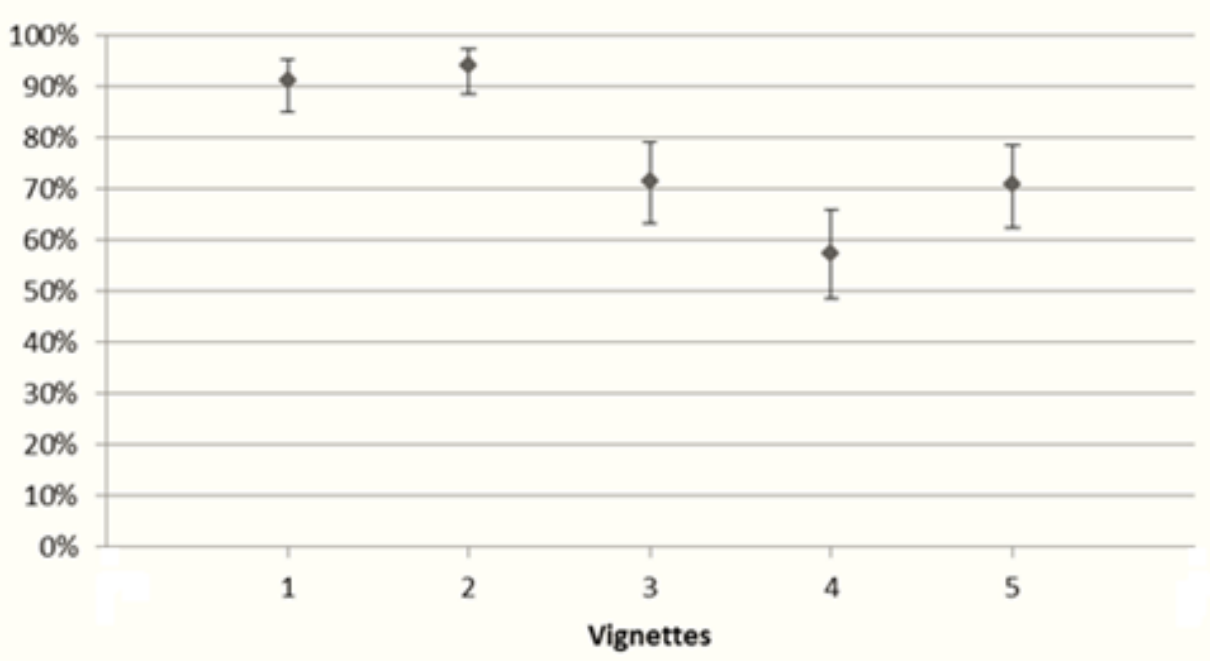

Chapter 3:

Conclusions and Recommendations

This study's main aim was to assess physician knowledge as a means of prioritizing antimicrobial stewardship guideline creation at KAMC. We were successful in demonstrating that physicians are both highly competent in some areas and in others lack knowledge for appropriate prescription. The most urgent need was found for drug use in acute bacterial prostatitis (vignette 5). Next, priority within the guidelines for vignettes 3 and 4 were identified as lesser, but still necessary, and entities covered in the vignettes should be included. Vignettes 1 and 2 showed a good awareness and correct action so inclusion within the guidelines may not be necessary. There was no statistically significant association among age group, gender, training status (resident or not), or years of service indicating that educational guidelines should be disseminated to all prescribers. Because of the convenience sampling used in this study, the external validity of the results should be interpreted with caution. Beyond that obvious limitation, the results did almost represent half of all the primary care physicians within KAMC. And as a group primary care physicians are major prescribers of antibiotics within the facility.

The information saturation that occurs within the medical profession is something that public health practitioners need to be acutely aware. Physicians are regularly inundated with information and the introduction of antimicrobial stewardship guidelines only adds to that load, an effort should be made to streamline this process to allow for better assimilation of information and adoption and practice of appropriate antimicrobial usage.

The main limitations to this study were the suboptimal participation rates and the non-association of the knowledge and attitudes portions of the KAP survey. Increased sample size may not alleviate the lack of association with attitudes as there was such a high degree of agreement possibly an effect of interview bias. The role in future KAP surveys of physicians' awareness of antimicrobial resistant may not be necessary.

Further study should focus on methods to improve participation, to evaluate the value of further vignettes as a guide to guideline priority, and a more comprehensive evaluation of usefulness of the knowledge and attitudes sections. Opportunities to improve future studies involving physicians at KAMC were found through this study. We initially disseminated the online version of the surveys to ease the time commitment needed from physicians; however it was the hard copies given directly at the clinics that accounted for the vast majority of completed surveys. Knowledge that physicians within KAMC are difficult to reach through mass emailing is critical to future studies involving them. Efforts should be made to make physicians more technologically aware of facility resources. Improving access to physicians via hospital email or rolling out a more intensive hard copy collection may improve future studies. The length of the survey proved an inhibitory factor for medical residents as only 17 of 109 actually completed it and after asked about the issues most commented that it was too long.

When used in conjunction with Delphi technique and prevalence surveys, vignette assessments of physician knowledge can help fill in potential gaps and streamline what is already mainstream knowledge and practice. Using a more robust design and more developed vignettes could prove an invaluable tool to adopting appropriate and locally relevant antimicrobial stewardship guidelines in Saudi Arabia.