A review on Antibiotic Policy and Antimicrobial Stewardship Program (AMSP) – Need of the hour

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ABSTRACT

Emerging trends of antimicrobial resistance and development of multidrug resistance and pan resistant strains have become a significant public health problem worldwide. The rate at which newer drugs are developing has slowed down and clinicians are left with only limited therapeutic options for treatment of the patient. We are heading towards the pre antibiotic discovery phase where mortality was high due to unavailability of appropriate drugs; however, in current situation due to misuse or over use of antibiotics, microbes have developed newer methods of resistance, thus rendering these antimicrobials ineffective in their action which has resulted in increased morbidity and mortality among patient and increase in the health care expenditure. Antimicrobial resistance continues to be a major public health problem of international concern. As there is alarming situation globally due to development of multi and pan resistant bacteria which are also known as superbugs, these superbugs have resulted in havoc as these infections are not treatable and is of great concern to the treating physician. Judicious use of antibiotics and implementation of antibiotic stewardship program are the only ways to combat the current situation. The present review aims to provide information on framing of antibiotic policy and implementation of antimicrobial stewardship program.

INTRODUCTION

Antimicrobial resistance (AMR) is an issue of great significance for public health at the global level, the inappropriate use of antimicrobials being the foremost cause. In order to curtail this emerging drug resistance in health care setting, it is very important to establish an antibiotic policy - the policy of rational use of antimicrobials for prophylactic and therapeutic purposes (Baggs et al., 2006; Hicks et al., 2010).

Proper framing of antibiotic policy in a hospital and implementation of antimicrobial stewardship program (AMSP) will help in decreasing morbidity and mortality in patients and decrease the overall cost of health care (Hecker et al., 2003).

The present review aims to provide information on framing of antibiotic policy and implementation of antibiotic stewardship program.

Definition of Antibiotic Policy

It is defined as a set of rules under which an antibiotic may be prescribed in a health care set up.
Objectives of Antibiotic Policy

1. Application of antimicrobial prophylaxis for better patient health care.
2. Decrease the misuse of antimicrobial consumption for prevention of development of multidrug resistant strains.
3. Judicious use of antimicrobials especially those which are reserved.
4. Promote information, education and communication (IEC) activity.
5. Make better utilization of resources by using cheaper drugs wherever possible.

Developing an Antibiotic Policy

The antibiotic policy of each institute is devised by a team comprising of members of all major specialities, these members with the help of elaborate discussions develop the antibiotic policy keeping consideration of the local antibiotic prescribing habits, local antibiotic resistance trends and national as well as international guidelines. Clinical microbiologist plays a key role in making an antibiotic policy in the hospital and moderating the discussion while framing of this policy (Ashiru-Oredope et al., 2012).

Handbook for Antibiotic Policy

Every hospital should frame their own hospital antibiotic policy in the form of a handbook containing goal of antimicrobial stewardship program. The book should contain general information about date of review of the book, its version and other general guidelines (Fishman, 2006). The handbook must contain list of available antibiotics, antimicrobial surveillance data of previous year and system wise pathogen agent and its regimen in adults as well as in children which should be supported by reliable references like reference books, national and international guidelines. The book should be tailored considering the trends of local antibiotic resistance with inter-and intra-departmental discussions (Centers for Disease Control and Prevention, 2020).

Role of the Clinical Microbiologist in Establishing an Antibiotic Policy

The work of the clinical microbiologist comprises three major areas: rational antibiotic testing, framing of antibiogram and infection control.

Rational antibiotic testing

Important step in establishing an antibiotic policy is to keep records of daily bacterial cultures with their respective susceptibility pattern based on latest international guidelines like CLSI (CLSI, 2020). The microbiologist correctly identifies the isolate and forms a rational antibiotic susceptibility testing protocol. The CLSI recommends a wide array of antimicrobials that may be tested against non-fastidious bacteria. The choice of antimicrobials to be tested should be tailored as per local prescribing trends supported by national and international guidelines. So we need to adopt rational practices at laboratory bench as well as while reporting.

Framing of antibiogram

Second step in framing of antibiotic policy is to cumulate the data of antibiogram 6 monthly or annually (Centers for Disease Control and Prevention, 2021). The cumulative data generated periodically should be presented in the clinical meeting, which is open for elaborate discussion and debate (Trautner et al., 2015). This data is to be used to evaluate the local antibiotic susceptibility trends that is to be used for framing of empirical therapy, patient care as well as monitoring of common drug resistance. The Microbiologist plays prominent role for framing and execution of the antibiotic policy within the institution (Shrestha et al., 2012).

Infection control

The microbiologist also plays a pivotal role in monitoring and implementation of infection control practices in the hospital which further helps in reducing the multidrug resistant strains (Pollack et al., 2016). Thus, the regular monitoring of antibiotic resistance patterns and infection control practices by a microbiologist not only helps the clinician to treat the patient more efficiently but also helps to modify the antibiotic policy accordingly.

Correlation of the Antimicrobial Susceptibility Patterns With The Antibiotic Usage in the Hospital

Burden of antimicrobial resistance

Burden of antibiotic resistance is showing upward trends in the community as well as in hospital set up, which may result in increase in health care expenditure as well as prolong hospital stay and also increase in mental stress to the patient and their family. It is essential to implement the antibiotic policy based on local trends and national as well international guidelines tailored as per the local need.

Rise in health care associated infection (HAI) with trend changing rapidly with time is of concern to health care practitioner, therefore it is important to maintain effective infection control practices at
local/ national and international levels. Due to scarcity of data on endemic antibiotic resistance across the world especially in developing countries where accessibility of over the counter drug procurement is easy, therefore active surveillance is required for making appropriate antibiotic policy.

Controlling emergence of antimicrobial resistance

As per the Centers for Disease Control and Prevention (CDC), there are four main strategies used for combating multidrug resistance strains (Mousa and Caron, 2010; Fleming-Dutra et al., 2010).

1. Early diagnosis and treatment of the infection
2. Judicious use of antimicrobials.
3. Adhere to infection prevention and control (IPC) practices.
4. Breaking the transmission chain.

Antimicrobial Stewardship Program (AMSP)

Antimicrobial stewardship is the cornerstone strategy to overcome antimicrobial resistance which is a burning issue world-wide. AMSP involves cautious, rational and responsible management of antimicrobial use. CDC defines “Antimicrobial Stewardship” as administration of right drug, to the right patient, at the right time and in right dose using the right route with least harm to the patient (Meeker et al., 2016). There are four main goals of AMSP- To decrease antimicrobial resistance. Improve clinical outcome. Better patient safety. Decrease healthcare expenditure without affecting quality of care (Magill et al., 2011).

Steps involved in effective implementation of AMSP

There are certain factors that directly affect the execution of AMSP in any hospital (Avdic et al., 2012; Dalen et al., 2005). These include:-

1. Strong administrative support, which is the most important prerequisite for implementation of AMSP. Hospital administration should provide power and freedom to the members of antibiotic stewardship team to execute policy and provide adequate fund for implementation of the same.
2. Evaluation of resources available in terms of infrastructure, manpower and funds.
3. Assessment of information and technology support.
4. Assessment of the present scenario and the problems related to implementation of AMSP, which involves defining a goal and customizing all the resources and funds for effective execution of AMSP.
5. Additionally, for the effective implementation of antimicrobial stewardship program, there should be provision of fast and accurate identification of the microbes and their susceptibility patterns which would enable better clinical outcome. This can be achieved by complete automation of the testing laboratory along with skilled laboratory personnel.
6. Set up multi-disciplinary antimicrobial stewardship team.
7. Framing antimicrobial policy (AMP).

Strategies for Antimicrobial Stewardship Program

Front end strategy

Formulatory restriction

All antibiotics are grouped as restricted / semi-restricted / unrestricted. For restricted and semi restricted antimicrobials prior approval is needed which is subject to regular audit. In case of continuation of the drug for duration more than the specified duration, the prescriber has to give justification and feedback. Although this strategy seems to be attractive, however it is difficult to implement as it impacts the clinician’s freedom to choose antibiotic (Elligsen et al., 2012).

Antibiotic cycling

It is scheduled rotation of antibiotic periodically to prevent antibiotic resistance.

Back end strategy

This strategy emphasizes the method of regular review of all antibiotics in use during clinical rounds as well as by antimicrobial stewardship team. This enables elaborate discussion among clinician and AMS team. This approach is more widely used as there is better acceptance of this strategy among clinicians as their freedom of prescribing is not hampered and also this policy provides more transparency and discussion opportunity among health care providers.

Continued medical education (CME), motivation and regular assessment and feedback by health care providers are important steps that make back end strategy more efficient and easy to implement (Fridkin et al., 2014).
Evaluation of AMSP

In order to evaluate the effectiveness of AMSP program implementation, certain indicators are monitored (Sastry and Deepashree, 2019). These parameters help in assessment of the impact of stewardship intervention on clinical practice and demonstrate benefits to the patient in the form of better clinical outcome and decreased health care cost.

Parameters used for evaluation of AMSP

1. Policy adherence indicator
2. Antibiotic usage outcome indicator
3. AMR outcome resistance indicator
4. Clinical outcome indicator
5. Financial outcome indicator

Policy adherence indicator

Antimicrobial stewardship audits are done to monitor whether the antibiotic policy of hospital is implemented properly by all the departments. Policy adherence indicators include various points like antimicrobial prescription, card filling adherence rate, de-escalation adherence rate, hand wash adherence rate, percentage of cultures sent before administration of antibiotics and time of cessation of antibiotics given for surgical prophylaxis. These statistical values reflect the degree to which AMSP is implemented.

Antibiotic usage outcome indicator

This can be calculated based on DDD (Daily drug dose) and DOT (Drug of Therapy). DDD is the average maintenance dose per day for a drug used for its indication in an adult. It is the best indicator to calculate antibiotic consumption. DOT on the other hand is defined as total days of therapy of an antibiotic in an ICU in a given period of time by total patients’ days of ICU in the same period.

AMR outcome resistance indicator

AMR surveillance helps to generate local trends in antibiotic resistance in a given hospital. Antimicrobial resistance should be recorded for different locations like ICU/ Ward/OPD, or specimen wise resistance should be recorded. Overall AMR pattern of hospital should be collected either using Microsoft Excel sheets or WHONET.

Clinical outcome indicator

It is useful in monitoring infection related morbidity and mortality. Thus it reflects the clinical outcome due to any infection or disease.

Financial outcome indicator

It includes cost of an antibiotic in terms of per patient or per day consumption or per admission consumption.

Limitations of auditing AMSP

1. Difficulty in finding person who is exclusively devoted in implementation and execution of AMSP.
2. Funding is important for proper planning and implementation of AMSP program and monitoring of such programs and for software.
3. Antimicrobial stewardship team members may not want to intervene with clinical practice of colleagues in other disciplines as this can hamper their interpersonal relationships.

CONCLUSION

Audits of antimicrobial use are important as they provide precise data regarding antibiotic resistance of the institution and it helps in framing of institutional antibiotic policy. Regular training in the form of continued medical education (CME) for doctors will help them in choosing correct drug in correct dose as well as knowledge regarding adverse drug resistance. Rational antibiotic use is essential to prevent long term health consequence related to antimicrobial resistance therefore AMSP is of utmost importance. AMSP audit is ultimately for patient safety which directly impacts quality of care while making it cost-effective and also protecting the community from ill-effects of antimicrobial resistance.

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Conflict of Interest

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