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Short Communication

An Evaluation of Antimicrobial Resistance in Bermuda

R Conyers[1], S Jatto[2], A Smith[3*], B Dagnachew[4], M Ashton[1], H Haigh[5]

[1] *Infectious Diseases and Hospital Epidemiology, King Edward VII Memorial Hospital, Bermuda*

[2] *Clinical Laboratory, Department of Health, Bermuda*

[3] *Department of Pharmacy, King Edward VII Memorial Hospital, Bermuda*

[4] *Department of Quality and Risk, King Edward VII Memorial Hospital, Bermuda*

[5] *Department of Pathology and Microbiology, King Edward VII Memorial Hospital, Bermuda*

**Corresponding author: Dr. A Smith, Department of Pharmacy, King Edward VII Memorial Hospital, Bermuda.*

Email: Ashley.Smith@bhb.bm

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Antimicrobial drug resistance is of great importance to healthcare facilities globally, especially in relation to the diagnosis and management of patients with life-threatening infections such as pneumonia and blood stream infections [1,2]. The battle continues between several Gram-negative and Gram-positive pathogens and the introduction of new antibiotics such as oxyimino-cephalosporins, carbapenems, linezolid, daptomycin, and tigecycline for the management of patients with critical bacterial infections.

Over the years, bacteria have developed sophisticated mechanisms such as efflux pumps, alteration of membrane proteins and antibiotic modifying enzymes to inhibit or suppress the activity of antimicrobial agents. Empirical antibiotic management for the first 48 hours, especially for severe infections, is based on the likely pathogens and local resistance data. The current increase in antimicrobial resistance has serious implications for the management of patients using empirical therapy. The choice of empirical therapy becomes difficult, given the challenges encountered with antimicrobial resistance, and studies have indicated that resistance to the empirical antibiotic treatment is compatible with an increase in mortality in bacteremias [3]. The emergence of antimicrobial resistance as a consequence of the use and abuse of antimicrobial agents has become a major global concern and as such, it is extremely important to collect antimicrobial resistance data, nationally and internationally.

We carried out a retrospective study for the period January 2014 to December 2014 to evaluate antibiotic resistance in bacterial isolates obtained from patients in King Edward VII Memorial Hospital and the community, presenting with urinary tract infections (urine), skin and soft tissue infections (wound swab or pus), lower respiratory infections (sputum) and blood stream infections (blood culture). King Edward VII Memorial Hospital, a general hospital accredited by Accreditation Canada, is the only healthcare facility in Bermuda. Antibiotic susceptibility testing and minimum inhibitory concentration (MIC) determinations of the isolates were carried out using the Vitek II automated system (bioMérieux, Inc., Durham, NC). The susceptibility profiles obtained for the isolates were analyzed using WHONET, a free Windows-based database software developed by the World Health Organization (WHO). Data reporting was generated with the use of OBSERVA data management software (bioMérieux, Inc., Durham, NC). The Clinical and Laboratory Standards Institute (CLSI) performance standards for antimicrobial susceptibility testing, M100-S18 (2008) were used to interpret the MIC results for antimicrobial agents. Antibiotic susceptibility profiles for the isolates and selected antibiotics are presented in Table 1. In our study, susceptibility rates for *E. coli, K. pneumonia, E. aerogenes, E. cloacae* and *P. mirabilis* to ampicillin were 63%, 0%, 8%, 7%, and 91% respectively. Susceptibility rates for *P. aeruginosa* to ciprofloxacin, ceftazidime, gentamicin and meropenem were 87%, 97%, 95%, and 80% respectively. Susceptibility rates for *E.coli* to amoxicillin-clavulanic acid, trimethoprim-sulfame thoxazole,

Organism	No. of isolates	% of isolates susceptible											
		AMP	AMC	SXT	CIP	CRO	CAZ	CLIN	TET	GEN	VAN	MEM	OXA
E. Coli	1390	63	87	82	85	97	97	NT	NT	96	NT	97	NT
K. Pneumoniae	260	0	88	94	97	98	99	NT	NT	99	NT	71	NT
E. aerogenes	43	8	2	100	97	98	98	NT	NT	100	NT	NT	NT
E. cloacae	35	7	11	71	83	78	92	NT	NT	94	NT	NT	NT
P. mirabilis	111	91	95	94	99	99	99	NT	NT	99	NT	100	NT
P. aeruginosa	234	NT	NT	NT	87	NT	97	NT	NT	95	NT	80	NT
Enterococcus Spp	81	86	NT	NT	42	NT	NT	NT	NT	NT	94	NT	NT
S. aureus	610	17	77	97	67	NT	NT	73	96	98	100	NT	78

AMP, ampicillin; AMC, amoxicillin-clavulanic acid; SXT, trimethoprim-sulfamethoxazole; CIP, ciprofloxacin; CRO, ceftriaxone; CAZ, ceftazidime; CLIN, clindamycin; TET, tetracycline; GEN, gentamicin; VAN, vancomycin; MEM, meropenem; OXA, oxacillin; NT, not tested

ciprofloxacin, ceftriaxone, ceftazidime, gentamicin and meropenem were 87%, 82%, 85%, 97%, 97%, 96%, and 97% respectively. *E.coli* is the predominant agent for causing urinary tract infections in healthcare facilities and the community. In addition, *E. aerogenes*, *E. cloacae*, *K. pneumonia* and *P. aeruginosa* are important agents associated with hospital acquired pneumonia. Susceptibility rates for *Staphylococcus aureus* to oxacillin, tetracycline, trimethoprim-sulfamethoxazole, clindamycin, gentamicin and vancomycin were 78%, 96%, 97%, 73%, 98%, and 100% respectively.

The results of this study are in agreement with those of a previous study investigating antibiotic resistance trends in Bermuda over fifteen years ago [4]. In the previous study, susceptibility rates of *E.coli* to ampicillin, amoxicillin-clavulanic acid, ciprofloxacin, trimethoprim-sulfamethoxazole and gentamicin were 68%, 90%, 98%, 85%, and 99% respectively. In addition, susceptibility rates of *P. aeruginosa* to ciprofloxacin, ceftazidime and gentamicin were 98%, 98%, and 98% respectively. In this study, the susceptibility rates of *S. aureus* to gentamicin and vancomycin are compatible with those obtained in the previous study. However, there was a decrease in the susceptibility rates of *S. aureus* to oxacillin, amoxicillin-clavulanic acid and clindamycin compared to the previous study. A recent study at our institution reported susceptibility rates of methicillin resistant *Staphylococcus aureus* (MRSA) to trimethoprim-sulfamethoxazole, tetracycline, gentamicin, vancomycin and linezolid of 95%, 100%, 100%, 100%, and 100% respectively [5]. Both the previous and present findings suggest that Bermudian isolates do not exhibit the typical resistance patterns observed in other countries. Our institution has adopted a multi-disciplinary approach to controlling antibiotic resistance, incorporating such activities as Infectious Disease rounds and building an Antimicrobial Stewardship Programme. It is very important for healthcare facilities to implement good antimicrobial stewardship, antibiotic utilization, infection prevention and control policies and procedures to limit the dissemination of multi-drug resistant organisms as well as antibiotic resistance. For fiscal years 2014-2016 the average Hospital associated-MRSA (HA-MRSA) rate at our institution was 7%, and the average hand hygiene compliance was 84%. Poor compliance with infection prevention and control policies and procedures can facilitate the transmission of multi-drug resistant organisms between patients [6]. Furthermore, good interactions between the Microbiology Laboratory, Consultant Microbiologist, Infectious Disease Specialist, Clinical Pharmacist, and the physician caring for the patient are important in the control of antimicrobial resistance.

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