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ANTIMICROBIAL STEWARDSHIP PROGRAM

Essay

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Ahmed Afify

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List of Abbreviations

Abb.	Full term
AMS	Antimicrobial Stewardship
AST	Antimicrobial Stewardship Team
ATS	American Thoracic Society
BTS	British Thoracic Society
CAP	Community Acquired Pneumonia
CDC	Centers for Disease Control and Prevention
CDI	Clostridium Difficile Infection
CoNS	Coagulase-Negative Staphylococci
CT	Computed Tomography
EIA	Enzyme Immunoassay
GNB	Golemeruli of Nonfermenting Bacilli
HCAP	Healthcare-Associated Pneumonia
IBD	Inflammatory Bowel Disease
ICU	Intensive Care Unit
IDSA	Infectious Diseases Society of America
IT	Informational Technology
LOS	Length of Stay
LUS	Lung Ultrasound
MALDI-TOF	Matrix-Assisted Laser Desorption Ionization–Time of Flight
MDR	Multidrug-Resistant
MRSA	Methicillin-Resistant Staph Aureus
MV	Mechanical Ventilation
NSTIs	Necrotizing Soft Tissue Infections
PCR	Polymerase Chain Reaction
PCT	Procalcitonin
PNA FISH	Peptide Nucleic Acid Fluorescence *In Situ* Hybridization
PSI	Pneumonia Severity Index
SCAP	Sever Community Acquired Pneumonia
US	Ultrasonography
UTI	Urinary Tract Infection
VAP	Ventilator-Associated Pneumonia
VRE	Vancomycin-Resistant Enterococci

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Introduction

Antimicrobials have transformed the practice of medicine, making once lethal infections readily treatable. The prompt initiation of antimicrobials to treat infections

has been proven to reduce morbidity and save lives, but like all medications, antimicrobials have serious side effects and patients who are unnecessarily exposed to antimicrobials are placed at risk for serious adverse events with no clinical benefit **(Dellinger et al., 2013).**

The misuse of antibiotics has also contributed to the growing problem of antibiotic resistance, which has become one of the most serious and growing threats to public health. Improving the use of antimicrobials is an important patient safety and public health issue as well as a national priority **(Dellinger et al., 2013).**

Antimicrobial stewardship programs (ASPs), can optimize the treatment of infections and reduce adverse events associated with antimicrobial use. These programs help clinicians to improve the quality of patient care and improve patient safety through increased infection cure rates, reduced treatment failures, and increased frequency of correct prescribing for therapy and prophylaxis. They also significantly reduce hospital rates of clostredium difficile infection (CDI) and antibiotic resistance. Moreover these programs often achieve these benefits while saving hospitals money **(Malani et al., 2013).**

Antimicrobial stewardship refers to coordinated

interventions designed to improve and measure the appropriate use of antimicrobial agents by promoting the selection of the optimal antimicrobial drug regimen including dosing, duration of therapy, and route of administration **(Society for Healthcare Epidemiology of America, 2012).**

There is no single template for a program to optimize antimicrobial prescribing in hospitals, antimicrobial stewardship programs can be implemented effectively in a wide variety of hospitals and that success is dependent on defined leadership and a coordinated multidisciplinary approach **(Ohi and Dodds, 2011).**

Aim of the Essay

Efficacy of antimicrobial stewardship program in optimization of antimicrobial use and evaluation of antimicrobial resistance.

Chapter (1):

Core Elements of Antimicrobial Stewardship Program

Antimicrobial stewardship programs have important core elements in form of leadership commitment, accountability, drug expertise, action, tracking, reporting and education **(CDC, 2013).**

Leadership Commitment to determine necessary human, financial and information technology resources. Leadership support is critical to the success of antibiotic stewardship programs and can take a number of forms, including:

- Formal statements to support efforts of improvement and monitoring antibiotic use.
- Including stewardship-related duties in job descriptions and annual performance reviews.
- Ensuring staff from relevant departments are given sufficient time to contribute to stewardship activities.
- Supporting training and education.
- Ensuring participation from the many groups that can support stewardship activities **(Davey et al., 2013).**

Accountability as it is important to identify single *Stewardship program leader* who will be responsible for program outcomes. Physicians have been highly effective in this role **(Rohde et al., 2013)**.

Hospitalists can be ideal physician leaders for efforts to improve antibiotic use given their increasing presence in inpatient care, the frequency with which they use antibiotics and their commitment to quality improvement **(Rohde et al., 2013)**.

Drug expertise is a single pharmacy leader identified to will be co-lead the program. The Pharmacy and Therapeutics committee should not be considered the stewardship team within a hospital if only performing its traditional duties of managing the formulary and monitoring drug-related patient safety, though in some smaller facilities the pharmacy and therapeutics committee has expanded its role to assess and improve antibiotic use **(Yam et al., 2012)**.

The work of stewardship program leaders is greatly enhanced by the support of other key groups in hospitals where they are available:

- *Clinicians and department heads*- As the prescribers of antibiotics, it is vital that clinicians are fully

engaged in and supportive of efforts to improve antibiotic use in hospitals.

- *Infection preventionists and hospital epidemiologists* coordinate facility-wide monitoring and prevention of healthcare-associated infections and can readily bring their skills to auditing, analyzing and reporting data. They can also assist with monitoring and reporting of resistance and clostridium difficile infection trends, educating staff on the importance of appropriate antibiotic use, and implementing strategies to optimize the use of antibiotics **(Moody et al., 2012).**
- *Quality improvement staff* can also be key partners given that optimizing antibiotic use is a medical quality and patient safety issue.
- *Laboratory staff* can guide the proper use of tests and the flow of results. They can also guide empiric therapy by creating and interpreting a facility cumulative antibiotic resistance report, known as an antibiogram. Lab and stewardship staff can work collaboratively to ensure that lab reports present data in a way that supports optimal antibiotic use. For facilities that have laboratory services performed

offsite, information provided should be useful to stewardship efforts and contracts should be written to ensure this is the case **(Moody et al., 2012)** .

- *Information technology staff* are critical to integrating stewardship protocols into existing workflow. Examples include embedding relevant information and protocols at the point of care (e.g., immediate access to facility-specific guidelines at point of prescribing); implementing clinical decision support for antibiotic use; creating prompts for action to review antibiotics in key situations and facilitating the collection and reporting of antibiotic use data **(Agwu et al., 2008)**.
- *Nurses* can assure that cultures are performed before starting antibiotics. In addition, nurses review medications as part of their routine duties and can prompt discussions of antibiotic treatment, indication, and duration **(Edward et al., 2011).**

Action consists of implement policies and interventions to improve antibiotic use. *Implement policies* that apply in all situations to support optimal antibiotic prescribing, for example: Document dose, duration, and indication. Specify the dose, duration and indication for all

courses of antibiotics so they are readily identifiable. Making this information accessible helps ensure that antibiotics are modified as needed and/or discontinued in a timely manner **(Levin et al., 2012).**

Interventions to improve antibiotic use based on the needs of the facility as well as the availability of resources and expertise; stewardship programs should be careful not to implement too many interventions at once **(Morris et al., 2010).**

Stewardship interventions are listed in three categories below: broad, pharmacy-driven; and infection and syndrome specific.

Broad interventions

Antibiotic "Time outs". Antibiotics are often started empirically in hospitalized patients while diagnostic information is being obtained. However, providers often do not revisit the selection of the antibiotic after more clinical and laboratory data (including culture results) become available **(Bornard et al., 2011).**

An antibiotic "time out" prompts a reassessment of the continuing need and choice of antibiotics when the clinical picture is clearer and more diagnostic information is available. All clinicians should perform a review of

antibiotics 48 hours after antibiotics are initiated to answer these key questions:

- Does this patient have an infection that will respond to antibiotics?
- If so, is the patient on the right antibiotic(s), dose, and route of administration?
- Can a more targeted antibiotic be used to treat the infection (de-escalate)?
- How long should the patient receive the antibiotic(s)?

Pharmacy-driven Interventions

- ***Automatic changes from intravenous to oral antibiotic therapy*** in appropriate situations and for antibiotics with good absorption, which improves patient safety by reducing the need for intravenous access **(Jenkins et al., 2010).**
- ***Dose adjustments*** in cases of organ dysfunction (e.g. renal adjustment).
- ***Dose optimization*** including dose adjustments based on therapeutic drug monitoring, optimizing therapy for highly drug-resistant bacteria, achieving central nervous system penetration, extended-infusion

administration of beta-lactams, etc **(Canton et al., 2012)**.

- ***Automatic alerts in situations where therapy might be unnecessarily duplicative*** including simultaneous use of multiple agents with overlapping spectra e.g. anaerobic activity, atypical activity, Gram-negative activity and resistant Gram-positive activity **(Rattanaumpawan et al., 2011)**.
- ***Time-sensitive automatic stop orders*** for specified antibiotic prescriptions, especisally antibiotics administered for surgical prophylaxis **(Gomez et al., 2006)**.
- ***Detection and prevention of antibiotic-related drug-drug interactions*** e.g. interactions between some orally administered fluoroquinolones and certain vitamins.

Infection and syndrome specific intervention will be discussed later in the second chapter.

Tracking and Reporting Antibiotic Use and Outcomes

Monitoring antibiotic prescribing is critical to identify opportunities for improvement and assess the impact of improvement efforts. For antibiotic stewardship, measurement may involve evaluation of both process (Are