

Drug Utilization Evaluation of Antimicrobials in Surgical Patients in Tertiary Care Hospital

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Abstract

Drug use/utilisation is an intricate process. Wide differences in the usage of medications for any particular ailment are due to the precariousness in diagnosis, therapy, and medication adherence. Antibiotics are produced by microbes. They act by selectively suppressing the growth (bacteriostatic) or killing (bactericidal) other microorganisms at very low concentrations. Antimicrobial agents, this term is designated for both naturally and synthetically obtained drugs that attenuate the growth of microbes. SSI is a consequence of a pathogenic microorganism multiplying in a surgical wound; it causes local and occasionally systemic signs and symptoms, which is known as a SSI. Depending on the surgical treatment and the patient, infections complicate operations in 1% to 5% of instances. SSIs are the reason for the increase in morbidity and hospital stay. Surgical Antimicrobial Prophylaxis (SAP) can be used to prevent wound infections during surgical procedures. Wound infection occurs when a crucial number of bacteria are present in the wound at the moment of closure. Antimicrobial drugs that target the invasive microorganisms can lower the no. of viable bacteria below the infection-causing threshold. The purpose of administration of SAP is to avoid or to decrease the prevalence of post-operative wound infection at or around the surgical site.

Keywords: Drug; Surgical; Patients; Tertiary

Literature Review

- Perioperative antibiotic prophylaxis in paediatric cardiac surgery study conducted by Nelson Alphonso, Petros V. Anagnostopoulos, Sarah Scarpace, Peggy Weintrub, Anthony Azakie, Gary Raff, Tom R. Karl concluded that there is no conclusive evidence of superiority of second generation cephalosporins over first-generation, cost-effectiveness may be the best way to decide. Vancomycin, and teicoplanin, are no more effective than Beta-lactam agents for the prevention of infection at the site of cardiac surgery.

<https://www.cambridge.org/core/journals/cardiology-in-the-young/article/abs/perioperative-antibiotic-prophylaxis-in-paediatric-cardiac-surgery>

- A study conducted on Prolonged antibiotic prophylaxis after cardiovascular surgery and its effect on surgical site infections and antimicrobial resistance by S Harbarth, M H Samore, D Lichtenberg, Y Carmel in which 1502 procedures using short ABP, recorded 131 SSIs, compared with 100 SSIs after 1139 operations with prolonged ABP, concluded that prolonged ABP was not associated with a decreased risk of SSI and was correlated with an increased risk of acquired antibiotic resistance

<https://pubmed.ncbi.nlm.nih.gov/10869263/>

- Effects of controlled perioperative antimicrobial prophylaxis on infectious outcomes in pediatric cardiac surgery, studied by Yuko Kato, MD; Nobuaki Shime, MD, PhD; Satoru Hashimoto, MD, PhD; Mayuko Nomura, MD, concluded that Limiting the duration of prophylactic antimicrobials was cost-effective and reduced the risk of acquiring resistant pathogens without increasing the frequency of postoperative infections. The use of glycopeptides in properly selected patients at high risk of methicillin-resistant *S. aureus* infection can lower the risk of postoperative infections.

https://www.researchgate.net/publication/6324293_Effects_of_controlled_perioperative_antimicrobial_prophylaxis_on_infectious_outcomes_in_pediatic_cardiac_surgery

- Prophylactic antibiotics in orthopedic surgery: Controversial

issues in its use by Ish Kumar Dhammi, Rehan Ul Haq, and Sudhir Kumar concludes that the use of surgical prophylactic antibiotics is clear but there is a controversy in the literature with no evidence regarding timing, choice of antibiotics and duration of prophylactic antibiotics in orthopedic surgery. The trend in western literature is to use 2nd generation cephalosporins prophylactically about 30 min to 1 h before skin incision and preferable for 24 h to 3 days postoperatively. However, in our scenario, theater conditions, prevalent pathogens and socioeconomic backgrounds are different and cannot be compared with the western world. Hence, there is a need to have level 1 studies to formulate guidelines for our country.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4510788/>

- A study was conducted on Antibiotic Use, Incidence and Risk Factors for Orthopedic Surgical Site Infections in a Teaching Hospital in Madhya Pradesh, India by Kristina Skender, Anna Machowska, Vivek Singh, in which data for 1205 patients were collected from 2013 to 2016, concluded that 7.6% of patients developed SSIs and the most common SSIs causative microorganism was *Staphylococcus aureus*, whose strains were resistant to penicillin (100%), erythromycin (80%), cotrimoxazole (80%), amikacin (60%) and ceftioxin (60%). Amikacin was the most prescribed antibiotic (36%). Male sex, previous hospitalization, antibiotic prescription during hospitalization before perioperative antibiotic prophylaxis and postoperative length of stay > 15 days were identified as significant risk factors. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9220190/>

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A Drug Utilization Study of Antimicrobials in Major Surgical Patients in Tertiary Care Teaching Hospital- A Prospective Observational Study by Dr Vidisha Vivek Parulekar, Dr Vandana Badar, Dr Vartika Gupta, Dr Priti Garate concluded that , the majority of surgical wounds were clean (39.11%) and most common AMA used pre-operatively was metronidazole (29.24%) & in the intraoperative & postoperative period was gentamicin (54.28%), and there is a clear need for the development of prescribing guidelines and educational initiatives to encourage the appropriate use of antimicrobials in surgical period. <http://jmscr.igmpublication.org/home/>

Introduction

Aim

To evaluate the utilisation pattern of antimicrobial agents (AMAs) in surgical prophylaxis and post-operative management of cardiothoracic, pediatric cardiology, and orthopaedic surgical departments.

Objectives

- To identify and evaluate the pattern of antimicrobial use in surgical prophylaxis.
- To identify and evaluate the pattern of antimicrobial use in post-operative management.
- To estimate the incidence of surgical site infections and average cost of antimicrobial therapy.

Methodology

Study site

The critique was conducted at Star Hospitals, Hyderabad, India

Study design and subjects

A prospective cross-sectional study was carried out over a period of 6 months in cardiothoracic, orthopaedic and pediatric cardiothoracic surgical departments after receiving the clearance from IEC of our hospital.

Study duration

The search lasted for six months. (from October 2022- February 2023)

Sample size

Overall 150 patients from cardiothoracic, orthopaedic and pediatric cardiothoracic surgical departments were evaluated.

Selection criteria

Inclusion Criteria-

- Patient age 0-99yrs of either gender
- Patient undergoing surgery and receiving inpatient care in cardiothoracic, orthopaedic and pediatric cardiothoracic departments.

Exclusion Criteria

Pregnant and lactating women

Source of data

All required data was compiled from

- Patient data collection form
- Treatment chart

Data collection

The initiation of data collection was done after receiving the clearance from IEC of Star Hospitals. The data was documented for patients that fit into the inclusion and exclusion criteria of the study, by using a data collection form. The average cost estimated solely for antimicrobial agents prescribed for surgical prophylaxis and post-op management [1-5].

Results

Overall 615 antimicrobial agents were prescribed out of which 281 were administered as surgical prophylaxis and 334 as post-operative SAP. The majority of patients were prescribed amikacin as preoperative (57%) and post-operative(62%) antimicrobial. Wounds of all patients were clean on discharge and 3 surgical site infections were encountered during the study.

Discussion

A total of 150 inpatients undergoing surgery were assessed from cardiothoracic, orthopaedic and paediatric cardiothoracic departments. Out of 150 patients, 49 underwent CABG, 49 TKR, 27 VSD closure, 10 ICR, 3 AVCD, 2 ASD closure and 10 other surgeries (TOF repair, PFNA). The majorly used SAP drug was amikacin sulphate accounting for ncomycin and levofloxacin. In post-op AMAs, the most frequently used AMA is amikacin accounting for 62% and the least used AMAs are cefixime, cefotaxime, nitrofurantoin and vancomycin. Out of 150 patients, single SAP was given to 60 patients, two SAPs were given in 48 patients, 3 SAPs were given in 41 patients and 4 SAPs were given in 1 patient. The TOA of SAP observed was 1hr before surgery (45%) and at the time of surgery (55%). The most common AMA at discharge was cefuroxime + clavulanic acid and least common was faropenem and linezolid. All 150 patients had clean wound on discharge. Out of 150 patients, 3 patients were observed to have an SSI during hospital stay.

Conclusion

During evaluation it was found that antimicrobial prescription of SAP and post-op management deviated from the standard guidelines. Very few AMAs prescribed according to CSTs. The CSTs that came back +ve showed high degree of resistance to most of the commonly prescribed antimicrobials. Restricted antimicrobials were prescribed to some patients without performing culture sensitivity test. The average cost estimation of antimicrobial agents prescribed for surgical prophylaxis & post-op management was big-budget and can be reduced by procuring & prescribing low-cost alternatives.

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