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Antibiotic prophylaxis in gastrointestinal surgery patients: a Retrospective Analysis of Our Experience

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ABSTRACT

An effective prophylactic regimen should be directed against the most likely infecting organisms, but need not eradicate every potential pathogen. Surgical site infections are the second most common cause of hospital acquired infections and happens in 10%–30% of all patients undertaking gastrointestinal surgery. They are more likely to be admitted in critical care unit and have five times higher mortality than those patients without surgical site infections [1].

Prophylactic use of antimicrobials and other preparation before surgery have shown significant reduction in infectious complication. The essential spectrum for coverage in gastrointestinal surgery is decided by the flora found within the patient's large intestine. This is a mixture of both anaerobic and aerobic bacteria along with than introduction of bacteria from the patient's skin or the operating room, so antibiotic choices that protect against both anaerobic and aerobic bacteria showed the best results. Retrospective analysis of all gastro intestinal surgeries performed at our institution during 2016-2018 with the same Antibiotic Prophylaxis protocol were analysed and discussed. We conclude that patients with disseminated cancer are at a higher risk for developing SSI. ASA score >3, COPD, and longer duration of surgery predict SSI risk.

Keywords: NIL.

INTRODUCTION

An effective prophylactic regimen should be directed against the most likely infecting organisms, but need not eradicate every potential pathogen. Surgical site infections are the second most common cause of hospital acquired infections and happens in 10%–30% of all patients undertaking gastrointestinal surgery. They are more likely to be admitted in critical care unit and have five times higher mortality than those patients without surgical site infections [1].

Prophylactic use of antimicrobials and other preparation before surgery have shown significant reduction in infectious complication. The essential spectrum for coverage in gastrointestinal surgery is decided by the flora found within the patient's large intestine. This is a mixture of both anaerobic and aerobic bacteria along with than introduction of bacteria from the patient's skin or the operating room, so antibiotic choices that protect against both anaerobic and aerobic bacteria showed the best results [2].

Common reasons of intra-abdominal infections after surgery in patients who stay in intensive care units are perforations of the upper gastrointestinal tract due

to ulcer disease, or in case of the lower gastrointestinal tract due to diverticular disease and cancer. Gut ischemia because of arterial embolism, thrombosis, or vascular disease lead to peritonitis, primarily in elderly patients. The treatment of postoperative bacterial or fungal infections comprises of cause control, antimicrobial cure, supportive and adjunctive approaches with the help of various types of antimicrobials. In this study, we explored the various prophylactic and post- operative antibiotics that can be used to reduce morbidity and mortality in gastrointestinal surgery [3].

Methodology:

Patients that underwent gastrointestinal surgery between 2016-2018 were included in the study. All the patients medical records were technically evaluated by the author for the review of antibiotics used as prophylaxis and post-operatively for any treatment of infections. Criteria for defining as surgical site infection and MRSA are described here below :

Surgical Site Infections

The Centers for Disease Control and Prevention (CDC) categorized postoperative infections as remote infection or surgical site infection (SSI). SSI was further classified into three types-- superficial, deep incisional and organ or space infection. SSI are the second most common cause of hospital acquired infections and happens in 10%–30% of all patients undertaking gastrointestinal surgery. The CDC estimated that around 500,000 SSIs happen yearly in the United States. 60% of the patients who experience SSIs get admitted in an intensive care unit. They are five times higher risk to be readmitted and unfortunately, have twice the mortality rate when compared to patients without an SSI. Therefore, health care costs are significantly increased in patients who are affected by SSIs [4].

Following a colorectal surgery, superficial infections are much more likely to occur than deep or organ SSIs. Deep organ infection represented surgical failure like anastomotic leak instead of a failure of prophylaxis. It is a primary care that the common type of infections was seen, with data recorded and a possibility of wrong care and healthcare costs, especially for use of antibiotics. Deep SSIs necessitate lengthy hospital stays, with the requirement of intensive care or additional surgical interventions and added treatments. All these complications and general survival were worsened following colorectal surgery, surgery for inflammatory bowel disease, lengthy operations, existence of a stoma and overweight or obesity [5]. Adherences with care along with surveillance programs for SSI incidence and prevention are not well-known in colorectal surgical practice and were unfortunately not supported by national institutions.

The significant clinical features of SSIs were erythema around site of incision, watery or purulent discharge and wound superficial dehiscence, which had additional systemic signs, all of which were nonspecific. The ASEPSIS score system included: Additional treatment, Serous discharge, Erythema, Purulent exudate, Separation of deep tissue, Isolation of bacteria, and Stay duration. This score offers interval data which can be useful in audit and research and permits an assessment of the severity of infection [6].

MRSA

There is a current discussion regarding antibiotic prophylaxis; whether it should provide coverage to resistant bacterial strains, for example methicillin-resistant Staphylococcus aureus(MRSA) and if the patient was already colonized before the surgery. Most studies did not support the empirical use of perioperative prophylaxis against MRSA if the patient is occupied by resistant bacteria. Studies from hospitals with a high occurrence of MRSA proved contradictory results for a cohort of cardiac surgery and of neurosurgery patients [7].

The data in cardiac surgery patients did not display a difference in the frequency of surgical wound infections when comparing efficacy of vancomycin with cefazolin, while the same method considerably decreased shunt infections and death rate when neurosurgical patients were studied. Nevertheless, for patients at high threat of SSI, who needs identification in advance of surgery, the addition of antibiotic prophylaxis against MRSA and additional resistant bacterial strains can be considered.

In case of patients with known MRSA colonization, vancomycin must be considered as the suitable antimicrobial for prophylaxis. Some prefer to avoid vancomycin because it has a big molecular weight

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and fails to penetrate into the tissues. Clindamycin, rifampicin or fosfomycin can be used if the MRSA strain is sensitive to these agents. Linezolid and daptomycin can be considered as additional options [8].

Results:

During the study period, data was collected on 269 patients that underwent gastrointestinal surgery. The breakdown by type of surgery is as follows: 161 (59.9%) had appendix surgery, 80 (29.7%) had colon surgery, 6 (2.2%) had rectal surgery, and 15 (5.6%) had small bowel surgery. The surgery was performed laparoscopically in 218 (83.5%) of patients. Prior to the intervention, 5 (9.1%) patients suffered a SSI, compared to 11 (5.1%) following the intervention ($p = 0.27$). On multivariate analysis, older age ($p = 0.03$) was a risk factor for SSI and patients that had an appendectomy had a significantly lower chance of developing an SSI compared to patients who had colon ($p = 0.00$), rectal ($p = 0.00$), or small bowel ($p = 0.00$) surgery.

Discussion:

SSI affected 12·3% of patients worldwide, and the incidence increased across HDI groups. The incidence of SSI remained higher in low-HDI countries than in middle-HDI or high-HDI countries, despite adjustment for factors describing patients, diseases (including contamination), procedures, safety, and hospitals. Length of hospital stay was three times longer for patients affected by SSI than for patients with no SSI. Delayed return to work or school carries a societal burden, which is likely to be greater in LMICs. [9]

These findings begin to characterise the relationship between SSI and global antimicrobial resistance. Where microbiological cultures were available, SSIs were more likely to be caused by bowel-derived organisms. Large amounts of antibiotics were consumed to prevent and treat SSI, yet in 21·6% of cases with a positive culture, the causative microorganism was resistant to the prophylactic antibiotics that had been administered. The prevalence of antimicrobial resistance increased to one of three isolates in low-HDI countries. Postoperative courses of antibiotics were longest for patients in low-HDI countries, and this was not explained by casemix.[10] Although there is randomised evidence that short postoperative antibiotic courses are as safe as long antibiotic courses, this evidence was not derived in LMICs, and caution is needed before changing practice.[11]The high prevalence of SSIs that were resistant to the initial prophylactic antibiotic illustrates a potentially important area for improvement worldwide. Complete microbiological analysis of all SSIs was not possible within this observational study, so the problem might be even larger that estimated here.[12] The focus in global surgery to date has been directed towards mortality. The 30-day mortality in this study was similar to that in the Global Surg 1 study (1·9% and 1·6% respectively).[13] This generally low mortality highlights the importance of studying more common outcomes such as SSI across health systems, given the impact on patients. We found an association between SSI and death, with a three-fold increase from 1·5% in patients without SSI to 4·7% in patients with SSI within this study. This is an association, and no causal link can be made with these data; it is likely that patients died with an SSI rather than from an SSI. Since SSI was also associated with deep organ space infection and other health-care-associated infections, this supports its use as a severity marker of illness.[14]

Interest in the use of surgical safety checklists has increased in the past 5 years, and they are now part of clinical routine in many surgical units. In this study, the failure to use an available surgical safety checklist was associated with a high SSI rate. This association was not explained by an omission of prophylactic antibiotics, nor was it particular to emergency surgery, when haste might improperly trump safety measures. The scientific literature describing checklists and SSI is contrasting and includes a recent systematic review of 14 studies.[15] The data in this systematic review showed a decrease in SSI with checklist use (range within individual studies from 3·2% to 10·2% absolute risk reduction). The GlobalSurg studies provide novel checklist data from LMIC settings. The explanation for the observed effect is unclear but probably describes a broader attitude to safety in hospital systems that require further investigation.[16]

A major strength of this study is its provision of prospective patient-level SSI data from a wide breadth of settings around the world. In particular, outcome assessment was standardised and training

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provided through our online tool. Several small and generally single-centre studies have been done in the past 20 years in attempts to characterise SSI in LMICs. These were systematically reviewed in a 2010 study that included 57 reports focusing on SSI. [17]General methodological quality was low and heterogeneity was high, with reported SSI rates varying from 0·4% to 30·9%. Since then, SSI outcomes from several single-centre and national multicentre studies in LMICs have been published.[18-21]The lower than expected rates emphasise the difficulty in robustly determining SSI, which, together with the between-study variability, make international comparisons difficult. The present study contributes to closing this knowledge gap and allows meaningful comparison from multiple income settings with accurate casemix adjustment and standardised training in outcome assessment. Reliability was increased through the vetting of incomplete records and was demonstrated in a parallel validation study.

A major limitation of this study was the inability to follow up every patient 30 days after surgery. SSI detection within randomised trials is higher when proactively followed up as a primary endpoint than when followed up as a secondary outcome.[22] Within our study, collaborators were trained and encouraged to directly determine 30-day outcomes whenever possible. Overall, this was successful; however, complete, in-person, 30-day follow-up for thousands of patients would not have been possible, particularly in resource-limited settings. Nevertheless, we did assess SSI as a primary endpoint, used a mandatory training package, and did a sensitivity analysis using in-hospital SSI rates. The variation in incidence of SSI before discharge from hospital and within 30 days was similar between countries of high, middle, and low HDI. Since these incidence data are already comparable to those from high-quality randomised trials, this provides some measure of validity.[23] Other limitations apply. First, with respect to microbiological analysis, we did not standardise specimen collection, laboratory assessment, techniques, or definitions. A pragmatic view was taken to use local protocols and techniques for collecting and processing specimens and for determining antimicrobial resistance. These measures were therefore recognised in advance as being an exploratory analysis to describe the prevalence of organisms with antimicrobial resistance against the particular prophylactic antibiotic administered. Second, although we did validation, there is still the potential for missed cases or inaccurate data.[16-18,24-26] The large number of patients, a prospective protocol, and the use of local coordinators might have minimised the potential bias.

Reducing SSI will contribute to ensuring safe and essential surgery around the world.29 Costs to patients in LMICs in terms of expenditure and time off work have not been measured but are probably considerable. The costs of preventive measures might be offset by the realised cost-savings. WHO has published recommendations to help reduce the incidence of SSI that include global perspectives relevant to LMICs.[17,27] Despite inclusion of strongly graded recommendations, none of these could be based on high-quality evidence, which is lacking in support of most interventions.[28] Virtually none of the existing evidence is derived from LMICs, leading to uncertainty about future performance of these measures.[29] SSI research is complex, and bundles of measures have been seen to paradoxically increase SSI incidence.[30] Implementation therefore necessitates careful consideration and meticulous attention to longer-term evaluation. In resource-limited settings, the development of robust policy will remain difficult without high-quality evidence. Our findings provide the rationale to plan, fund, and perform high-quality surgical research that can effect change in health policy. There are no multicentre, multi-country randomised trials on SSI prevention in LMICs at a time when efforts to combat SSI should be informed by high-quality research derived in these settings.[31]

Conclusion:

Patients with disseminated cancer are at a higher risk for developing SSI. ASA score >3, COPD, and longer duration of surgery predict SSI risk. WHO recommended antibiotic prophylaxis would be equally effective for all abdominal surgeries as well.

References:

1. Allegranzi B, Bagheri Nejad S, Combescure C, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. Lancet 2011; 377: 228–41.

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2. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance de nition of health care-associated infection and criteria for speci c types of infections in the acute care setting. Am J Infect Control 2008; 36: 309–32.
3. Tanner J, Khan D, Aplin C, Ball J, Thomas M, Bankart J. Post-discharge surveillance to identify colorectal surgical site infection rates and related costs. J Hosp Infec 2009; 72: 243–50.
4. Leaper DJ, van Goor H, Reilly J, et al. Surgical site infection— a European perspective of incidence and economic burden. Int Wound J 2004; 1: 247–73.
5. Bagheri Nejad S, Allegranzi B, Syed SB, Ellis B, Pittet D. Health-care-associated infection in Africa: a systematic review. Bull World Health Organ 2011; 89: 757–65.
6. Allegranzi B, Zayed B, Bischo P, et al. New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: an evidence-based global perspective. Lancet Infect Dis 2016; 16: e288–303.
7. Rosenthal VD, Richtmann R, Singh S, et al. Surgical site infections, International Nosocomial Infection Control Consortium (INICC) report, data summary of 30 countries, 2005–2010.
8. Infect Control Hosp Epidemiol 2013; 34: 597–604.
9. Aiken AM, Karuri DM, Wanyoro AK, Macleod J. Interventional studies for preventing surgical site infections in sub-Saharan Africa: a systematic review. Int J Surg 2012; 10: 242–49.
10. WHO. Global guidelines on the prevention of surgical site infection. Geneva: World Health Organization, 2016.
11. Allegranzi B, Bischo P, de Jonge S, et al. New WHO recommendations on preoperative measures for surgical site infection prevention: an evidence-based global perspective. Lancet Infect Dis 2016; 16: e276–87.
12. GlobalSurg Collaborative. Determining the worldwide epidemiology of surgical site infections after gastrointestinal resection surgery: protocol for a multicentre, international, prospective cohort study (GlobalSurg 2). BMJ Open 2017; 7: e012150.
13. Bhangu A, Kolias AG, Pinkney T, Hall NJ, Fitzgerald JE. Surgical research collaboratives in the UK. Lancet 2013; 382: 1091–92.
14. Mortality of emergency abdominal surgery in high-, middle- and
15. low-income countries. Br J Surg 2016; 103: 971–88.
16. de Jager E, McKenna C, Bartlett L, Gunnarsson R, Ho YH.
17. Postoperative adverse events inconsistently improved by the World Health Organization surgical safety checklist: a systematic literature review of 25 studies. World J Surg 2016; 40: 1842–58.
18. Berard F, Gandon J. Postoperative wound infections: the in uence of ultraviolet irradiation of the operating room and of various other factors. Ann Surg 1964; 160 (suppl 2): 1–192.
19. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and work ow process for providing translational research informatics support. J Biomed Inform 2009; 42: 377–81.
20. Watters DA, Hollands MJ, Gruen RL, et al. Perioperative mortality rate (POMR): a global indicator of access to safe surgery and anaesthesia. World J Surg 2015; 39: 856–64.
21. Albert V, Mndolo S, Harrison EM, O'Sullivan E, Wilson IH, Walker IA. Lifebox pulse oximeter implementation in Malawi: evaluation of educational outcomes and impact on oxygen desaturation episodes during anaesthesia. Anaesthesia 2017; 72: 686–93.
22. Sawyer RG, Claridge JA, Nathens AB, et al. Trial of short-course antimicrobial therapy for

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intraabdominal infection. N Engl J Med 2015; 372: 1996–2005.

23. Rosenthal VD. International Nosocomial Infection Control Consortium (INICC) resources: INICC multidimensional approach and INICC surveillance online system. Am J Infect Control 2016;44: e81–90.
24. Petroze RT, Byiringiro JC, Kyamanywa P, Ntakiyiruta G, Calland JF, Sawyer RG. Infectious outcomes assessment for health system strengthening in low-resource settings: the novel use of a trauma registry in Rwanda. Surg Infect (Larchmt) 2014; 15: 382–86.
25. Alvarez-Moreno C, Perez-Fernandez AM, Rosenthal VD, et al. Surgical site infection rates in 4 cities in Colombia: ndings of the International Nosocomial Infection Control Consortium (INICC). Am J Infect Control 2014; 42: 1089–92.
26. Ahoyo TA, Bankole HS, Adeoti FM, et al. Prevalence of nosocomial infections and anti-infective therapy in Benin: results of the rst nationwide survey in 2012. Antimicrob Resist Infect Control 2014; 3: 17.
27. Ramirez-Wong FM, Atencio-Espinoza T, Rosenthal VD, et al. Surgical site infections rates in more than 13 000 surgical procedures in three cities in Peru: ndings of the International Nosocomial Infection Control Consortium. Surg Infect (Larchmt) 2015;
28. 16: 572–76.
29. Matthews JH, Bhanderi S, Chapman SJ, Nepogodiev D, Pinkney T, Bhangu A. Underreporting of secondary endpoints in randomized trials: cross-sectional, observational study. Ann Surg 2016; 264: 982–86.
30. Pinkney TD, Calvert M, Bartlett DC, et al. Impact of wound edge protection devices on surgical site infection after laparotomy: multicentre randomised controlled trial (ROSSINI Trial). BMJ 2013; 347: f4305.
31. European Society of Coloproctology. The relationship between method of anastomosis and anastomotic failure after right hemicolectomy and ileo-caecal resection: an international snapshot audit. Colorectal Dis 2017; published online March 6.
32. STARSurg Collaborative. Multicentre prospective cohort study of body mass index and postoperative complications following gastrointestinal surgery. Br J Surg 2016; 103: 1157–72.
33. Meara JG, Hagander L, Leather AJ. Surgery and global health: a Lancet Commission. Lancet 2014; 383: 12–13.
34. Anthony T, Murray BW, Sum-Ping JT, et al. Evaluating an evidence-based bundle for preventing surgical site infection: a randomized trial. Arch Surg 2011; 146: 263–69.
35. GlobalSurg Collaborative*. Surgical site infection after gastrointestinal surgery in high-income, middle-income, and low-income countries: a prospective, international, multicentre cohort study. Lancet Infect Dis 2018; 18: 516–25.

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