Journal of Antimicrobial Stewardship Practices and Infectious diseases

JASPI

September 2026/Volume 4/Issue 3

Editorial

Surgical Antimicrobial Prophylaxis : An Indian Update

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INTRODUCTION

Surgical Site Infections (SSIs) have consistently been one of the major contributors of Hospital Acquired Infections (HAI) . Every year, up to one-third of patients undergoing surgery suffer from SSIs and at least some of these are potentially preventable by a combination of good clinical practices and appropriate pharmaco-prophylaxis.

In India, Surgical antimicrobial prophylaxis (SAP) is one of the most impactful, yet misused interventions in peri-operative care. The rationale of SAP is to use narrow-spectrum antibiotics timed to achieve tissue bactericidal concentrations at the time of incision, repeated only if surgery is prolonged or associated with excessive bleeding. Deviation from these principles contributes to the catastrophic, downstream antimicrobial resistance (AMR) we are facing worldwide, especially in India. An estimated 4.71 million deaths globally were associated with bacterial AMR in 2019, of which 1.27 Million were directly attributable to it.[1] Inappropriate antibiotic use drives a vicious circle of events causing more SSIs, requiring broader antibiotic coverage thereby leading further to AMR.

CHOICE OF IDEAL ANTI-MICROBIAL AND ADMINISTRATION

The anti-microbial must be (1) active against pathogens likely to contaminate the surgical site (skin flora), (2) given in an appropriate dosage and timing ensuring adequate serum and tissue concentrations during the period of potential contamination, (3) safe, and (4) administered for the shortest effective period to minimize adverse effects, AMR and cost.[2] Ideally, the chosen narrow-spectrum antibiotic should not be in common therapeutic use to ensure continued efficacy. The administration of antibiotics should be seen as a component of a perioperative stewardship bundle incorporating a clear indication, rationale for choice of drug, planning its delivery and redosage as required for duration of surgery or blood loss, timed discontinuation and auditing for feedback. Single pre-op dose within 60 minutes before incision is appropriate for most procedures. Postoperative prophylaxis should not routinely continue beyond 24 hours.

THE INDIAN CONTEXT

The dual challenge in India lies in the rising rates of AMR coupled with high burden of SSI, as in other Low and Middle Income Countries (LMICs). The ICMR (in line with other international guidelines for SAP) recommends the use of single dose cefazolin as the antibiotic of choice for most surgeries, not to be continued beyond the duration of surgery.[3] However, continuing the prophylactic drug for longer is common. In a multi-center rural study, 79.8% of the cases were prescribed anti-microbials beyond the indicated timeline.[4] Many surgeons may have the misguided concern that the "milieu" in over-burdened public sector hospitals may not be as clean as those in resource-rich countries, and therefore continue to prolong antibiotics following surgery.[5] Several studies

Citation: Dhar A, Dhar P. Surgical Antimicrobial Prophylaxis : An Indian Update. *JASPI.* 2026;4(3):01-04. DOI: 10.62541/jaspi176

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have attested that prolonging antibiotics beyond 24 hours has not shown to reduce the risk of SSIs, but instead contributes to AMR and C. difficile infections.[2] This was validated in a public sector tertiary care hospital in Delhi, where a quality improvement study showed that adherence to a single anti-microbial dose of SAP increased from 2.1% to 67.7% over 6 months without any concomitant increase in SSI rate.[6] Extension to 48 hours is frequently debated in Cardiac surgery and joint replacement with conflicting evidence but still practiced more from fear of the devastating consequences of infections therein. However it is important to stress that resource limitation cannot be used as a rationale for longer prophylaxis. In fact, unnecessary prolonged antibiotics consume scarce pharmacy resources, increase adverse effects and select resistance, while diverting attention from higher-value SSI prevention measures.

The recent spurt of accreditation activities by hospitals and insurance regulatory bodies in India, has probably had a positive-ripple effect on increasing appropriate use. However continued monitoring and audits by infection control teams would be required to show continued compliance. S. aureus and E. coli have been common in post-operative infections, but the continuing rise of gram negative MDR organisms from post-operative patients in India is a cause for concern.[5] Hierarchical dynamics and fear of blame in Surgical fields in India, often lead ~~to~~ junior surgeons to mimic senior colleagues instead of following prevailing hospital guidelines. Guidelines alone will not change prescribing behaviour; senior-surgeon ownership, audit-and-feedback, standardised order sets and visible accountability are required.[7]

HOW DO WE SOLVE THIS? (PLAYING WITH FIRE WHILE WALKING ON THIN ICE)

The cornerstone of SSI prevention should be standard infection control practices eg incorporation of the 7S Bundle of SSI Prevention (Safe operating room; Screen for risk factors and MRSA/MSSA; Showers with chlorhexidine; Skin prep with alcohol based antiseptics; Sutures with antimicrobial; Solution to irrigate with chlorhexidine; Skin adhesive or antimicrobial dressings to protect incision) [8].

. The misinformed belief that this can be compensated by broad/extended spectrum antibiotics for longer than necessary durations has proven to be detrimental by increasing AMR. Protracting antimicrobial prophylaxis until the removal of all indwelling drains, catheters and intra-vascular lines has been demonstrated to be unnecessary in multiple studies.[2] The metabolic stress response to surgery may result in mild pyrexia or leukocytosis without any actual “infection”. This early post-operative occurrence can prompt prolongation of the prophylactic antibiotic in a confused therapeutic manoeuvre. Postoperative fever/leukocytosis should NOT automatically trigger continuation of SAP. If sepsis is clearly suspected, the diagnosis of infection should be attempted with requisite cultures. It is preferable, at this stage, to switch to a therapeutic course of an appropriate antibiotic and if an anastomotic leak is demonstrated - it requires source control combined with therapeutic antibiotics rather than continued prophylaxis. Antibiotics cannot seal the perforation! Source control must be primary and paramount, along with the *therapeutic* antibiotics.

Those who are allergic to Beta-lactam antibiotics, clindamycin and vancomycin have been recommended for prophylaxis, but are associated with a higher risk of SSIs and worse outcomes.[9] The label of penicillin allergy can be erroneous and a good history should be sought or records checked, whether it was a true severe immediate hypersensitivity or a vague documentation of a possible (minor?) event. Besides, the allergy is rarely synonymous with cross-reactivity with cephalosporins. Pre-operative skin testing could be a viable option to increase cefazolin utilization in such cases (by de-labelling allergy) without a corresponding increase in adverse events.[10] Reserving specified antibiotics for prophylaxis, and avoiding their use therapeutically should be an important component of antibiotic stewardship. Cefazolin has been recommended most widely, but there could be regional differences in AMR and drug availability.

Existing resistance patterns must be monitored to ensure that such use is sensible. In this regard, the National Accreditation Board for Hospitals (NABH) recommends a similar policy to monitor local antibiograms. This may explain why Cefuroxime is a frequent alternative (and included in ICMR guidelines as an alternative to Cefazolin) as second generation cephalosporins came later to India and have not been used as much, as a therapeutic drug. Integrating technology with the institutional antibiotic policy at the point of prescribing, can help in guiding surgeons in making the right decision.

The common causes of non-compliance include deviation of antibiotic selection from the recommended antibiotic policy of the hospital, or the prescription of the antimicrobial beyond the recommended duration. Well-intentioned surgeons while caring for the tangible patient in front of them resort to irrational antibiotic use, which is the hammer driving the nail into the (seemingly intangible) coffin of antimicrobial resistance. The negative feedback loop of inappropriate

ISSN: 3048-4510 (Online)
DOI: 10.62541/jaspi176

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antibiotic use causes more drug-resistant SSIs, thereby requiring broader spectrum of antibiotics.

In minimal access surgery, the routine use of SAP in low-risk cases should be individualised and prophylaxis should be indicated based on procedure, patient and risk stratification. A meta-analysis of 18 trials concluded that SAP in low-risk laparoscopic cholecystectomies proved no benefit.[11] Surgeons in public hospitals serving lower income groups of society and perceived less hygienic milieu may have the feeling that the guidelines have been designed for elitist public hospitals, without substantiating evidence. Cross institutional visits and studying actual data might help in dispelling such notions.

CONCLUSIONS

Rational SAP is a low-cost, high-impact lever to reduce SSIs and arrest the rising AMR in India. The key lies in diligent implementation of available guidelines, audits and making surgical groups a larger part in the antimicrobial stewardship. SSI rates may reflect infection control practices of the settings where the surgeries are performed, but the high antimicrobial resistance rates within these patient groups reflect an overwhelming need for surgical antimicrobial stewardship. SAP should not be viewed as an isolated antibiotic intervention. It is one component of a perioperative safety system in which infection prevention, appropriate prophylaxis, antimicrobial stewardship, source control and surveillance are interconnected.

Proposed 10-point SAP action points: SAP-HAI AMSP checkpoint

- **S – Select the indication.**
  Confirm that antibiotic is indicated for procedure and patient-specific risk. Avoid routine prophylaxis where evidence does not support it.
- **A – Adjust to each patient.**
  Individualize antimicrobial selection and dosing based on body size, renal/hepatic function, allergic history, operative duration and blood loss.
- **P – Perfect the timing.**
  Administer SAP within the recommended pre-incision window so that effective serum and tissue concentrations are present at incision.
- **H – Hit the right dose.**
  Use the appropriate procedure-specific and patient-appropriate dose, with weight-based dosing where indicated.
- **A – Avoid unnecessary continuation.**
  Stop prophylaxis at the appropriate time; drains, catheters, postoperative fever, or leukocytosis alone should not trigger continuation. Switch to therapeutics if required.
- **I – Infection prevention and control.**
  Integrate SAP with the 7S SSI-prevention bundle: Safety, Screen, Showers, Skin preparation, Solution, Sutures and Skin closure, adapting individual components to current evidence and local resources.
- **A - Assess daily therapy.**
  Review antimicrobial therapy daily with assigned member withing each surgical team ensuring compliance to local hospital policies.
  Antibiotic de-escalation and IV-to-oral switch when clinically appropriate is essential.
- **M – Monitor and measure.**
  Audit indication, drug, dose, timing, redosing and discontinuation, alongside antimicrobial consumption, SSI and safety outcomes.
- **S – Surveillance and vaccination.**
  Conduct periodic antimicrobial-use and resistance surveillance with feedback through AMS meetings, and promote appropriate adult vaccination.
- **P - Partnership in stewardship.**
  Engage surgeons, anesthesiologists, microbiologists, pharmacists, nurses and infection-control teams; educate patients about antimicrobial use and involve them in shared decision-making.

ACKNOWLEDGEMENT

None

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

None

ETHICS STATEMENT INCLUDING PATIENT CONSENT

Not applicable

AUTHOR'S CONTRIBUTION

Both authors contributed to the literature review, writing the draft and editing the draft to finalise it.

AI DECLARATION

No AI tool was used to generate research data, perform data analysis, interpret findings, formulate scientific conclusions, or make editorial decisions. All AI-assisted content was critically reviewed, verified, and revised by the authors. The authors take full responsibility for the accuracy, originality, integrity, and final content of the manuscript.

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