Antibiotic Resistance Usage Policy: Stewardship

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1- Development of Antibiotic Resistance and it is Impact:

Over the years, infectious diseases were considered as a major cause of death; however the invention of antibiotics in 1940 was a breakthrough in the management of these diseases.
The invention of antibiotics did not only save lives it also achieved major advances in medicine and surgeries.
Until now finding treatments for infectious diseases other than antibiotics has failed despite all researches made in this field, and these ones remains a cornerstone in the management of infectious problems. Nonetheless the appearance of resistant bacteria became a major threat and a public health concern specifically that the invention of new molecules is difficult.
The first antibiotic discovered was penicillin in 1928, it was purified in 1939 first used on humans in 1940, and soon after that the resistance became apparent as E.coli was discovered to be resistant to it in 1940.
Over time, resistant bacteria have emerged and spread all over the world, for example, antibiotic-resistant gonorrhea emerged in Vietnam in 1967, and then spread to the Philippines, and finally to the USA. Bacteria holding NDM enzymes, first reported in 2008 are now found worldwide.
Each year resistant germs infect 2 million people in the USA, 4 730 000 in Asia, 415 000 in Africa, and 390 000 people in Europe.

High rate of antimicrobial resistance is associated with increased mortality and morbidity, for example, out of the 56.4 million deaths that occurred worldwide in 2015, more than half (54%) were due to the top 10 causes. Respiratory tract infections ranked third, followed by diarrhea and tuberculosis.
Bacterial resistance in the US causes 23 000 deaths yearly.
Infections due to resistant bacteria caused 200 000 deaths of children worldwide and the mortality of 25 000 people in Europe in 2007.
It is expected that infections due to resistant bacteria are the basis of 700 000 deaths per year worldwide.
In the US/EU, infections dues for resistant germs increased the healthcare cost by 20 billion dollars/1.6 billion euros respectively.
It is expected that in 2050 infections due to resistant germs will kill more than 10 million people and will cost more than 100 trillion dollars.
The most important risk factor for the emergence of resistant bacteria is the inappropriate use of antibiotics designed by overuse and misuse of antibiotics in human and animals.
Overuse is The use of antibiotics when no health benefit is possible, such as to treat upper respiratory tract infections caused by viruses and misuse is the suboptimal use of antibiotics for responsive conditions, such as the choice of drugs with an unnecessarily broad spectrum, and an incorrect dosage or duration, or poor patient adherence to the prescribed treatment.
The misuse of antibiotics is encountered in humans (community and hospitals) animals and agriculture.

2- Policies to Preserve the Effectiveness of Antibiotics:

To preserve the effectiveness of antibiotics, countries have implemented many policies in order to limit the misuse of antibiotics without affecting the quality of care.
These policies are made to:
- Improve awareness and understanding of AMR (through effective communication, education and training).
- To strengthen knowledge and evidence base through surveillance and research (National surveillance, Laboratory services).
- To reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures and good agricultural and biosecurity practices, also through the implementation of infection prevention and control program.
- To optimize the use of antimicrobial agents in humans, aquaculture, plant production and in animal health in the 'one health' approach.

The control of use of antibiotics should be applied in the community and in hospitals as well.
In the community, the use of antibiotics should be controlled by a national body. Policies should aim to not selling antibiotics without medical prescription, to vaccinate people, to advise physicians not to treat viral illness with antibiotics and not to shorten the duration of treatment of infectious problems according to recent guidelines.
And from the public health point of view, research should be done to improve the use of existing molecules and invent new ones.
In hospitals, the most important program used to adjust the use of antibiotic is the antibiotic stewardship program.
Antibiotic stewardship program is defined as "coordinated interventions designed to improve and measure the appropriate use of [antibiotic] agents by promoting the selection of the optimal [antibiotic] drug regimen including dosing, duration of therapy, and route of administration" these strategies can be applied in the community and in hospitals ,but most published studies regarding this program were done in hospitals.

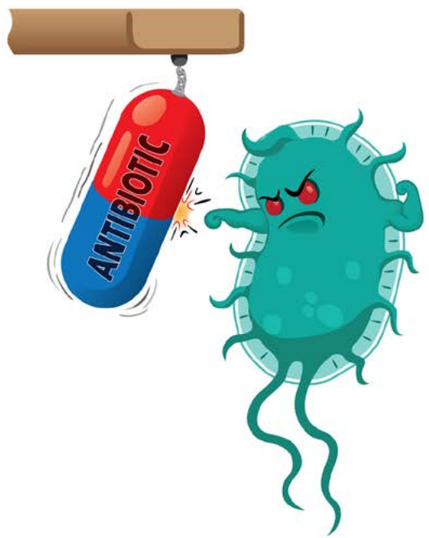
The benefits of the antibiotic stewardship program include improved patient outcomes, reduced adverse events including Clostridium Difficile Infection (CDI), improvement in rates of antibiotic susceptibilities to targeted bacteria, and optimization of resource utilization across the continuum of care.

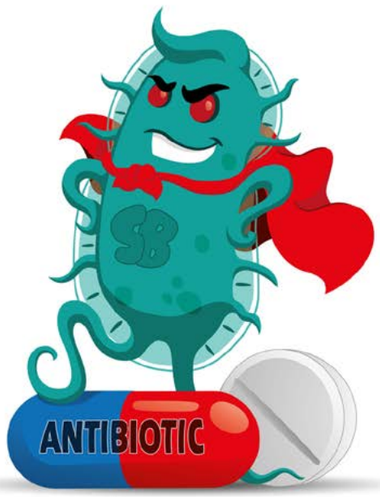
IDSA and SHEA strongly believe that antibiotic stewardship programs (ASPs) are best led by infectious disease physicians with additional stewardship training.
IDSA and SHEA have recently published recommendations to implement ASP in hospitals. I will summarize these recommendations as such :

A. Interventions:

1.ASPs should perform preauthorization and audit on antibiotic prescriptions then give early feedback to primary prescribers (strong recommendation, high quality of evidence).

2.ASPs should not rely solely on didactic educational materials for stewardship (weak recommendation, low





quality evidence).

3. ASPs should develop facility-specific clinical practice guidelines coupled with a dissemination and implementation strategy (weak recommendation, low-quality evidence).

4. ASPs should implement interventions to improve antibiotic use and clinical outcomes that target patients with specific infectious diseases syndromes (weak recommendation, low-quality evidence).

5. ASPs should use antibiotics with low risk for CDI (strong recommendation, moderate-quality evidence).

6.ASPs must use strategies (eg, antibiotic time-outs, stop orders) to encourage prescribers to perform routine review of antibiotic regimens to improve antibiotic prescribing (weak recommendation, low-quality evidence).

7. Hospitals must incorporate computerized clinical decision support at the time of prescribing into ASPs (weak recommendation, moderate-quality evidence).

8.ASPs are supposed to use antibiotic cycling as a stewardship strategy (weak recommendation, low-quality evidence).

B.Optimization:

9. Hospitals should implement PK monitoring and adjustment programs for aminoglycosides (strong recommendation, moderate-quality evidence).

10. Hospitals should implement PK monitoring and adjustment programs for vancomycin (weak recommendation, low-quality evidence).

11. In hospitalized patients, ASPs must advocate for the use of alternative dosing strategies vs standard dosing for broad-spectrum β-lactams to decrease costs (weak recommendation , low-quality evidence).

12. ASPs have to implement programs to increase both appropriate use of oral antibiotics for initial therapy and the timely transition of patients from IV to oral antibiotics (strong recommendation, moderate-quality evidence).

13. In patients with a history of β-lactam allergy, ASPs have to promote allergy assessments and penicillin (PCN) skin testing when appropriate (weak recommendation, low-quality evidence).

14. ASPs should implement guidelines and strategies to reduce antibiotic therapy to the shortest effective duration (strong recommendation, moderate-quality evidence).

C. Microbiology and Laboratory Diagnostics:

15. Microbiologist should develop stratified antibiograms over solely relying on nonstratified antibiograms to assist ASPs in developing guidelines for empiric therapy (weak recommendation, low-quality evidence).

16. Microbiologist should apply selective and cascade reporting of antibiotics over reporting of all tested antibiotics (weak recommendation, low-quality evidence).

17. laboratories should use rapid viral testing for respiratory pathogens to reduce the use of inappropriate antibiotics (weak recommendation, low-quality evidence).

18. Laboratories should use rapid diagnostic testing in addition to conventional culture and routine reporting on blood specimens if combined with active ASP support and interpretation (weak recommendation, moderate-quality evidence).

19. In adults in ICUs with suspected infection, ICU physicians should order the
use of serial PCT measurements as an ASP intervention to decrease antibiotic use (weak recommendation, moderate quality evidence).

20. In patients with hematologic malignancy at risk of contracting Invasive Fungal Disease (IFD), physicians must incorporate nonculture-based fungal markers in ASP interventions to optimize antifungal use (weak recommendation, low-quality evidence).

References

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