The antimicrobial stewardship program in Gulf Cooperation Council (GCC) states: insights from a regional survey

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Abstract

Objectives: The purpose of the current study is to describe the prevalence and characteristics of antimicrobial stewardship programs (ASP) in Gulf Cooperation Council (GCC) states to explore opportunities and overcome barriers to effective ASP implementation.

Methods: A cross-sectional questionnaire survey was used to evaluate the current status of ASP: major stewardship components, barriers of implementation and program impact in acute care hospitals of GCC states.

Results: Forty-seven healthcare professionals responded from four GCC states, the majority from Saudi Arabia (81%). Twenty-nine (62%) participating hospitals had ASP in place. Of these established programs, 35 (75%) reported lack of funding and personnel as major barriers to program implementation. The top three objectives cited for the hospital ASP were to reduce resistance (72.3%), improve clinical outcomes (70.2%) and reduce costs (44.7%). The reported impact of existing ASP was reduction of inappropriate prescribing (68%), reduction of broad spectrum antibiotic use (63.8%), reduction of healthcare-associated infections (61.7%), reduction of length of stay or mortality metrics (59.6%), reduction in direct antibiotic cost (57.4%) and reduction of reported antibiotic resistance (55.3%).

Conclusion: Survey participants from GCC states who have implemented ASP report significant impacts in the reduction of broad spectrum antibiotic use, hospital-acquired infection, inappropriate prescribing and antimicrobial resistance. These findings suggest a promising opportunity to enhance existing ASP through sharing of best practices and support the development of regional guidelines across GCC states.

Keywords

Antimicrobial stewardship, antibiotics, Saudi Arabia, Gulf Cooperation Council (GCC)

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Introduction

The increasing emergence of antimicrobial resistance (AR) presents a serious public health crisis and adversely affects patient clinical outcomes resulting in higher rates of morbidity and mortality as well as adding considerable and avoidable costs to the already overburdened healthcare systems (Nathan and Cars, 2014). Recently, organisations such as the Centers for Disease Control and the World Health Organization have declared AR a public health crisis and a threat to national security (Centers for Disease Control, 2013; World Health Organization, 2013).

A national surveillance of antimicrobial resistance among Gram-positive bacteria in Saudi Arabia revealed

high resistance among coagulase-negative staphylococci (oxacillin: 63%), *Staphylococcus aureus* (methicillin-resistant *S. aureus*: 32%) and pneumococci (penicillin G: 33%; erythromycin: 26%; ceftriaxone: 11%) (Shibl et al., 2014). Moreover, Gulf Cooperation Council (GCC) states

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share a high prevalence of extended-spectrum-B-lactamase (ESBL) and carbapenemase-producing gram negative bacilli, most of which are associated with nosocomial infections (Zowawi et al., 2013).

Antibiotic misuse is a major determining factor of AR, occurring in around 50% of prescribing (Paterson, 2006). GCC countries are facing challenges of emerging antimicrobial resistance with no clear, regional guidelines for antimicrobial use or precise policies for restricting and monitoring antimicrobial prescriptions (Aly and Balkhy, 2012).

The antimicrobial stewardship program (ASP) is a strategic initiative to optimise the use of existing antibiotics – for those who need them – thus preserving their effectiveness and delaying emergence of resistance. As a patient-centred multifaceted program, ASP ensures that patients receive the right antibiotic choice, the right dose and the shortest effective duration to improve their outcome and minimise unintended consequences.

The proven benefits of ASPs have led to increasing calls for their implementation in all hospitals (File et al., 2014). Despite its publicity in most North American, European and Australian hospitals, there are limited assessments of ASP strategies across hospitals in the Arabian Gulf. Our survey aimed to evaluate the current status of ASP in the GCC, its core components, funding, barriers and outcomes. Insights from this regional survey may aid in understanding the challenges to and opportunities for developing effective ASP in the region that will help develop regional guidelines for antibiotic consumption and resistance surveillance.

Methods

A web-based survey tool was adapted from Worldwide Antimicrobial Stewardship Survey Developed by the European Society for Clinical Microbiology and Infectious Diseases Study group for Antibiotic Policies (ESGAP) and International Society for Chemotherapy (ISC) Working Group for Antimicrobial Stewardship.

It was disseminated to healthcare institutions in GCC countries during the period January to March 2013. The study received approval from The Institutional Review Board of King Fahad Medical City. Informed consent was formulated highlighting the voluntary participation, confidentiality and use of the survey data for research purposes only. The survey tool was posted on a website for healthcare professionals (<http://www.doctorksa.com>) targeting 2000 healthcare professionals. In addition, 20 personalised emails were sent to infectious diseases and pharmacy networks representing different healthcare systems.

The target population was infectious diseases specialists, pharmacists, microbiologists or other physicians / administrators with an interest or experience in antibiotic policies. Instructions specified that a single survey be filled out by one person at each hospital. The survey tool contained 21 questions (Appendix); it collected information on hospital

demographic characteristics, hospital size, self-identified hospital classification and teaching status. Presence of electronic prescribing systems was assessed. Participants' demographic data in terms of job title, and role in hospital antimicrobial and drug and therapeutic committees were collected. Data on the presence or absence of an ASP, ASP strategies used, outcome measures and barriers identified were collected. Data were managed and analysed using the SPSS statistical analysis package version 20. Categorical variables were presented as frequencies and percentages.

Results

Forty-seven participants from four GCC states, namely Saudi Arabia, Oman, United Arab Emirates and Bahrain, submitted completed surveys. Participants from Saudi Arabia constituted the bulk 38/47(80.9%), while only two participants were from Oman, United Arab Emirates and Bahrain each. Unfortunately there was no participation from Kuwait or Qatar (the total number of hospitals in Saudi Arabia is 415). Demographic characteristics of participants are illustrated in Table 1.

Most of the participating institutions were tertiary care teaching hospitals with a capacity in the range of 200–800 beds as illustrated in Table 2.

Twenty-nine out of 47 participating hospitals (61.7%) had ASP in place. Of these, the top three objectives for the hospital current or planned ASP were to reduce resistance, improve clinical outcome and reduce costs (72%, 70% and 45%, respectively). Multiple barriers were identified to effective stewardship programs including limited personnel

Table 1. Respondents' demographics.

Respondent characteristic	Number of respondents out of the 47 responses (%)
<i>Respondent job title (n = 47)</i>	
• Infection control consultant	23 (48.9)
• Assistant consultant physician	7 (14.9)
• Pharmacist	5 (10.6)
• Others	8 (17.0)
• No response	4 (8.5)
<i>Respondent role in hospital (n = 47)</i>	
• Antimicrobial utilisation committee member	16 (34.0)
• Drug and therapeutics committee member	4 (8.5)
• Infectious diseases specialist	7 (14.9)
• Medical microbiologist	2 (4.3)
• Nurse	3 (6.4)
• Other physician	8 (17.0)
• Pharmacist	2 (4.3)
• Senior management	4 (8.5)
• Other	1 (2.1)

Table 2. Institutional demographics.

Characteristics	Number of respondents out of the 47 responses (%)
<i>Institution type (n = 47)</i>	
• Teaching tertiary care	19 (40.4)
• Non-teaching tertiary care	8 (17.0)
• District / general	9 (19.1)
• Community	2 (4.3)
• Private	4 (8.5)
• No response	5 (10.6)
<i>Hospital beds (n = 47)</i>	
• 200–400	20 (42.6)
• 500–700	11 (23.4)
• >800	16 (34.0)
<i>Antimicrobial stewardship (n = 47)</i>	
• Yes	29 (61.7)
• No	15 (31.9)
• Don't know	3 (6.4)
<i>1. Electronic prescribing (n = 47)</i>	
• Yes	34 (72.3)
• No	13 (27.7)
<i>2. Funding</i>	
• Dedicated funds	8 (17.0)
• Funding from savings of antimicrobials	3 (6.4)
• Don't know / not applicable	35 (74.5)

Table 3. Barriers to functional and effective ASP.

Barriers	Number of respondents out of the 47 responses (%)
• Administration not aware of ASP	4 (8.5)
• Lack of personnel or funding	10 (21.3)
• Multiple factors	23 (48.9)
• Obstruction from prescribers	5 (10.6)
• Others	5 (10.6)

and lack of funding, as illustrated in Table 3. Almost 75% of established stewardship programs had no dedicated funding, constituting a major barrier.

Antimicrobial stewardship rounds occurred in 51% of institutions, most frequently in their intensive care unit.

Among all participating institutions, 37 (78.7%) had antimicrobial guidelines that included first choice antibiotics, therapy of specific infectious diseases, dosage of specific antibiotics including calculation in special populations (renal

Table 4. Antimicrobial stewardship objectives and strategies.

Sets of objectives of ASP (n = 47)	Frequency out of the 47 responses (%)
• Improve clinical outcome	33 (70.2)
• Minimize or stabilise resistance	34 (72.3)
• Reduce cost	21 (44.7)
• Reduce <i>Clostridium difficile</i> infection	6 (12.8)
• Reduce length of stay	1 (2.1)
<i>3. Strategies: Restricted list of antimicrobial agents (n = 47)</i>	
• Yes	40 (85.1)
• No	4 (8.5)
• Don't know	3 (6.4)
<i>4. Strategies: Antimicrobial audit (n = 47)</i>	
• Yes	30 (63.8)
• No	16 (34.0)
• Don't know	1 (2.1)
<i>5. Strategies: Antimicrobial guidelines (n = 47)</i>	
• Treatment of specific infectious syndrome	10 (21.3)
• First choice antibiotic (empiric)	12 (25.5)
• Antimicrobial dosing	12 (25.5)
• Dosing in special population	8 (17.0)
• Surgical prophylaxis	9 (19.1)
• Route of administration	9 (19.1)
• Duration of prescription	4 (8.5)

or liver impairment), surgical prophylaxis and duration of prescription as illustrated in Table 4.

Preauthorisation of restricted antimicrobial therapy existed in 40 (85%) hospitals with 27.7% requiring preauthorisation before the first dose, 25.5% before the second dose and 15% during the working day. Other methods of restriction were used by 27.7% of the hospitals. Out of 47 institutions, 30 (63.8%) had antimicrobial auditing, while 29 (61.7%) had reporting and monitoring antibiotics. Electronic prescription was found in 34 (72%) participating hospitals.

Among the reported significant impacts of existing ASP were reduction of broad spectrum antibiotic use, hospital-acquired infection, inappropriate prescribing and antimicrobial resistance. Reduced length of stay or mortality metrics and reduction in direct antibiotic cost were other benefits as illustrated in Table 5.

Discussion

To our knowledge, this is the first published assessment of ASPs in GCC states. The survey results indicate that many ASPs are active in the region; however, the definition of an ASP was unclear in the survey and may have been interpreted differently by various respondents.

Table 5. Outcomes of antimicrobial stewardship programs.

Outcome (n = 47)	Number of respondents out of the 47 responses (%)
6. <i>Reduction of inappropriate prescribing</i>	
• Yes	32 (68.1)
• No	2 (4.3)
• Don't know	13 (27.7)
7. <i>Reduction of healthcare-associated infection</i>	
• Yes	29 (61.7)
• No	2 (4.3)
• Don't know	16 (34.0)
8. <i>Reduction of direct antibiotic cost</i>	
• Yes	27 (57.4)
• No	4 (8.5)
• Don't know	16 (34.0)
9. <i>Reduction of length of stay / mortality metrics</i>	
• Yes	28 (59.6)
• No	0
• Don't know	19 (40.4)
10. <i>Reduction of antimicrobial resistance</i>	
• Yes	26 (55.3)
• No	2 (4.3)
• Don't know	19 (40.4)
11. <i>Reduction of broad spectrum antibiotic use</i>	
• Yes	30 (63.8)
• No	4 (8.5)
• Don't know	13 (27.7)

Preauthorisation and restricted list of antimicrobial agents appears to be the core stewardship strategy practised in GCC countries; this is consistent with the IDSA Emerging Infections Network survey (Johansson et al., 2011). Post-prescription review with feedback has been associated with decreased and improved antimicrobial use (Arnold et al., 2006; Cosgrove et al., 2007; Di Pentima and Chan, 2010).

The latter strategy was not evaluated in the current study although the presence of stewardship rounds in half of the institutions may indirectly reflect post-prescription review of antibiotics.

A noticeable finding of our study is the reported favourable impact on patients and hospitals after initiation of ASP; reduction in healthcare-associated infection, inappropriate antibiotic prescribing, length of stay or mortality metrics and antimicrobial resistance makes ASP worthwhile as part

of quality and patient safety initiatives. These benefits are well documented by other studies (Trivedi and Rosenberg, 2013). Since we did not evaluate specific metrics such as antibiotic consumption in days of therapy or defined daily dosing per 1000 patient days or the rate of healthcare-associated infections, the mentioned benefits may reflect participants' observations that need confirmation. IDSA and Australian Commission on Safety and Quality in Healthcare recommend both process (did the intervention result in the desired change in antimicrobial use?) and outcome measures (did the process implemented reduce or prevent resistance or other unintended consequences of antimicrobial use?) in determining the impact of antimicrobial stewardship on antimicrobial use and resistance patterns.

Lack of program funding and staffing were underscored as the most important barriers to effective ASPs. Other barriers were lack of awareness by hospital leaders of ASP and opposition by prescribers. Hospitals that have no ASP in place may use alternate ways such as telemedicine, remote consulting or identification of less specialised healthcare monitoring activities that a nurse or a non-pharmacist would be able to perform (Trivedi and Rosenberg, 2013).

Another approach to spreading ASP across hospitals is to mandate it through national or regional legislation as well as accreditation boards, as has other regional health authorities (Australian Commission on Safety and Quality in Health Care, 2011; Society for Healthcare Epidemiology of America et al., 2012; Trivedi et al., 2014). Presence of electronic health records in the majority of participating institutions in GCC states, computerised decision support and use of electronic tools could assist with stewardship efforts particularly in less resourced hospitals (Forrest et al., 2014; Kullar et al., 2013).

The survey results should be viewed with some caution due to some limitations: the nature of survey design being subject self-selective and self-reporting, with small sample size and lack of adequate representation of all GCC countries, which make the results overestimated. Moreover, there are gaps in assessing outcome of existing ASP programs, as 30–40% of participants did not know the impact of their programs on antibiotic consumption, resistance, healthcare-associated infections or direct cost.

Conclusion

The majority of these survey participants from GCC states have implemented ASP and reported subjective positive impacts in the reduction of broad-spectrum antibiotic use, hospital-acquired infection, inappropriate prescribing and antimicrobial resistance. Although these findings need further verification, it may reflect a promising opportunity to enhance existing antimicrobial stewardship programs through sharing of best practices across GCC, overcoming barriers and support the need to make ASP regulatory requirement in all healthcare facilities.

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References

- Aly M and Balkhy H. (2012) The prevalence of antimicrobial resistance in clinical isolates from Gulf Corporation Council countries. *Antimicrobial Resistance and Infection Control* 1: 26.
- Arnold FW, McDonald LC, Smith RS, Newman D, Ramirez JA. (2006) Improving antimicrobial use in the hospital setting by providing usage feedback to prescribing physicians. *Infection Control and Hospital Epidemiology* 27: 378–382.
- Australian Commission on Safety and Quality in Health Care. *National Safety and Quality Health Service Standards*. Sydney: ACSQHC, 2011. Available at: <http://www.safetyandquality.gov.au/wp-content/uploads/2011/01/NSQHS-Standards-Sept2011.pdf>.
- Centers for Disease Control and Prevention. *Antibiotic resistance threats in the US, 2013*. Atlanta, GA: Centers for Disease Control and Prevention. Available at: www.cdc.gov/AntibioticResistanceThreats/index.html.
- Cosgrove SE, Patel A, Song X, Miller RE, Speck K, Banowetz A, Hadler R, Sinkowitz-Cochran RL, Cardo DM, Srinivasan A. (2007) Impact of different methods of feedback to clinicians after postprescription antimicrobial review based on the Centers for Disease Control and Prevention's 12 Steps to Prevent Antimicrobial Resistance Among Hospitalized Adults. *Infection Control and Hospital Epidemiology* 28: 641–646.
- Di Pentima MC and Chan S. (2010) Impact of antimicrobial stewardship program on vancomycin use in a pediatric teaching hospital. *Pediatric Infectious Disease Journal* 29: 707–711.
- File TM Jr, Srinivasan A and Bartlett JG. (2014) Antimicrobial stewardship: importance for patient and public health. *Clinical Infectious Diseases* 59(S3): s93–96.
- Forrest GN, Van Schooneveld TC, Kullar R, Schulz LT, Duong P, Postelnick M. (2014) Use of electronic health records and clinical decision support systems for antimicrobial stewardship. *Clinical Infectious Diseases* 59(S3): S122–133.
- Johannsson B, Beekmann SE, Srinivasan A, Hersh AL, Laxminarayan R, Polgreen PM. (2011) Improving antimicrobial stewardship: the evolution of programmatic strategies and barriers. *Infection Control and Hospital Epidemiology* 32(4): 367–374.
- Kullar R, Goff DA, Schulz LT, Fox BC, Rose WE. (2013) The “epic” challenge of optimizing antimicrobial stewardship: the role of electronic medical records and technology. *Clinical Infectious Diseases* 57(7): 1005–1013.
- Nathan C and Cars O. (2014) Antibiotic resistance – problems, progress and prospects. *New England Journal of Medicine* 371: 1761–1763.
- Paterson DL. (2006) The role of antimicrobial management programs in optimizing antibiotic prescribing within hospitals. *Clinical Infectious Diseases* 42 (Suppl. 2): S90–95.
- Shibl AM, Memish ZA, Kambal AM, Ohaly YA, Ishaq A, Senok AC, Livermore DM. (2014) National surveillance of antimicrobial resistance among Gram-positive bacteria in Saudi Arabia. *Journal of Chemotherapy* 26(1): 13–18.
- Society for Healthcare Epidemiology of America, Infectious Diseases Society of America and Pediatric Infectious Diseases Society. (2012) Policy statement on antimicrobial stewardship by the Society for Healthcare Epidemiology of America, the Infectious Diseases Society of America, and the Pediatric Infectious Diseases Society. *Infection Control and Hospital Epidemiology* 33(4): 322–327.
- Trivedi KK, Dumartin C, Gilchrist M, Wade P, Howard P. (2014) Identifying best practices across three countries: hospital antimicrobial stewardship in the United Kingdom, France, and the United States. *Clinical Infectious Diseases* 59(S3): S170–178.
- Trivedi KK and Rosenberg J. (2013) The state of antimicrobial stewardship programs in California. *Infection Control and Hospital Epidemiology* 34(4): 379–384.
- World Health Organization. (2013) *Antibiotic resistance – a threat to global health security*. Geneva: World Health Organization. Available at: http://www.who.int/drugresistance/activities/wha66_side_event/en/.
- Zowawi HM, Balkhy HH, Walsh TR, Paterson DL. (2013) B-lactamase production in key Gram-negative pathogen isolates from the Arabian Peninsula. *Clinical Microbiology Reviews* 26(3): 361–380.