Perioperative Use of Antibiotics in a University Hospital

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Abstrak

Dilakukan evaluasi harian terhadap rekam medik 735 pasien dewasa yang menjalani pembedahan di RS Dr.Cipto Mangunkusumo. Selama periode survei, dilakukan tindakan pembedahan sebanyak 745 dan dilakukan 1552 tindakan pengobatan dengan antibiotika. Hampir semua pasien menerima pengobatan antibiotika, terutama sebagai profilaksis. Pukul rata, setiap penderita bedah memperoleh 2 jenis antibiotika. Penisilin merupakan antibiotika tersering digunakan, diikuti oleh sefalosporin, metronidazol, gentamisin dan kloramfenikol. Pemberian yang tidak teratur, indikasi yang tidak tepat, dan pemberian yang berkepanjangan merupakan cacat yang mencolok dari penggunaan antibiotika sebagai tindakan profilaksis pada pembedahan.

Abstract

Consecutive charts of 735 adults who were admitted for surgery were reviewed for numbers, dose, route, duration, timing of initial dose of antibiotic(s) given for prophylaxis or treatment. In these 735 cases, 745 surgical procedures were performed and 1552 courses of antibiotics were administered. This implied that almost all cases received antibiotics, with the average of two per case. Penicillins were the most frequent prescribed antibiotics, then followed, in order, by cephalosporins, metronidazole, gentamicin, and chloramphenicol. The following pattern of the antibiotic(s) used was observed. The first dose was commonly administered in the ward prior to surgery, the dose schedule was largely irregular, the common route of administration was oral or intrmuscular, and the duration of administration was as long as the patient stay in hospital. Assuming that the nature of antibiotic use in surgery was largely for prophylaxis, we judged that in 1192 courses (76,8%) their use were inappropriate in terms of indication and duration of use. We speculate that lack of information, education, and training in antibiotic use in surgery, and strong promotional pressure from pharmaceutical companies are important factors contributing to the excessive and incorrect use of antibiotics. Having discussed the result of the study with surgeons, it is agreed to introduce a guideline of antibiotic use in surgical prophylaxis in our hospital and to use the present study as a base line data in assessing the impact of the guideline.

***Keywords :** Antibiotics, Perioperative, Prophylaxis.*

INTRODUCTION

Antibiotic use in hospitals has been subjected to many surveys.[1-11] Investigators from those surveys believed that antibiotic use in hospitals has increased rapidly, keeping pace with the introduction and marketing of new antibiotics.

The increasing use of antibiotics should be rational, with respects to indication, efficacy, safety and cost.[12] However, in most surveys it was discovered that antibiotic use has been inappropriate, and therefore this might hamper the quality of medical care.[13]

When inappropriate antibiotic use is encountered, investigation has to be taken to determine causes; and corrective measures has to be planned.[1-6,14-15]

This study focussed on the use of antibiotics in surgery, since it was known from many surveys that inappropriate use of antibiotics was of highest prevalence in surgical patients.[2-4,12,16]

MATERIALS AND METHODS

Six surgical wards of the Department of Surgery at Dr. Cipto Mangunkusumo Hospital, Jakarta, were sur-

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veyed prospectively for three months. The hospital is a teaching hospital for undergraduate and graduate students, and it is a tertiary referal hospital.

Consecutive charts of 735 adults who were admitted for surgery during the period of November 1, 1989 to January 31, 1990 were reviewed daily. Patient's demographics, primary diagnosis, name of surgical procedure, dates of admission, procedure and discharge, as well as antibiotic medication were recorded. Data on administration of antibiotics were checked against those on the nursing record.

All data were recorded on a form designed for this survey. Numbers antibiotic prescription and length of antibiotic courses for each patient were calculated. **One antibiotic course** was defined as the administration of a particular antibiotic prescribed by the doctor in charge. The same antibiotic prescribed more than once to the same patient was considered as the same antibiotic course. The length of one antibiotic course was counted from the date of first dose to the date of last dose administration. The surgeons on the ward were not aware of the survey, and were not consulted throughout the survey.

RESULTS

Surgical procedures and antibiotic courses

There were 745 surgical procedures of all kind performed for the 735 patients, and 1552 courses of antibiotics were given. These courses were administered in all procedures, except for three patients who underwent elective herniotomy (Table 1).

Mean and mode of the number of antibiotic course were 2.08 and 2 respectively (Figure 1). The number of antibiotic courses was highest (mean = 2.4) in abdominal surgery, and lowest (mean = 1.4) in head, neck and breast surgery (Table 1).

Table 1. Antibiotic courses prescribed in surgical procedures

Surgical procedures	Number of AB courses	Number of operations	Prescription Ratio
Abdominal surg.	705	294*	2.4
Urology	333	150	2.2
Head, neck, breast	209	151	1.4
Orthopaedics	225	103	2.2
Reconstructive surg.	51	29	1.7
Others	29	18	1.6
TOTAL	1552	745	

* Including 3 procedures without antibiotic prophylaxis

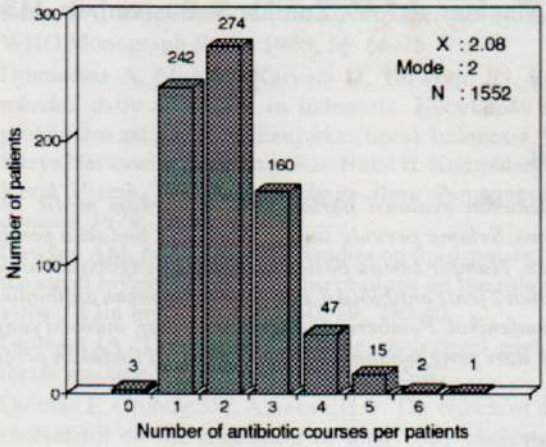

Figure 1. Frequency distribution of antibiotic courses received by surgical patient

Choice of antibiotics and timing, duration and route of administration

Penicillin derivatives were the most frequent prescribed antibiotics, and their use was evenly distributed among each subspecialty of surgery (Table 2). Cephalosporins were next in order, and were heavily used in orthopaedic and urological surgery. Metronidazole, aminoglycosides and chloramphenicol were the third, fourth and fifth most frequent prescribed respectively, and their use were limited to abdominal surgery.

Ampicillin was the most frequent penicillin derivatives prescribed in all subspecialties, except in urological surgeries where it was sulbenicillin (Table 3). Of cephalosporins, cephadroxil was frequently prescribed in urological surgery, while cephradine and cefazolin were frequently prescribed in orthopaedic surgery (Table 4).

Of 1552 antibiotic courses, which were presumably intended for prophylaxis, the first dose was administered preoperatively in the ward before transferring the patient to operating theatre in 562 cases (36,2%). This timing of first administration was common in abdominal, orthpaedic and urological surgery. This was not the case in head, neck, and breast, and reconstructive surgery where the first dose was usually given postoperatively. The preoperative antibiotic was generally single, except in emergency appendectomy and colorectal surgery where it was commonly a combination of metronidazole and gentamicin.

Table 2. Various groups of antibiotics prescribed

Antibiotic group	Abdominal surgery	Head,neck and breast	Urology surgery	Orthopaedic surgery	Reconst.	Others
Penicillins	203	182	142	72	36	22
Cephalosporins	34	15	108	105	3	1
Metronidazole	164	-	-	1	1	
Aminoglycosides	153	2	8	1	-	
Chloramphenicol	98	6	5	3	6	3
Quinolones	20	-	19	10	-	
Cotrimoxazole	2	2	38	-	-	2

Table 3. Prescription of penicillin derivatives

	Abdominal surgery	Head,neck and breast	Urology surgery	Ortho-paedic surgery	Recons.
Penicillins					
Parenteral					
Ampicillin	89	58	11	27	6
Ampicillin+ sulbactam	1	-	-	-	-
Sulbenicillin	25	33	129	16	2
Amoxycillin+ clavulanic acid	6	6	-	4	-
Proc. Penicillin G	-	-	-	4	3
Ticarcillin	1	-	-	-	-
Oral					
Ampicillin	79	77	1	18	15
Ampicillin+ cloxacillin	-	1	-	-	1
Amoxycillin	2	6	-	3	9
TOTAL	203	182	142	72	36

Table 4. Prescription of cephalosporins

	Abdominal surgery	Head,neck and breast	Urology surgery	Ortho-paedic surgery	Recons.
Cephalosporins					
Parenteral					
Cephradine	2	-	1	9	-
Cephazolin	-	-	1	48	2
Cephalexin	-	-	1	-	-
Cefuroxim	-	5	-	-	-
Cefmetazone	-	-	1	-	-
Cefotaxime	1	-	-	-	-
Ceftriaxon	28	1	-	-	-
Cefoperazon	-	-	12	-	-
Oral					
Cephadroxil	1	2	93	-	-
Cephradin	2	7	1	48	2
TOTAL	34	15	108	105	3

Of the 562 cases only 113 courses were given perioperatively, while 449 course were either discontinued or continued postoperatively (Figure 2). In the remaining cases, the first dose was either delayed until the second day of postoperative period. All antibiotics given postoperatively lasted for several days.

It was also noted that in most cases antibiotic administration were initially parenteral, largely intramuscular, although they were changed later to oral.

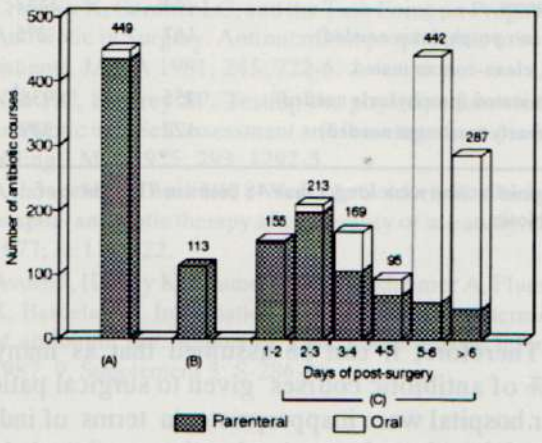

Figure 2. Preoperative first dosing (A), perioperative prescription (B), and duration of antibiotic courses (C).

Appropriateness of antibiotic use

We also intended to establish the justification for antibiotic use in each surgical procedure. This should have been possible by looking at the report of the surgical procedure. However in most cases report on

cleanness of the surgery was not available, we could not therefore assess the degree of contamination in each surgical procedure. It was impossible then to assess directly the appropriateness of antibiotic courses in surgical patients admitted to our hospital.

Nevertheless, the appropriateness of antibiotic use can be judged indirectly by applying one or other of the available text written by experts [17-19] as guideline for surgical antibiotic prophylaxis. According to the guideline, antibiotic prophylaxis is primarily indicated for only a few clean, but for all clean-contaminated and contaminated surgeries, and duration of administration should be no longer than 48 hours.

In our case series, 938 (60,4%) antibiotic courses were given correctly to clean, clean-contaminated and contaminated surgeries. However 917 (59,1%) courses were longer than 48 hours. The other 275 (17,7%) courses should even be considered inappropriate because they were given to a clean prosedures (Table 5).

Table 5. Appropriateness of antibiotic use

Class of surgical procedures	Number of procedures	Number of AB courses
All classes	744	1552
Clean (no prophylaxis needed)	167	275
Clean, clean-contaminated, contaminated (prophylaxis needed)	455	938*
Dirty (early treatment needed)	122	339

* Administrations were longer than 48 hours in 917 course of antibiotic

Therefore, it can be assumed that as many as 76,8% of antibiotic courses given to surgical patients in our hospital were inappropriate in terms of indication and duration of use. As already mentioned above inappropriateness of antibiotic courses was also encountered in route of administration, timing of initial dose, and schedule of dosing. According to most guidelines, prophylactic antibiotic should normally be given intravenously, started at the time of anaesthetic induction, and continued regularly for several doses only.

DISCUSSION

This study has shown that antibiotic were prescribed excessively for surgical prophylaxis and incorrectly used in our hospital. The prophylaxis use is indicated in all surgery irrespective of the cleanness of the procedure. The use of antibiotic prophylaxis mostly continued as long as patient stays in the hospital. At least one antibiotic was prescribed to each surgical patient, and in many cases two or more antibiotics were administered concurrently or consecutively. Initially, most antibiotics were given parenterally, then continued by this route or changed to oral administration, often without regard to correct dosing schedules.

The inappropriate use of antibiotic prophylaxis has been found in many surveys. At least 80% of the antibiotic courses were continued for more than 48 hours (5,6), only 10% of patients received appropriate prophylaxis (38), over 66% of antibiotic courses were started too early or too late (11), one half of antibiotic prophylaxis were given to patients undergoing clean surgery (39), and it was a common practice to switch from one antibiotic to another (16). In the present study we found a comparable fraction (76,8%) of the antibiotic courses for surgical prophylaxis were inappropriate in terms of indication and/or duration.

In this survey we did not specifically look into reasons for the excessive and incorrect use of antibiotic prophylaxis in our hospital. However, when we recounted our data to the surgeons, they commented that the excessive use of antibiotics was due to insecure feeling about hygiene and asepsis-antisepsis practices in the hospital. However, we suspect that lack of information, education and training in antibiotic use in surgery, and strong promotional pressure from pharmaceutical companies are important factors contributing to the situation. The same view have been expressed by many experts and panels.[15,22-24]

Surgeons in our hospital seem to neglect the importance of the classification of wounds in relation to contamination-infection risk. Therefore, many surgical patients received antibiotics without consideration of whether the indication was really correct. If it was correct, the surgeon still had to consider the appropriate dose, interval, length, and aim of the antibiotic course according to the degree of contamination and infection risk.

Since inappropriate antibiotic surgical prophylaxis is an endemic problem in many hospitals, preventive measures have to be taken to correct it. With respect to this, the result of this study was presented to surgeons and administrators, and there was an agreement then to introduce guidelines for the selection and use of antibiotics in surgery. We also agreed to treat the guidelines as an integral part of the action plan to improve the incidence of nosocomial infections in the hospital.

It has been reported that introducing a protocol or guidelines for surgical prophylaxis reduced inap-

propriate use of antibiotics and reduced the antimicrobial drug cost. The results of this study can therefore be used as a base line data in assessing the impact of guidelines on the practice of surgical antibiotic prophylaxis in the future. The future study should also include determination of incidence of nosocomial infection in our hospital periodically.

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