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EFFICIENCY AND EFFECTIVENESS OF ANTIBIOTIC POLICY IN SUPER SPECIALITY HOSPITAL-BIOTECHNOLOGY (MICROBIOLOGY)

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ABSTRACT

Antibiotic resistance is a serious and growing health problem, gaining international attention as resistance increases at alarming rate, particularly in hospital settings .To help curb resistance ,there is an urgency to improve both physician prescribing practices and diagnosis of those conditions for which an antibiotic is indicated. Selective pressure exerted by wide spread antimicrobial use is a driving force in the development of antibiotic resistance. Improving the use of antibiotics, together with better infection control and prevention management, have been recognized as the key interventions that can control the continuing emergence of antibiotic resistance.

Antibiotic policies and guidelines have been shown to

- *Improve patient care by prudent use of antibiotics for prophylaxis and therapy.*
- *Make better use of finance.*
- *Retard the emergence of multiple antibiotic resistant bacteria.*
- *Advance the education of junior doctors by providing template for appropriate therapy.*

Antibiotic therapy should always be stepped down to a narrower spectrum and/or safer antimicrobial that is active against the isolated pathogen deemed to causing the infection. If more than one antibiotic qualifies for these criteria. The cheaper one should be preferred. Additionally parental therapy should be switched to oral as soon as this is indicated. In countries where there is unrestricted sale "over the counter" of antibiotics, uncontrolled misuse of antibiotics is responsible for a general pool of resistant strains in the microbial population. Sales of antibiotics should be restricted to medical prescription only. Within hospitals, the unnecessary use or overuse of antibiotics encourages the selection and proliferation of resistant and multiply resistant strains of bacteria. Once selected, resistant strains are favored by antibiotic usage and spread by cross-infection. Where resistance is encoded on transmissible plasmids, resistance can also spread between bacterial species. There is thus a link between antibiotic use (or abuse) and the emergence of antibiotic resistant bacteria causing hospital-acquired infections. It is not possible to completely eliminate this evolutionary phenomenon, but it can be slowed or modified by prudent antibiotic use. This requires the inclusion of an antibiotic policy in the infection control programme. Antimicrobial resistance is recognized as a significant threat to public health by compromising our ability to treat infections effectively. It is widely acknowledged that antibiotic resistance is driven by high rates of antibiotic prescribing. The continuing problem of antimicrobial

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resistance has prompted efforts to reduce unnecessary antibiotic use to maximize the lifespan of these valuable drugs and to strive to prevent a return to the "preantibiotic"era.

I. INTRODUCTION

Selective pressure exerted by wide spread antimicrobial use is a driving force in the development of antibiotic resistance. Improving the use of antibiotics , together with better infection control and prevention management , have been recognized as the key interventions that can control the continuing emergence of antibiotic resistance.(1).

Antimicrobial resistance is recognised as a significant threat to public health by compromising our ability to treat infections effectively.It is widely acknowledged that antibiotic resistance is driven by high rates of antibiotic prescribing. The continuing problem of antimicrobial resistance has prompted efforts to reduce unnecessary antibiotic use to maximise the lifespan of these valuable drugs and to strive to prevent a return to the "preantibiotic"era.(2)

Evidence-based antimicrobial guidelines are a key tool in efforts to improve antibiotic prescribing, reduce the progression of antibiotic resistance and optimise patient outcomes. Antimicrobial drugs include agents for treating bacterial, viral, fungal and parasitic infections. They represent some of the most important and effective pharmaceuticals available to modern medicine. (3) After a period of unrestricted use we are now entering an era in which antimicrobial resistance is a rapidly increasing, problem.

About 20% of the antimicrobial prescribing to humans takes place in hospitals[1] and estimates suggest that anything between 20 – 50% of this use is unnecessary. As with all drugs, antimicrobials may cause adverse reactions affecting an individual. The use of antimicrobials to treat infection also modifies the normal bacterial flora, and can lead to the selection of resistant organisms. For example antibiotic use is a risk factor for colonisation and infection with MRSA. Diarrhoea or colitis caused by C difficile may follow use of antibacterials. These organisms can spread to unaffected individuals. Therefore inappropriate use of antimicrobials can affect not just the individual but also the health of the community, causing healthcare associated infections, a proportion of which are avoidable.(4)

Infection control (IC), hospital-acquired infection (HAI) seems to be an ever increasing problem. Most of the high profile organisms are multidrugresistant (MDR) either with acquired ,e.g ,methicillin-resistant Staphylococcus aureus (MRSA) and extended-spectrum b-lactamase (ESBL) producers, or natural resistance (Clostridium difficile), and some such as MRSA are not merely replacing methicillin-susceptible S. aureus (MSSA) but are an additional burden of infection.(5) Darwinian theories of evolution and survival of the fittest suggest that the selection and maintenance of MDR bacteria would not happen without antibiotic exposure and the heavier the exposure, the greater the resistance problem. It is also possible that in transmission of MDR from patient to patient, antibiotic pressures may be as important as failures in IC. First, antibiotic exposure can increase the bioburden of MDR bacteria in a patient through suppression of normal flora, allowing multiplication of the MDR bacteria. This increased bioburden makes the patient more likely to contaminate the environment, staff and other patients.(6)

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II. AIM

To reduce the antimicrobial resistance and to produce simple appropriate and cost effective guidelines for the treatment of infections commonly encountered in general practice. To create awareness on antibiotics as misuse is counter productive .

III. ANTIBIOTIC POLICY GUIDELINES

In view of increasing problems of antibiotic resistance and cost of inappropriate prescribing ,the Patel hospital infection control committee ,Jalandher has developed his policy for the use of antibiotics. The infection control committee shall continuously review the policy according to the changes in local resistance epidemiology and evidence based literature. The formulation of these guidelines has been preceded by wide consultation exercise ;similarly any further feedback or proposals of amendments are more than welcome.(7)

This policy is for guidance only & does not cover eventuality. Please be ready to change therapy and /or course-length in light of

- Culture and sensitivity results
- Patient non response/reaction
- Microbiological consultation
- The infection control committee has identified four things that can make a difference:

- No prescribing of antibiotics for simple cough and colds
- No prescribing of antibiotic for viral sore throats
- For uncomplicated cystitis in otherwise fit women limit course to three days.
- Limit prescribing of antibiotics over the telephone to exceptional cases.

- Educating patients about benefits and disadvantages of antimicrobial agents is advocated .Practitioners can provide leaflets and display notices advising patient not to expect a prescription for a antibiotic, together with the reason why.
- Avoid

-Using longer courses than necessary

-Unnecessary use of combinations where a single drug would be equally effective

-Broad spectrum antibiotics where a narrow spectrum agent in indicated.

-Prophylactic use of antibiotics unless of proven benefit.

- Topical antibiotics should be use very rarely if at all (eye infection) topical antibiotics encourage resistance and may lead to hypersensitivity.
- Antibiotic therapy should always be stopped down to a narrower spectrum or safer antimicrobial that is active against the isolated pathogen been to be causing the infection, if more than one antibiotic qualities for these criteria the cheap one should be preferred .Additionally parenteral therapy should be switched as this is indicated.

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- The accuracy of laboratory culture and sensitivity results depend significantly on the quality of the specimen submitted. Guidelines on the laboratory are included in this policy . It is important that the laboratory sheet accompanying the specimen includes clearly stated information of any antibiotic treatment that the patient was already on or would have been started after the collection of specimen.(8)
- Penicillin-allergic patients will react to all penicillin. About 10% of penicillin-sensitive patients will also be allergic to cephalosporins If necessary a microbiologist can advise on suitable alternatives. Penicillin-sensitivity should be clearly documented in the patient's notes.
- The following are felt to be safe in pregnancy:
  - Penicillins
  - Cephalosporins
  - Erythromycin
  - Nitrofurantoin (not in 3rd trimester)
- Experience in anticoagulant clinics suggests that the INR can be alterd by a course of most antibiotics .Increased frequency of INR monitoring is advisable during and after a course of antibiotics until the INR has stabilized again. cephalosporins, erythromycin, ciprofloxacin and trimethoprim seen ,to cause a particular problem .In these cases contact the anticoagulant clinic for further advice(9)

  Guidelines for doctors before putting pen to the paper,and writing out a prescription,to look at the checklist below:
- Is there a strict indication for using an antibiotic?
- Have I decided on a short ,sharp course?
- Have I chosen the right antibiotic with minimal side effects ,maximal efficacy and the narrowest spectrum possible?
- Are there cheaper and acceptable alternatives?
- Have I taken into consideration local resistance patterns?
- Has the patient understood my instructions?
- Do I need bacteriological control?
- Do I need to review the case? If so ,when and how often?

  It is hoped that these antibiotic guidelines will prove a useful tool in continuing efforts to avoid unnecessary and inappropriate antibiotic therapy and the repercussions of costs and resistance that invariably result from such.(10)

IV. REVIEW OF LITERATURE

The purpose of antibiotic policies is to ensure that an effective range of antibiotics is maintained. Policies should describe effective antibiotics in appropriate dosages, avoid unnecessary treatment, reduce the emergence of antibiotic resistance, promote good practice and contain costs(11).

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The use of antimicrobials in the most appropriate way for the treatment or prevention of human infectious diseases, having regard to the diagnosis (or presumed diagnosis), evidence of clinical effectiveness, likely benefits, safety, cost (in comparison with alternative choices), and propensity for the emergence of resistance. The most appropriate way implies that the choice, route, dose, frequency and duration of administration have been rigorously determined.(12).Antimicrobial therapy courses should be reviewed no later than 5 days after commencing treatment and discontinued or re-prescribed according to clinical presentation.(13).Antimicrobial drugs include agents for treating bacterial, viral, fungal and parasitic infections. They represent some of the most important and effective pharmaceuticals available to modern medicine. After a period of unrestricted use we are now entering an era in which antimicrobial resistance is a rapidly increasing, problem.(14)

With the emergence of antimicrobial resistance, the use of antimicrobial drugs has increased in both inpatient and outpatient settings .From 1995 through 1998, the overall proportion of isolates of Streptococcus pneumoniae, a community-acquired pathogen, that were resistant to three or more antimicrobial drug classes rose substantially, and high rates of antimicrobial use for upper respiratory tract infections are believed to be a major factor responsible for this increase.(15)

Antibiotics are generally used to treat bacterial infections. The toxicity to humans and other animals from antibiotics is generally considered to be low. However, prolonged use of certain antibiotics can decrease the number of gut flora, which can have a negative impact on health. Some recommend that, during or after prolonged antibiotic use, one should consume probiotics and eat reasonably to replace destroyed gut flora.(16)

Infection control (IC),hospital-acquired infection (HAI) seems to be an ever increasing problem. Most of the high profile organisms are multidrugresistant (MDR) either with acquired, e.g. methicillin-resistant Staphylococcus aureus (MRSA) and extended-spectrum b-lactamase (ESBL) producers, or natural resistance (Clostridium difficile), and some such as MRSA are not merely replacing methicillin-susceptible S. aureus (MSSA) but are an additional burden of infection.(17)

It is also possible that in transmission of MDR from patient to patient, antibiotic pressures may be as important as failures in IC. First, antibiotic exposure can increase the bioburden of MDR bacteria in a patient through suppression of normal flora, allowing multiplication of the MDR bacteria. This increased bioburden makes the patient more likely to contaminate the environment, staff and other patients.(18)

With the emergence of antimicrobial resistance , the use of antimicrobial drugs has increased in both inpatient and outpatient setting. Isolates of Streptococcus pneumoniae, a community-acquired pathogen, that were resistant to three or more antimicrobial drug classes rose substantially and high rates of antimicrobial use for upper respiratory tract infections are believed to be a major factor responsible for this increase.(19)

V. MATERIAL AND METHODS

Data Collection

For preparing antibiotic policy .I have collected the previous records(i.e 2010 ,2011,2012) of various samples for culturing and sensitivity in microbiology dept.

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VI. ANALYSIS

Sample Collection

The accuracy of the laboratory culture and sensitivity result depend significantly on the quality of specimen submitted. It is important that the laboratory sheet accompanying the specimen includes clearly stated information of any antibiotic treatment that the patient was already on or that would has been started after collection of the specimen.

1. **BLOOD CULTURE** :- Culture should be taken prior to starting antibiotic therapy.
2. **SPUTUM CULTURE** :- Sputum and not saliva should be taken always use clean ,wide mouthed contaniors of a pattern known not to leak to collect the sputum sample. First morning sample should be collected and submitted immediately in the laboratory.
3. **URINE CULTURE**:- Mid stream specimens of urine should be passed directly in either disposable universal bottles or in special wide mouthed contaniors specimens of urine should be passed directly in either disposable universal bottles or in special wide mouthed containers
4. **PUS CULTURE:-** The submission of actual pus in sterile container is preferable especially for sample taken during surgery. Swabs are satisfactory if moist and visibly soiled with pus.(20)

VII. SAMPLE RECEIVED FOR CULTURE AND SENSTIVITY: -

In hospital following samples are received and processed-

1. Sputum.
2. Blood.
3 .ETT lavage
4. Urine.
5 .BAL fluid.
6 .Pus.
7. Throat swab
8. Ear swab
9. Other body fluid i.e aspirate form kidneys, pleural fluid, synovial fluid, bile, tympanic rims

VIII. SAMPLE PROCESSING

1. Gram staining.
2. Culture.
3. Antibiotic sensitivity.
4. Biochemical tests.
5. Results.

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IX. RESULT

1.The total number of ETT samples received was 42. Out of which 25 are Positive cultures with predominating organism being Pseudomonas **(7)** followed by E.Coli **(8)** .Following the sensitivity pattern of the isolate ,we can prescribe a combination of Amikacin + Piperacillin + tazobactam OR Amikacin + Cefepime + Tazobactam for patients with VAP ,for coverage of all gram negative and gram positive organisms.

2.The total number of blood samples received was 611.Out of which 85 are positive cultures with predominating organism being E.Coli **(35)** followed by Acinetobacter **(11)** .Using sensitivity pattern for isolates we can priscribed

- Amikacin
-Amikacin + Piperacillin + Tazobactam
-Amikacin + Cefepime + Tazobactam

For the patients with septicemia for coverage of all Gram negative and Gram positive.

3. The total number of Sputum sample received was 181.Out of which positive cultures was 60, with predominating organism being E.Coli **(12)** followed by kleb **(11).**Using the sensitivity pattern of the isolates we can prescribe Amikacin, a combination of Cefoperazone+ Sulbactam+ Amikacin, a combinztion of Amikacin + Piperacillin\Tazobactam for the patient with community acquired Pneumonia, for the coverage of all Gram negative and Gram positive micro organism.

X. DISCUSSION

The wide spread use of antibiotics both inside and outside of medicine is playing significant role in the emergence of resistant bacteria. Steadly increasing antibiotic resistant and decreasing no. of antibiotics appear to a point to a post – antibiotic period during which treatment of infection would become difficult The reasons behind that are :-

1. The antibiotics are sold over the counter without prescription
2. Misuse and overuse of antibiotic by doctors as well as patients.
3. Patient taking less than the recommended dosage or falling to take their dose within the prescribing timing
4. An insufficient long course of antibiotics
5. Poor hand hygine by hospital staff

If the patient taking insufficient long course of antibiotics this allows the more resistant bacteria present to survive , leading to more resistant normal flora and possible relapse with a more severe infection that is more difficult to treat . About 22% people finished their antibiotic course primarily because they feel better.

If the patient taking less than the recommended dosage than there is decrease concentration of antibiotics in bloodstream and tissues , and exposure of bacteria to suboptimal antibiotic concentration increases the frequency of antibiotic resistant organisms.

Poor hand hygiene by hospital staff has also associated with the spread of resistant organism.

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XI. CONCLUSION

I have concluded that if we have an appropriate antibiotic therapy, then along the problem of finance ,the major and current problem of antibiotics resistance can be prevented. The antibiotic resistance can be reduced by using following guidelines:

1. No prescribing of antibiotics for simple cough and colds.

2 . No prescribing of antibiotics for viral sore throats.

3. Limit prescribing of antibiotics over the telephone.

4. Avoid using longer course than are necessary.

5 .Avoid unnecessary use of combinations where a single drug is effective.

6. Avoid broad-spectrum antibiotics where a narrow spectrum agent is indicated.

7. Topical antibiotics should be used very rarely.

8 . Educating patients about the benefits and disadvantages of antimicrobial agents.

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