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Impact of antimicrobial stewardship program on antibiotic resistance and length of hospital stay of patients at Bicol regional training and teaching hospital: A retrospective descriptive study

Paulo Martin B. Villanueva[1], John Bryle J. Zapanta[2]
[1]*Polytechnic State University of Bicol/Manila Doctors College of Nursing, Philippines*
[2]*Bicol Regional Training and Teaching Hospital, Philippines*
Corresponding Email: paulomartin3006@yahoo.com

ABSTRACT
The study determined the impact of antimicrobial stewardship program on antibiotic resistance and length of hospital stay of patients at Bicol Regional Training and Teaching Hospital. Specifically: (1) Determined the top three isolated organisms in the hospital antibiogram of 2017. (2) Determined the patient's average length of hospital stay and antibiotic resistance of top three isolated organisms before AMS (2017), (3) Monitored the top three isolated organisms of 2017 after one (1) year of AMS (2019) in terms of Average length of hospital stay and Antibiotic Resistance, and (4) Compared the patient's average length of hospital stay and antibiotic resistance of top three isolated organisms before AMS (2017) and after AMS (2019). The study used a retrospective and descriptive study, this design aimed to compare the antibiotic resistance and length of hospital stay of patients during the pre AMS (January 1 – December 31, 2018) and post AMS era (January 1 – December 31, 2019). Patient with respiratory infections shown at greater risk to be infected with Klebsiella pneumoniae and pseudomonas sp, while patient with would injury or related condition are at greater risk for staphylococcus infection. The pediatric patients are at higher risk for prolonged hospital stay compare to all other patients from the medical, surgical and OB-Gyne ward during the Pre AMS. After the 1st year of AMS (2019) implementation reveals a significant percentage of patients who still develop antibiotic resistance to Penicillin, followed by ceftriaxone and Amoxicillin. It implies that the impact of AMS to the average LOHS in 1-year period of its implementation was not significant, maybe due to other underlying factors not considered in this study, however the reduction in the antibiotic resistance can be attributed with the proper use of antibiotics with the regulation of Antimicrobial Stewardship program of BRTTH.

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INTRODUCTION

In the history of Medicine, antibiotics are considered one of the most successful forms of chemotherapy. It has saved countless lives and significantly contributed to the control of infectious diseases that are considered one of the leading causes of morbidity and mortality. The main problem one is facing with antibiotic therapy is that after a new antibiotic is introduced, resistance will soon arise (Aminov, 2010).

The Philippines has an estimated 700,000 deaths due to antibiotic resistance and expected to rise to 10 million by the year 2050 (Department of Health, Antimicrobial Stewardship Program in Hospital Manual of Procedures, 2016). In Bicol Regional Training and Teaching Hospital (BRTTH), sepsis is always included in the top ten causes of morbidity and mortality in every department. Last 2011, with the rapidly emerging global public health threats of antimicrobial resistance, former Philippine President Benigno Aquino III signed the Administrate Order no. 42 series of 2014 the title of which was "Creating an Inter-Agency Committee for the Formulation and Implementation of a National Plan to Combat Antimicrobial Resistance (AMR) in the Philippines" as a response to the World Health Organization urged to take urgent concreted action to address the world issue of antimicrobial resistance. One of the action plans was creating the antimicrobial stewardship program. In 2016, the Department of Health (DOH) launched the Manual of Procedures in the Antimicrobial Stewardship Program and implementing it at different level III hospitals in the National Capital Region, followed by the Regional and Provincial Hospitals in the country.

Last May 2018, BRTTH began to adopt the National Policy for the Antimicrobial Stewardship Program with the following goals: to enable antibiotic prescribers (physicians) and antibiotic dispensers (pharmacists) to use antibiotics in the most rational, effective and efficient manner. It is expected that the utilization of antimicrobials will be optimized from the selection of the most appropriate drug regimen to proper dosing, duration, and route of administration until the results of diagnostic workup become available. It seeks to achieve the best clinical outcomes for its patients related to antimicrobial use, minimize toxicity, and most importantly, slow down the emergence of antimicrobial-resistant strains (Bicol Regional Training and Teaching Hospital, Antimicrobial Stewardship Policy, 2018).

On the same year, the Department of Health – Region 5 urges the public to abstain from misuse of antibiotics, Regional Director Napoleon Arevalo cited that "without effective antimicrobials for prevention and treatment of infections, medical procedures such as organ transplantation, cancer chemotherapy, diabetes management and major surgery would be compromised." He also added that the cost of health care for patients with resistant infections is higher than care for patients with non-resistant infections due to longer duration of illness, additional tests and use of more expensive drugs (Bicol Consortium for Health Research and Development, 2018). To assess local susceptibility rates of antibiotics, the hospital antibiograms are often used by clinicians as an aid in selecting empiric antibiotic therapy, and in monitoring resistance trends over time within an institution. It is an annual summary of antimicrobial susceptibilities of local bacterial isolates submitted to the hospital's clinical microbiology laboratory. It can also be used to compare susceptibility rates across institutions and track resistance trends (Joshi, 2010). There are various ways to measure the impact of an antimicrobial stewardship program in an institution. These include: clinical outcome, microbiological, antimicrobial consumption, and financial. Under clinical outcomes are mortality, length of hospital stays, complications, readmission rates, and toxicities, resistance level under microbiological, total antibiotic use and appropriateness of therapy under antimicrobial consumption and under financial aspect is cost-benefit ratio (Dik et al., 2016). In this study, it focuses on measuring the effect of antimicrobial stewardship (AMS) program in terms of antimicrobial resistance pattern and length of hospital stay of patients pre and post AMS era.

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Objectives

The study aims to determine the impact of antimicrobial stewardship program on antibiotic resistance and length of hospital stay of patients at Bicol Regional Training and Teaching Hospital. Specifically, to determine the top three

isolated organisms in the hospital antibiogram of 2017; to determine the patient's average length of hospital stay and antibiotic resistance of top three isolated organisms before AMS (2017); to monitor the top three isolated organisms of 2017 after one (1) year of AMS (2019) in terms of average length of hospital stay and antibiotic resistance; and to compare the patient's average length of hospital stay and antibiotic resistance of top three isolated organisms before AMS (2017) and after AMS (2019).

METHODS

The study utilized a retrospective and descriptive study, this design aimed to compare the antibiotic resistance and length of hospital stay of patients during the pre and post AMS era.

Population and sampling technique

An expertise of a statistician was sought to compute the sample size of the study using 95% confidence level and confidence interval of 5. To draw more precise conclusions, the researcher used stratified sampling method, dividing the population by month, ensuring that every subgroup was properly represented in the sample. The study included the patients with culture and sensitivity test results that matched any of the top three (3) isolated organism of 2017 who were admitted at Medical, Surgical, Pediatric, and OB GYN ward from January 1, 2017 to December 31, 2017 and January 1, 2019 to December 31, 2019. Patients who were discharged against medical advice, died during hospital stay, or transferred to other hospital as it will create a bias on the average length of hospital stay of patients. This also excludes patients admitted at private wards.

Data collection and procedure

Upon granting of approval from the Department of Internal Medicine of the Bicol Regional Training and Teaching Hospital, and Technical Review Committee a letter of intent (Appendix A) together with an endorsement letter (Appendix B) was forwarded to the BRTTH Medical Center Chief. A letter request to conduct research on AMS program was forwarded to the AMS committee (Appendix C). An affidavit of non-disclosure (Appendix D) was sought from the Data Privacy Officer and an ethical clearance was also sought from the Institutional Review Board (IRB) of the same institution.

To determine the impact of antimicrobial stewardship program on antibiotic resistance and length of hospital stay of patients, the researcher reviewed data gathered by the Antimicrobial stewardship program committee, specifically the Hospital Antibiogram of 2017 and 2019. The researcher determined the top three isolated organisms of 2017, its average length of hospital stay and antibiotic resistance and monitor it after one (1) year of AMS program.
A letter of request to the laboratory section (appendix E) and medical records (appendix F) was sought to gather data about the patient's culture and sensitivity test results that matched any of the top three (3) isolated organism of 2017. Then a chart review was done to determine the length of hospital stay of patients who were included in the study and used it to compare in the pre and post AMS era. A certificate of approval (Appendix G) was sought from IRB prior to data gathering and a data gathering tool (Appendix H) was utilized for an efficient data collection.

Data processing and analysis

Data gathered was entered and checked for errors in Microsoft Excel. Categorical variables were described in terms of frequencies and percentages. Continuous variables were described using means and standard deviations (SD) or medians. These data and results were presented in a tabular form to present the top three isolated organism, antibiotic resistance pattern and patient's length of hospital stay included in the study. The expertise of a statistician was sought and MS Excel was used as a computing tool for translating and labeling data. The outcome of the study compared the antibiotic resistance pattern of organisms and length of hospital stay of patients during the pre and post AMS era.

Ethical considerations

Increase in the rate of antimicrobial resistance correlates directly to the rate of morbidity and mortality in the healthcare system. This study provided benefit to healthcare providers through proper antibiotics could be given to the patient empirically guided by the hospital antibiogram and regulated through the antimicrobial stewardship program (AMS). This study also provided benefit to the patient and the AMS program itself, by determining the impact of AMS program, recommendations was suggested that could help lessen the patient's length of hospital stay which may translate to less cost of treatment and lobby to the administration to institute measures to support the program in the future. This also provided benefit to the hospital as resources and bed capacity is limited, if AMS program could shorten patient's hospital stay, more patients could be accommodated by the hospital. This also provided benefit to the Department of Health by effective antibiotic use would prevent antibiotic resistance, ways or other program could be brought to support or strengthen the program itself leading to effectively combat antibiotic resistance.

The study had negligible risk where the only possible foreseeable risk was disclosure of the information/data gathered during the research, be it intentional or not. The researcher shall discontinue the conduct of research, take full responsibility thereto, shall cooperate to any investigating government authority and surrender all copies of gathered information/data to the hospital for proper safekeeping and disposal. All information obtained was treated with utmost care observing the rights to privacy and confidentiality at all times and the negligible risk of information leakage was addressed accordingly. The researcher did not have any conflict of interest in this study, be it financial, familial or proprietary considerations. The outcome of the study aimed to determine the impact of antimicrobial stewardship program on antibiotic resistance and length of hospital stay of patients at Bicol Regional Training and Teaching Hospital, be it positive or negative. Recommendations was suggested that could help strengthen the program itself that directly course to effective antibiotic usage, and further prevent antibiotic resistance.

RESULTS AND DISCUSSION

These data were organized and presented in tabular form followed by a textual interpretation in order to provide better and significant insights of the subject under study.

Top three (3) isolated organisms in the hospital antibiogram (2017)

The 2017 Hospital Antibiogram shows large number of specimens that were tested, and comprises primarily of blood, respiratory product and wound discharges reaching 88 percent of total specimen collected. Data revealed in table 1 reveals the top 3 isolated organisms in that period. Of the total number of organisms isolated from 1,423 specimens; 276 or 19 percent were positive for Klebsiella sp.; and 176 or 14 percent are pseudomonas; and 161 or 11.31 percent were positive for Staphylococcus Aureus respectively. Data also reveals that majority of specimen positive for Klebsiella sp. and pseudomonas were from respiratory tract with a frequency of 178 (12.51 percent) and 113 (7.94 percent) respectively. While staphylococcus aureus was commonly found in wound discharges with a frequency of 98 or 6.89% of the total specimen tested.

Table 1. Top three (3) isolated organisms in the hospital antibiogram (2017)

Top three isolated organism	f (N=1423)	%
1. Klebsiella sp.	276	19.40
• Respiratory	178	12.51
• Blood	34	2.39
• Urine	0	0.00
• Wound Discharge	64	4.50

2. Pseudomonas	176	12.37
• Respiratory	113	7.94
• Blood	0	0.00
• Urine	0	0.00
• Wound Discharge	63	4.43
3. Staphylococcus Aureus	161	11.31
• Respiratory	0	0.00
• Blood	63	4.43
• Urine	0	0.00
• Wound Discharge	98	6.89

Patient's Average Length of Hospital Stay (LOHS) of top three (3) isolated organisms before AMS (2017)

Table 2 presents the average length of hospital stay (LOHS) of patient in the four clinical ward who tested positive in the culture test for the top 3 isolated organisms before the implementation of the Antimicrobial stewardship program in 2017. Data reveals that the average length of hospital stay for the total patients in the four clinical wards with culture positive test for Klebsiella sp. were 10.76 days; for Pseudomonas positive culture test patients were 13.12 days; while 8.74 days for staphylococcus aureus positive culture test patients. However, data also reveals that patients in pediatric ward has the highest average length of hospital stay based on the top three isolated organisms specifically 17.39 days for Klebsiella sp. positive; 15.06 days for pseudomonas; and 10.64 days for staphylococcus culture positive pediatric patients. It reveals that pediatric patients are at higher risk for prolonged hospital stay compare to all other patients from the medical, surgical and OB-Gyne ward.

Table 2. Patient's Average Length of Hospital Stay (LOHS) of top three (3) isolated organisms before AMS (2017)

Top three isolated organisms	Average LOHS
1. Klebsiella sp.	10.76
• Medical ward	10.13
• Surgical ward	9.55
• Pediatric ward	17.39
• OB Gyne Ward	3.83
2. Pseudomonas	13.12
• Medical ward	13.65
• Surgical ward	11.54
• Pediatric ward	15.06
• OB Gyne Ward	12.00
3. Staphylococcus Aureus	8.74
• Medical ward	10.43
• Surgical ward	3.54
• Pediatric ward	10.64
• OB Gyne Ward	3.75

Antibiotic Resistance top three (3) isolated organism before AMS (2017)

Date presented in table 3 shows the 5 highest percentage of patients who develop antibiotics resistance from the top three identified isolated organism before the implementation of the Anti-microbial stewardship program in 2017. Of the total number of patients with culture positive for Klebsiella sp, 64.00 percent had resistance to Amoxicillin; 48.00 percent for Cefepime; 44.70 percent to ceftriaxone; followed by 42.00 percent to cephalexin; and 40 percent to cefuroxime. Along with the total number of patients with culture positive for Pseudomonas, 38.00 percent develop antibiotic resistance to Cefepime; 21.00 to ceftazidime; 14.50 percent to ciprofloxacin; followed by 10.00 percent to Imipenem; and lastly, 9.50 percent to Tobramycin. For patients with

culture positive for Staphylococcus Aureus, 100.00 percent develop antibiotic resistance to Penicillin; 48.50 to Oxacillin; 30.50 for Trimethoprim-sulfamethoxazole; 8.50 percent to Erythromycin; and lastly, 3.00 percent of the patients to Daptomycin. It further reveals that during the period before the AMS (2017), it shows that there is a significant percentage of patients develop antibiotic to Penicillin, followed by Amoxicillin and Oxacillin.

Table 3. Antibiotic Resistance top three (3) isolated organism before AMS (2017)

Top three isolated organisms	Antibiotic resistance (%)
1. Klebsiella sp.	
• Amoxicillin Clavulanate (AMC)	64.00
• Cefepime (FEP)	48.00
• Ceftriaxone (CRO)	44.70
• Cephalexin (CN)	42.00
• Cefuroxime (CXM)	40.00
2. Pseudomonas	
• Cefepime (FEP)	38.00
• Ceftazidime (CAZ)	21.00
• Ciprofloxacin (CIP)	14.50
• Imipenem (IPM)	10.00
• Tobramycin (TOB)	9.50
3. Staphylococcus Aureus	
• Penicillin (P)	100.00
• Oxacillin (OX)	48.50
• Trimethoprim-sulfamethoxazole (SXT)	30.50
• Erythromycin (E)	8.50
• Daptomycin (DA)	3.00

Patient's Average LOHS of top three (3) isolated organism after one (1) year of AMS (2019)

Table 4 presents the average length of hospital stay (LOHS) of patient in the four clinical ward who tested positive in the culture test for the top 3 isolated organisms after 1 year of implementation of the Anti-microbial stewardship program. Data reveals that the average length of hospital stay for the total number of patients in the four clinical wards with culture positive test for Klebsiella sp. were 13.68 days; 14.54 days for Pseudomonas positive culture test patients; and 11.46 days for staphylococcus aureus positive culture test patients. It further reveals slight variations in the average length of hospital stay (LOHS) among patients in the medical ward, surgical ward and pediatric ward. However, lower hospital stays are observed among the OB-Gyne patients.

Table 4. Patient's Average LOHS of top three (3) isolated organism after one (1) year of AMS (2019)

Top three isolated organisms	Average LOHS
1. Klebsiella sp.	**13.68**
• Medical ward	14.77
• Surgical ward	12.32
• Pediatric ward	11.53
• OB Gyne Ward	9.56

2. Pseudomonas	**14.54**
• Medical ward	12.98
• Surgical ward	16.78
• Pediatric ward	16.44
• OB Gyne Ward	14.09
3. Staphylococcus Aureus	**11.46**
• Medical ward	10.14
• Surgical ward	9.08
• Pediatric ward	13.97
• OB Gyne Ward	3.75

Antibiotic Resistance top three (3) isolated organism after one (1) year of AMS (2019)

Date presented in table 5 shows the same 5 antibiotics with resistance from the top three identified isolated organism in 2017. However, data for 2019 were collected. Of the total number of patients with culture positive for Klebsiella sp, 47.30 percent had resistance to Amoxicillin; 32.30 percent for Cefepime; 47.70 percent to ceftriaxone; followed by 21.30 percent to cephalexin; and 52.00 percent to cefuroxime. Along with the total number of patients with culture positive for Pseudomonas, 11.50 percent develop antibiotic resistance to Cefepime; 14.00 to ceftazidime; 6.00 percent to ciprofloxacin; followed by 12.50 percent to Imipenem; and lastly, 11.00 percent to Tobramycin.

Table 5. Antibiotic Resistance top three (3) isolated organism after one (1) year of AMS (2019)

Top three isolated organism	Antibiotic resistance (%)
1. Klebsiella sp.	
• Amoxicillin Clavulanate (AMC)	47.30
• Cefepime (FEP)	32.30
• Ceftriaxone (CRO)	47.70
• Cephalexin (CN)	21.30
• Cefuroxime (CXM)	52.00
2. Pseudomonas	
• Cefepime (FEP)	11.50
• Ceftazidime (CAZ)	14.00
• Ciprofloxacin (CIP)	6.00
• Imipenem (IPM)	12.50
• Tobramycin (TOB)	11.00
3. Staphylococcus Aureus	
• Penicillin (P)	96.00
• Oxacillin (OX)	26.00
• Trimethoprim-sulfamethoxazole (SXT)	12.00
• Erythromycin (E)	12.50
• Daptomycin (DA)	10.00

For patients with culture positive for Staphylococcus Aureus, 96.00 percent develop antibiotic resistance to Penicillin; 26.00 to Oxacillin; 12.00 for Trimethoprim-sulfamethoxazole; 12.50 percent to Erythromycin; and lastly, 10.00 percent of the patients to Daptomycin. It further reveals that after the 1st year of AMS (2019) implementation, it shows that there is still a significant percentage of patients develop antibiotic resistance to Penicillin, followed by ceftriaxone and Amoxicillin.

Patient's Average LOHS pre and post AMS

Data presented in table 6 shows comparative data between the average length of hospital stay of patients with culture positive test for the top three (3) isolated organism from Pre-AMS and Post-AMS.

Table 6. Patient's Average LOHS pre and post AMS

Top three isolated organisms	Average LOHS Pre AMS	Average LOHS Post AMS
1. Klebsiella sp.	10.76	13.68
• Medical ward	10.13	14.77
• Surgical ward	9.55	12.32
• Pediatric ward	17.39	11.53
• OB Gyne Ward	3.83	9.56
2. Pseudomonas	13.12	14.54
• Medical ward	13.65	12.98
• Surgical ward	11.54	16.78
• Pediatric ward	15.06	16.44
• OB Gyne Ward	12.00	14.09
3. Staphylococcus Aureus	8.74	11.46
• Medical ward	10.43	10.14
• Surgical ward	3.54	9.08
• Pediatric ward	10.64	13.97
• OB Gyne Ward	3.75	3.75

Data reveals that there is a slight increase in the average length of hospital stay of patients with culture positive test for Klebsiella sp., pseudomonas and staphylococcus. It implies that the impact of AMS to the average LOHS in 1-year period of its implementation was not significant, maybe due to other underlying factors not considered in this study.

Antibiotic Resistance pre and post AMS

Data presented in table 7 shows the comparative data of antibiotic resistance to the top three (3) isolated organism from Pre-AMS and Post-AMS. Data reveals that there is significant decline in the percentage of antibiotic resistance after the 1-year implementation of AMS. Significant decline can be observed in the Amoxicillin for Klebsiella which initially has 64 percent resistance down to 47.30 percent. Same observation can be seen to Cefepime for Klebsiella and pseudomonas with initial resistance of 48.00 and 38.00 respectively, then down to 32.30 and 11.50 respectively. Cephalexin for Klebsiella were also down to 21.30 percent from 42.00; Oxacillin for staphylococcus from 48.50 percent to 26.00 percent. And Trimethoprim-sulfamethoxazole for staphylococcus from 30.50 percent down to 12.00 percent. However, few antibiotics such as ceftriaxone, cefuroxime, imipenem and erythromycin develop slight increase in antibiotic resistance. This finding can be attributed to the improper use of the antibiotics or other underlying factors not considered in this study. This data further implies that Antimicrobial Stewardship Program had significant effect in reducing the antibiotic resistance of common drugs against the top three (3) isolated organism.

Table 7. Antibiotic Resistance pre and post AMS

Top three isolated organisms	Antibiotic resistance (%) Pre AMS	Antibiotic resistance (%) Post AMS
1. Klebsiella sp.		
• Amoxicillin Clavulanate (AMC)	64.00	47.30

• Cefepime (FEP)	48.00	32.30
• Ceftriaxone (CRO)	44.70	47.70
• Cephalexin (CN)	42.00	21.30
• Cefuroxime (CXM)	40.00	52.00
2. Pseudomonas		
• Cefepime (FEP)	38.00	11.50
• Ceftazidime (CAZ)	21.00	14.00
• Ciprofloxacin (CIP)	14.50	6.00
• Imipenem (IPM)	10.00	12.50
• Tobramycin (TOB)	9.50	11.00
3. Staphylococcus Aureus		
• Penicillin (P)	100.00	96.00
• Oxacillin (OX)	48.50	26.00
• Trimethoprim-sulfamethoxazole (SXT)	30.50	12.00
• Erythromycin (E)	8.50	12.50
• Daptomycin (DA)	3.00	10.00

Antibiotics are considered one of the most successful forms of chemotherapy. It has saved countless lives and significantly contributed to the control of infectious diseases that are considered one of the leading causes of morbidity and mortality. (Aminov, 2010) However with the improper use of antibiotic therapy, resistance develop. The increase in the rate of antimicrobial resistance correlates directly to the rate of morbidity and mortality for which this antibiotic can no longer serve its purpose.

This study that determines the most common isolated organism, the measure of average length of hospital stay among patient positive to the identified organism, and as well as the percentage of antibiotic resistance with this organism will benefit BRTTH healthcare providers through proper use of antibiotics regulated through the antimicrobial stewardship program (AMS). This study could also provide benefit to the patient and the AMS program itself, by determining the impact of AMS program, recommendations can be suggested that could help lessen the patient's length of hospital stay which may translate to less cost of treatment and lobby to the administration to institute measures to support the program in the future. This could also provide benefit to the hospital as resources and bed capacity is limited, if AMS program could shorten patient's hospital stay, more patients could be accommodated by the hospital. This could also benefit the Department of Health by effective antibiotic use would prevent antibiotic resistance, ways or other program could be brought to support or strengthen the program itself leading to effectively combat antibiotic resistance. The 2017 Hospital Antibiogram shows large number of specimens that were tested, and comprises primarily of blood, respiratory product and wound discharges reaching 88 percent of total specimen collected. It reveals the top 3 isolated organisms in that period. Of the total number of organisms isolated from 1,423 specimens; 276 or 19 percent were positive for Klebsiella sp.; and 176 or 14 percent are pseudomonas; and 161 or 11.31 percent were positive for Staphylococcus Aureus respectively.

The average length of hospital stay for all patients in four clinical wards with culture positive test for Klebsiella sp. were 10.76 days; for Pseudomonas positive culture test patients were 13.12 days; while 8.74 days for staphylococcus aureus positive culture test patients. However, patients in pediatric ward has the highest average length of hospital stay based on the top three isolated organisms specifically 17.39 days for Klebsiella sp. positive; 15.06 days for pseudomonas; and 10.64 days for staphylococcus culture positive pediatric patients. The pediatric patients are at higher risk for prolonged hospital stay compare to all other patients from the medical, surgical and OB-Gyne ward. There is a slight increase in the average

length of hospital stay of patients with culture positive test for Klebsiella sp., pseudomonas and staphylococcus that implies that the impact of AMS to the average LOHS in 1-year period of its implementation was not significant, maybe due to other underlying factors not considered in this study. The significant decline in the percentage of antibiotic resistance after the 1-year implementation of AMS can be observed in the used of Amoxicillin for Klebsiella, Cefepime for Klebsiella and pseudomonas, Cephalexin for Klebsiella, Oxacillin for staphylococcus and Trimethoprim-sulfamethoxazole for staphylococcus. This implies that Antimicrobial Stewardship Program had significantly reduce the antibiotic resistance of these identified drugs against the top three (3) isolated organism. The reduction in the antibiotic resistance can be attributed with the proper use of antibiotics with the regulation of Antimicrobial Stewardship program of BRTTH.

CONCLUSION AND RECOMMENDATION

Based on the salient findings of this study, the following conclusions are drawn: Patient with respiratory infections shown at greater risk to be infected with Klebsiella pneumoniae and pseudomonas sp, while patient with would injury or related condition are at greater risk for staphylococcus infection. The pediatric patients are at higher risk for prolonged hospital stay compare to all other patients from the medical, surgical and OB-Gyne ward during the Pre AMS. After the 1st year of AMS (2019) implementation reveals a significant percentage of patients who still develop antibiotic resistance to Penicillin, followed by ceftriaxone and Amoxicillin. It implies that the impact of AMS to the average LOHS in 1-year period of its implementation was not significant, maybe due to other underlying factors not considered in this study, however the reduction in the antibiotic resistance can be attributed with the proper use of antibiotics with the regulation of Antimicrobial Stewardship program of BRTTH. Thus, it is recommended to include antibiotics abused in the health education and promotion to clients especially in the Out-patient Department. Educate physicians especially to the new one about the AMS program. Encourage physician to include antibiotic education to the client consultation visit. Enhance the implementation of AMS program in the hospital through continuous monitoring and evaluation of the program. There should be an intense campaign to educate people in the community on the improper use of antibiotics specially those antibiotics that has greater antibiotic resistance found in this study. And revisit the guidelines and policy for prescribing antibiotics especially to all antibiotic that are abused.

LIMITATIONS OF THE STUDY

One of the limitations of the study is its time frame, the target antibiograms are 2017 and 2019 only which is 1 year prior to antimicrobial stewardship program and 1 year after its launch. The period of the study did not include the year 2018 in which the AMS program was launched, the researcher gave a 6-month allowance for the program to be established. Antibiotic Resistance of organisms might not significantly change in a matter of one year. Another limitation is that the researcher only compared the top three isolated organisms and used it to identify the target population of the study. All data gathered for this study is specifically for Bicol Regional Training and Teaching Hospital only and may not be the same with other institution.

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