Intervention to Improve Timing of Preoperative Antibiotic Prophylaxis in Major Elective Surgery

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ABSTRACT

Aims: Timely administration of antibiotic before incision ensures effective concentration in blood and tissues. Compliance with established guidelines is problematic due to logistics. Aim of this study was to improve timing of antibiotic prophylaxis (AP) with appropriate intervention in existing practices.

Methods: Cross sectional study was conducted from May-June 2011 with target of enrolling at least 100 elective major cases (excluding obstetrics) who received AP before surgery. Anesthetists took responsibility of AP administration (Cefazoline 1 g as per our protocol unless indicated otherwise) instead of floor nurse as our earlier practice. Institutional ethical committee approved the study. Data collected in a pre-designed proforma was analyzed using Microsoft Excel.

Results: Out of 120 patients, 64% were female. Average age was 43 years (4 to 87). General surgery cases were 51%, urosurgery 20%, gynecology and orthopaedic each 13% and others 6%. One hundred nineteen (99%) received AP before incision, 58(48%) within 60 to 30 minutes before incision and 1 (1%) after the incision.

Conclusions: Anesthetist taking charge of the team for AP administration is a feasible option to improve compliance.

Keywords: Antibiotic prophylaxis, compliance, intervention, surgical site infection, timing.

INTRODUCTION

Surgical site infection (SSI) is an important contributor of increase in hospital stay, morbidity, mortality and cost.[1-3] In addition to good aseptic techniques, antibiotic prophylaxis (AP) is an important aid to prevent SSI.[4]

Optimum timing of AP administration within 60 to 30 minutes before incision and not exceeding 2 hours before surgery[5-8] is most effective in preventing SSIs.[9-16] Our earlier study[17] and literatures[14,18-21] reveal poor compliance to established guidelines. Study conducted at our institute revealed that 19% (24/125) got AP after the incision.[17] Korean study from six referral hospitals found that only 11.2% (188/1,676) patients received prophylaxis within optimum time before surgery.[22] Multicenter study in Netherlands reported only 28% of patients met AP guidelines.[23] Similarly in a Canadian study only 5% AP complied with protocol.[24]

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Scenario may be similar in Nepal as there is lack of published data on adherence to guidelines. After discussion among the team of 'surgeons- operating room (OR) nurses-anesthetists' we planned to introduce changes in our existing practices to improve compliance of AP timing. In this study, we did not aim to study efficacy of drugs or SSIs because no amount of 'good' antibiotic will achieve the goal if it is not given on time before incision. In present study we concentrated on 'intervention' to improve compliance to established guidelines on 'timing of AP' administration.

METHODS

This cross sectional study was conducted (from May 15 to June 15, 2011) with target of enrolling at least 100 cases of elective major cases that were scheduled to receive AP before surgery as per our existing institutional practice. Our practice has been to give Cefazoline 1gm intravenous before surgery in all major cases unless indicated otherwise. The exception for example is Gentamycin in urosurgery cases.

We discussed among 'surgeon-OR nurse-anaesthetists' to introduce changes to optimize the timing of AP. The changes in practice in this study included anesthetist taking overall charge of AP administration instead of floor nurses in OR which has been the practice at our institute. Traditional practice at our institute has been anesthetists to put intravenous (IV) line after the patient is being kept on operation table and floor nurses administer AP. We discussed with nurses and anesthetist to modify this practice. In present study, the anesthetists took responsibility to oversee that AP was given within optimum time of within 60-30 minutes before incision. Patients were received by OR nurse as per operation list which is distributed at least one day before surgery. Anesthetists put IV line in the waiting area looking at the operation schedule as well as ongoing operations (we run 3~4 OR simultaneously) to give AP (with help of nurses) so that AP timing could be optimized within 60 to 30 minutes before incision. Re-dosing of antibiotic was given after four hours when surgery was extended for longer duration.

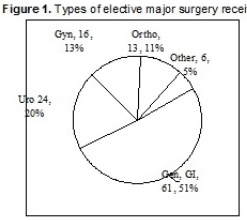
An 'AP form' was designed with date, time of AP administration, type of surgery and incision time. Forms were kept in each operation room. Members of anesthetic team were requested to fill in the forms. One member of surgical team was designated to collect the forms and enter data in predesigned Microsoft Excel data sheet for analysis.

Ethical approval was obtained from institutional review committee. All the elective major surgery cases scheduled to receive AP as per our institutional practice were included in the study. The emergency surgeries, and the patient with known allergy to antibiotic were excluded. Microsoft Excel was used to analyze data.

RESULTS

There were 120 cases who received AP as per our protocol during study period from May 15 to June 15, 2011. Females were 64%. Average age was 43 years (4 to 87). General surgical cases, mainly gastrointestinal and biliary diseases accounted for 51% (61/120) and Gynecology and Urosurgery cases each were 13% (Figure 1). Overall, 99% got AP before incision, 48% within 60 to 30 minutes of incision. One patient had AP after the incision (Table 1). Two cases, one for 'pancreaticoduodenectomy' (seven hours) and another 'total gastrectomy' (5 hours) received repeat dose of antibiotic.

Figure 1. Types of elective major surgery receiving AP (n= 120).



Note: AP- antibiotic prophylaxis, Uro- urosurgery, Gyn- gynecology, Ortho- orthopedic, Gen-general, GI- gastrointestinal

Timing of AP (Minute)	N	%	N	%
Before incision	119	99	101	81
<5	7	6	64	51
6-15	11	23	25	20
16-30	42	35	11	9
31-60	58	48	1	1
>60	1	1		
After incision	1	1	24	19
<5	1	1	11	9
6-15			7	5
>15			6	5

Note: AP- antibiotic prophylaxis

DISCUSSION

After introduction of intervention in existing practice we observed improved compliance in AP administration, 99% of patients receiving antibiotic before the incision. Studies have shown that two thirds of SSIs can be prevented[25-27] by timely and appropriate administration

of AP.[25,28-30] However, compliance with the established guidelines is often far from optimal as found in our earlier study[17] and reported literatures.[14,18-21] Awareness, lack of co-ordination and resistance to accept changes are some of the barriers to successful implementation of evidence-based practice of AP. To overcome these issues, we had discussions among 'surgeons-OR nurses-anesthetist' to introduce changes to improve the timing of AP administration before incision in major elective surgeries at our institute. Collaborative approach with appropriate intervention is important to improve compliance with standard protocol.[31] Besides strict aseptic procedures, timely administration of AP before incision to achieve adequate concentration of drugs at tissue level is important to control colonization of surgical wound and prevention of SSIs.[20] Based on timing, AP may be 'early' (2-24 hours before incision), 'preoperative' (within 2 hours before the incision), 'peri-operative' (3 hours after the incision) and 'postoperative' (3-24 hours after the incision).[12]

Even though we had improved result after intervention in present study, there is space to do more to better comply with the established guidelines for AP. In present study among 99% of patients who got AP before incision only 48% were within 60-30 before incision. (Table 1). This demands further consolidation of team effort and communication among 'surgeon-nurse-anesthetist'. Failure in system to implement guidelines leads to increased SSIs, morbidity, mortality, and increased health care costs. Both institute and individual health care provider have obligation to safeguard rights of the patient. Clearly defined role, high priority and better communication can improve compliance to guidelines. The web based guidelines from CDC (Centers for Disease Control and Prevention), APIC (Association for Professionals in Infection Control and Epidemiology) and SHEA (Society for Healthcare Epidemiology of America) are some of the useful resources on issues related to AP and SSIs.[12]

Introduction of appropriate changes with anesthesia department assuming responsibility in present study was successful in reducing number of patients receiving AP after incision like in other study.[32] Our findings support the view that increasing awareness to evidence based practice can improve compliance and quality. Study from university hospitals in USA found improved compliance from 56% to 84%.[33] Interventions based on specific circumstances of institute and its services are key issues to improve compliance.[34] Issues which influence compliance to guidelines include: i) Individual-knowledge, attitudes, beliefs and practice; ii) Team work-communication and allocation of responsibilities; iii) institution policy- support for promoting and monitoring practice.[35]The implementation of SURgical PAtient Safety System (SURPASS) checklist was useful in improving time of AP before incision.[36] Awareness and periodical audit helps ensure proper use of AP.[37,38] In present study we introduced changes to optimize AP administration. In initiation of surgeons, the anesthetist took charge of timing of AP administration with the help of OR nurses. This resulted in 99% (119/120) of AP before incision (from earlier 81%[17]). Also, the number of patients increased to 48% (from earlier 1%[17]) who got AP within optimum time of 60 to 30 minutes before incision. Less than 1% (1/120) received AP after the incision (from earlier 19%[17]).

The anesthetist plays crucial role in maintaining the safe recovery of patients in peri-operative period. This study supports our belief that anesthetists are the best member of the team (surgeon-OR nurse-anesthetist) to ensure timely administration of AP in OR before incision.

The new knowledge added by this study- Existing practice of AP at institution level needs improvement through periodical audit. Appropriate intervention is needed to comply with the established evidence based protocols and guidelines to ensure AP administration within 60 to 30 minutes before incision. For this compliance, anesthetist is probably the best member of the team (of surgeon-OR nurse-anesthetist) in OR environment.

Possible implications- The result of this study is useful in clinical practice, system development at institution level and evaluation of existing practices of AP. Team work among all the stake holders (surgeon-OR nurse-anesthetist) with anesthetist leading the responsibility of AP administration can improve the compliance of AP within 60 to 30 minutes before incision. Periodical audit of the institutional protocol is important to evaluate the practice and devise appropriate intervention.

CONCLUSIONS

Introduction of changes in practice resulted in improvement in timing in accordance with the standard protocol of antibiotic prophylaxis before incision in elective major surgeries.

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