Antibiotic Prescription Style in Surgery Department in Baquba Teaching Hospital

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Abstract

Background: Antibiotics are one of the most common drugs prescribed in the hospitals. The present survey was performed to study the style of prescription of different types of antibiotic regimens in different surgeries in Baquba Teaching Hospital and assess the appropriateness of antibiotic therapy through a comparison with the standard guidelines for antibiotic prescription.

Methodology: A retrospective survey were used to evaluate the patients undergone surgery through one month duration beginning from the 1st of April 2009 to the 1st of May 2009. 303 patients were enrolled in our survey and questionnaires concerning demographic data, type of surgery, and parameters of antibiotic therapy (selection of antibiotic, dose, route and duration of therapy) were completed.

Results: From 303 patients, 179 patients receiving one antibiotic and the other 124 patients receiving 2 or more antibiotics (antibiotic combination). Claforan was the common antibiotic prescribed where it was written for 169 patients as a single agent or in combination with other antibiotics. Claforan with Flagyl was the common antibiotic combination, prescribed for 63 patients.

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Concerning duration of therapy, 159 patients continue on antibiotic therapy for 2-3 days while 71 patients continue for one day.

Conclusion: The antibiotic selection in this hospital is optional and not according to any guidelines or recommendations. The utilization of culture and sensitivity studies is absent and antibiotic prescription is almost totally empirical. Therefore, antibiotic prescription is inappropriate and didn't follow the standard guidelines for antibiotic prescription.

Key words: antibiotic, standard guidelines, claforan

Introduction

Antibiotics are the most frequently prescribed drugs among hospitalized patients especially in intensive care and surgical department. Programs designed to encourage appropriate antibiotic prescriptions in health institutions are an important element in quality of care, infection control and cost containment [1].

Widespread and indiscriminate use of broad spectrum antibiotics has contributed to the emergence of multi-resistant organisms [2]. Existing evidence suggest that there is a causal association between antimicrobial usage in hospitals and antimicrobial resistance [3, 4]. Restricting use of certain antibiotics to defined groups of patients and using narrow spectrum antibiotics wherever possible can slow or constrain the emergence of antibiotic resistance and prolong the effectiveness of existing antibiotics [5, 6].

Several studies have shown that administration of antibiotics was inappropriate in 22% to 65% of patients that received treatment [7, 8]. Antibiotic costs have increased dramatically over the years with an overall trend to prescribe expensive broad spectrum rather than narrow-spectrum antibiotics [9, 10]. Clinicians were warned of the dire consequences overuse of antibiotics would bring; now these predictions are reality, with a multitude of antibiotic-resistant organisms and inflated hospital pharmacy costs [11]. Today, antibiotics are one of the most expensive drug expenditures in hospitals, accounting for 20% to 50% of total pharmacy spending [12], with intravenous (IV) antibiotics accounting for the most expensive category of antibiotics in hospitalized patients. Furthermore, patients on IV therapy often have prolonged hospital stays to complete antibiotic treatment; a switch from IV to oral (PO) therapy could favour an earlier discharge and directly save health care costs [13].

Various interventions including restricted antibiotic formularies, antibiotic control programs and improved accessibility to guidelines have been proposed to improve the use of antibiotics. Antibiotic

guidelines have proven to be a simple, yet effective, intervention while encouraging appropriate choices of antibiotic therapies and recommending a timely switch from IV to PO therapy [14, 15].

In hospitals, drug choice may be influenced by such local factors as trends in susceptibility of current isolates, cost of the drugs, and in some instances traditional preference or familiarity. The present survey was conducted to illustrate the pattern of antibiotic prescription and the appropriateness of antibiotic therapy in surgical unit in Baquba teaching hospital through answering on the following questions:

1- What are the common single antibiotic prescribed?
2- What are the common antibiotic combinations prescribed?
3- What are the common cases admitted to whom antibiotics prescribed?
4- How long the antibiotics continued (duration of therapy)?
5- Whether there is a difference in duration of therapy among selected cases?
6- Whether there is a difference in dose of antibiotics prescribed among different age groups?
7- What is the percentage of patients utilized antibiotics for prophylactic and therapeutic indications?
8- Does the intravenously administered antibiotics switched to oral dosage form after improvement of patient state?

Patients and Methods

Baquba hospital, a 400 bed teaching hospital providing tertiary and referral care, with approximately 20000 admission per year. The majority of cases admitted to surgical unit were referred from emergency unit. The data of this retrospective study were collected from the patients files after discharging from the hospital.

This survey was established on 303 patients of both sexes (205 male and 98 female) with different ages admitted to surgery department in Baquba teaching hospital from the 1st of April to the 1st of May 2009. These cases were classified according to the type of single antibiotic prescribed, type of antibiotic combinations prescribed, number of antibiotics prescribed per prescription, type of surgery performed, doses of antibiotics prescribed per day , duration of therapy in the hospital and the aim of antibiotic prescription whether for therapeutic or prophylactic purposes. Then we discuss the appropriateness of therapies for a given cases by comparing the results with the standard guidelines for antibiotic prescription [16].

Statistical analysis: Data were entered and analysed with SPSS 16.0. Data were expressed as mean ± SEE or frequencies and percentages. Comparison of continuous variables was performed with students t-test (unpaired t-test) and significance level were set at $P < 0.05$.

Results

From 303 patients, 179 patients receive one antibiotic while the other 124 patients receiving antibiotic combinations of two or more agents as illustrated in table 1. Claforan was the common antibiotic prescribed where it was written for 169 patients as a single agent or in combination with other antibiotics, followed by Ampiclox (prescribed for 110 patient) and flagyl (prescribed for 97 patient) as viewed in figure 1. Claforan with Flagyl was the common combination prescribed where such combination was written for 63 patient, followed by Ampiclox with Flagyl (written for 6 patient) , Roxcef with Flagyl and **Roxcef with Ampiclox (written for 5 patient) as shown in table 2.**

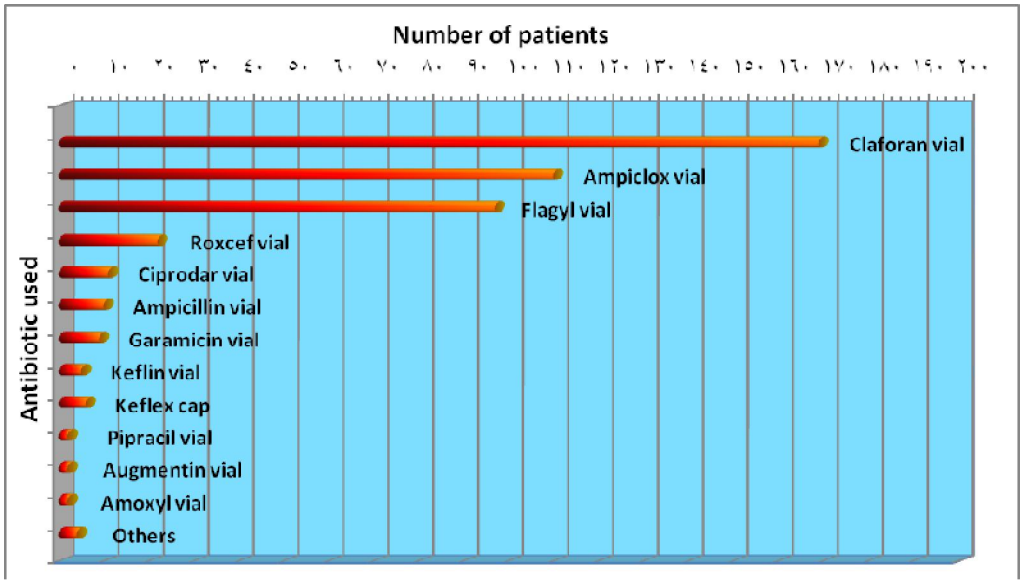

Figure (1): type and frequency of antibiotics prescribed

Table (1): number and percentage of patients to whom one, two, three and more than three antibiotics prescribed per prescription

No. of patients receiving antibiotics		Percentage
No. of patients receiving one antibiotic	179	59
No. of patients receiving two antibiotics	103	34
No. of patients receiving three antibiotics	16	5
No. of patients receiving > three antibiotics	5	2

Table (2): common antibiotic combinations prescribed

No. of antibiotics combined	Name of antibiotics combined	Frequency of antibiotics combined
Two	Claforan+Flagyl	63
	Claforan+Ampiclox	3
	Claforan+[Ciprodar or Claribac or Erythromycin]	1(for each)
	Roxcef+[Flagyl or Ampiclox]	5 (for each)
	Roxcef+[Ciprodar or Augmentin or Garamycin]	1(for each)
	Ampiclox+Flagyl	6
	Ampiclox+Ciprodar	2
	Ampiclox+[Flamazine or Keflex]	3 (for each)
	Ampicillin+[Flagyl or Garamicin]	1 (for each)
	Garamicin+Ciprodar	1
	Keflin+Flagyl	2
	Flagyl +[Ciprodar or Keflex]	1 (for each)
Three	Ampiclox+ Flagyl+[Claforan or Roxcef]	3 (for each)
	Ampiclox+Garamicin+Flagyl	1
	Claforan+ Flagyl+[Ciprodar or Garamicin]	2 (for each)
	Claforan+Ciprodar+Chloromphenicol	1
	Claforan+Garamicin+[Ciprodar or Flamazine]	1 (for each)
	Claforan+Pipracil+Flagyl	1
	Augmentin+Garamicin+Flagyl	1
>=Four	Claforan+Ampiclox+Flagyl+[Fucidine or Pipracil]	1 (for each)
	Claforan+Flagyl +Flamazine+[Amikacin or Fucidine]	1 (for each)
	Roxcef+Flagyl+Pipracil+Fucidine+Flamazine	1

Figure 2 shows the common surgical cases received antibiotics where the first factor contributing to antibiotic prescription was trauma injury (68 patients), followed by appendectomy (49 patients) and hernia repair (31 patients).

Duration of antibiotic therapy was illustrated in table 3 and 4 where about 159 patients continue to use antibiotic for 2-3 days, 71 patients for 1 days and 50 patients for 4-7 days as shown in table 3.

Table 4 shows duration of therapy among selected cases. There is significant difference in duration of therapy between cases received therapeutic antibiotics (open fractures and trauma injury) and cases received prophylactic antibiotics (cholecystectomy and appendectomy).

A non significant differences exist (in the dose of Ampiclox per day) among children older than 6 years and adults with the various age groups while significant difference present between the doses of children less than 6 years and the other age groups ($P< 0.05$) as illustrated in table 5.

In the other hand, a significant differences exist (in the dose of Flagyl per day) among various age groups ($P< 0.05$).

Concerning Claforan and Roxcef, a significant differences present (in the dose per day) between children less than 6 years and adults greater than 13 years old ($P< 0.05$).

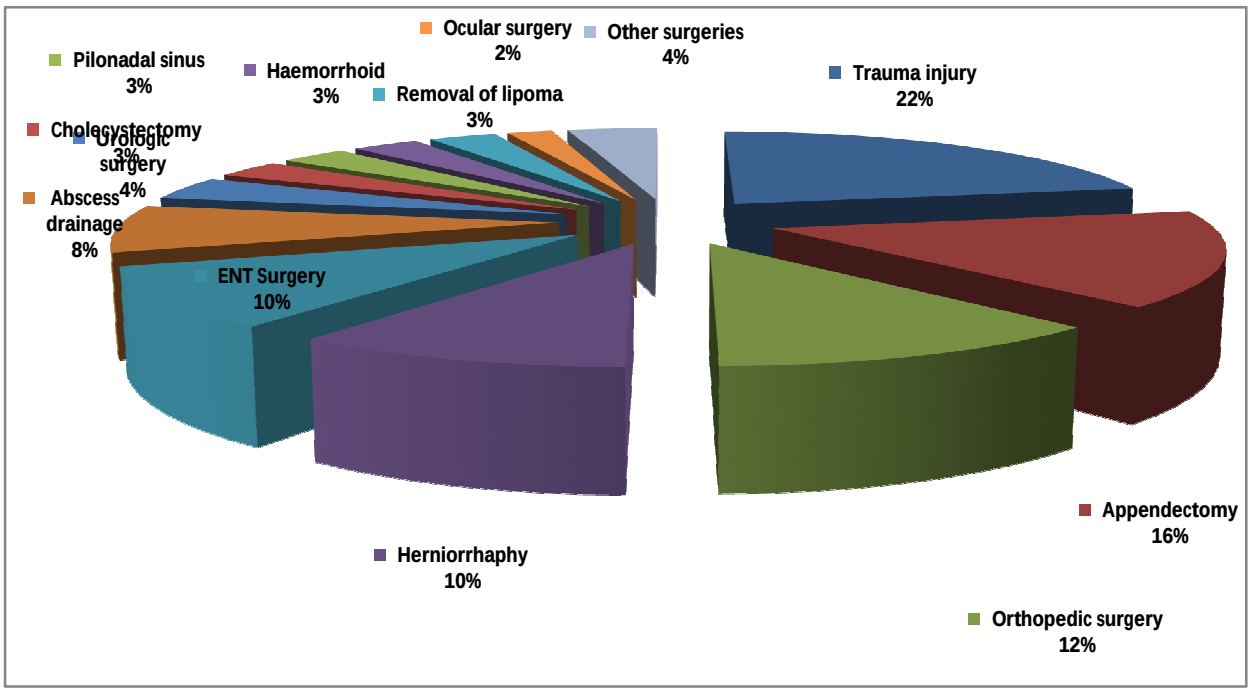

Figure (2): common surgical cases to whom antibiotic prescribed.

Table (3): Duration of antibiotic therapy

Duration of therapy	1 day	2-3 day	4-7 day	8-14 day	> 15 days
Number of cases	71 (23.4%)	159 (52.5%)	50 (16.5%)	15 (5%)	8 (2.6%)

Table (4): Duration of therapy for selected surgical cases.

Surgical cases	Appendectomy	Hernia	Tonsillectomy	Bone fracture	Trauma injury
Duration of therapy (days)	3.02 ± 0.23^{a}	2.29 ± 0.24^{a}	1.88 ± 0.11^{b}	3.70 ± 0.68^{c}	4.94 ± 0.54^{c}
N =	49	31	26	27	68

Data were expressed as mean ± SEM

Values with non-identical subscription (a, b, c) are considered significantly different ($P < 0.05$).

Table (5): doses of antibiotics in different age groups

Antibiotics	Dose of antibiotic (gm/day) in:			
	Child (0-6 year)	Child (7-12 year)	Adult (13-60 year)	Elderly (> 60 year)
Claforan	1.64 ± 0.28^{a}	1.96 ± 0.14^{a}	2.9 ± 0.06^{c}	2.5 ± 0.18^{b}
	N=7	N=13	N=20	N=8
Ampiclox	1.68 ± 0.10^{a}	2.00 ± 0.00^{b}	2.00 ± 0.00^{b}	2.00 ± 0.00^{b}
	N=24	N=21	N=38	N=7
Roxcef	0.46 ± 0.04^{a}	0.66 ± 0.10^{a}	1.77 ± 0.23^{b}	1.25 ± 0.16^{b}
	N=6	N=6	N=13	N=8
Flagyl	0.62 ± 0.08^{a}	1.18 ± 0.15^{b}	1.5 ± 0.00^{c}	1.5 ± 0.00^{c}
	N=6	N=7	N=8	N=6

Data were expressed as mean ± SEM

Values with non-identical subscription (a, b, c) are considered significantly different ($P < 0.05$). About 27% (67 from 251 selected cases) of the patients received antibiotic with the aim of prophylaxis and the other 73% received antibiotic for therapeutic purposes as illustrated in table 6.

Table (6): Antibiotic prescription for therapeutic or prophylactic purposes in selected surgeries

Type of surgical cases	Number of patients taking antibiotics prescribed for:		
	Prophylactic purposes	Therapeutic purposes	Total
Trauma injury	-	68	68
Appendectomy	22	27	49
Herniorrhaphy	13	18	31
Bone fracture	-	27	27
Tonsillectomy	16	10	26
Abscess drainage	5	20	25
Pilonadal sinus	4	5	9
Cholecystectomy	5	4	9
Hemorrhoids	2	5	7
Sum	67	184	251

From 303 patients, only 6 patients whose antibiotics switched from intravenous route to oral route and the other patients continue to use intravenous antibiotics as long as their stay in the hospital and some of them switched to oral antibiotic after discharging from hospital.

Discussion

Antibiotics account for a considerable proportion of drugs prescribed to hospitalized patients worldwide, and they tend to be both overused and misused, resulting in unnecessary costs and emergence of resistant bacteria [17, 18]. This malpractice is more obvious in the developing countries [19] where policies of antibiotic prescription are absent, the use of bacterial cultures and sensitivity studies for each patient are inadequate, and the studies that define the frequency of different pathogens and their antibiotic resistance rate are lacking. It has been shown that using standardized guidelines and adopting policies that restrict antibiotic prescriptions will lead to both cost reduction and reduction in the emergence of resistant bacteria [20, 21].

In our results as viewed in figure 1, the common antibiotic prescribed was Claforan, a third generation cephalosporin with restricted prescription, followed by Ampiclox and Flagyl although a list of more than 10 antibiotics were available in the internal pharmacy of the hospital. Prescription of this drug (Claforan) by this way indicate that the majority of patients admitted to surgical unit

directly received the antibiotic without regarding to culture and sensitivity test and standard guidelines for antibiotic prescription which states that the antimicrobial therapy directed at specific organisms should include the most effective, least toxic, narrowest spectrum drug available. This practice reduces the problems associated with broad-spectrum therapy (ie selection of and superinfection with resistant microorganisms), and will usually be the most cost-effective.

Drug and Therapeutics Committee (DTC) criteria refer to policies for restricted prescription of broad spectrum antibiotics that have been developed at a local or area level in consultation with infectious diseases experts, pharmacists and clinical microbiologists. Such policies should be consistent with the current edition of Therapeutic Guidelines: Antibiotic [16] as a minimum standard, although DTCs may choose to impose stricter restrictions.

Targeted therapy should be used in preference to broad spectrum antimicrobials unless there is a clear clinical reason (for example mixed infections or life threatening sepsis) and the prescription of broad spectrum antimicrobials should be reviewed as soon as possible and promptly switched to narrow spectrum agents when sensitivity results become available.

In our survey, the pattern of antibiotic prescription doesn't followed the pattern described in surveys conducted in both developed as well as developing countries.

The use of Claforan in our survey was higher than that reported from Australia [22] and Russia [23].

In Russia [23], the common antibiotic prescribed for colorectal surgery was cefazolin, followed by gentamicin and cefuroxime (for perioprerative prophylaxis) and gentamicin, followed by metronidazole and cefazolin (for postoperative period).

The observed high tendency to prescribe the 3rd generation cephalosporins is probably because of the lack of information regarding the frequency of different pathogenic bacteria involved in such infections and their antibiotic susceptibility in our community; therefore doctors tend to prescribe this broad spectrum group of antibiotics which they presume to have a low resistance rate against them. This over prescription of 3rd generation cephalsporins was observed in other studies [24]. This is not a good practice, and bacterial antibiotic sensitivity studies should be undertaken to define the bacteria resistance rate for different types of antibiotics.

Surprisingly, in contrast to our results the antibiotic prescription pattern reported by Elzouki *et al* [25] showed that amoxicillin/clavulinic acid was the commonest prescribed single antibiotic (54% as compared to 0.66% in our study) while non of their patients had received a 3rd generation cephalosporin(compared to 63% of our patients).

In our survey, 59% of patients received one antibiotics and 41% of them received antibiotic combinations (two or more antibiotics). About 35 antibiotic combinations prescribed and some of these combinations are scientifically approved like combination of Flagyl with penicillin or cephalosporin (to cover bacterial spectrum in mixed aerobic and anaerobic infections), combination of Garamicin with penicillin or cephalosporin (synergistic activity), combination of ciprodar with penicillin, cephalosporin or garamycin (synergistic activity). However, there are a number of combinations prescribed has not been approved to have additive or synergistic activity and required reevaluation for its prescription like combination of Claforan or Roxcef with Ampiclox, combination of Roxcef with Augmentin. The combination of Claforan with Flagyl was the common antibiotic combination prescribed (prescribed for 63 patients) mainly for patients with appendectomy and hernia repair. This combination aimed to cover aerobic and anaerobic bacteria.

In contrast to our results, in Swiss hospital study [26], 79% of patients receiving one antibiotic and 21% of them receiving antibiotic combinations (two antibiotics) while in Libyan hospital study [25], 84% of patients receiving one antibiotic and 16% of them receiving antibiotic combinations.

Trauma injury which involve bullet injury, gunshot injury, blast injury, road traffic accident, and burns constitute the common causes contribute to admission to surgical department. Appendectomy and hernia repair represent the second cause of admission.

52% of patients in our study continue to use antibiotic for 2-3 days and 23.4% for 1day. Some patients continue on antibiotic after discharging from the hospital for a prolong period of time (from 7-10 days) and some of them switched from IV to oral therapy during this period. Some surgeries required a single prophylactic dose of antibiotic preoperatively to prevent surgical site infection postoperatively like appendectomy, cholecystectomy, colorectal surgery.

In clean surgery (inguinal without a mesh, breast and thyroid surgery), antibiotic prophylaxis was not recommended [27, 28] where as in our study all these cases received antibiotic for a prolong period of time and this prescription doesn't follows the standard guidelines.

Besides in colorectal surgery, antibiotic prophylaxis should consist of mechanical bowel preparation and administration of parenteral antibiotics at induction of anaesthesia [29-31]

The surgeons were accustomed to following their 'own guide lines' as they had been trained in a wrong way in the past and it was counterintuitive for them to accept the new evidence and the new guidelines about antibiotic prophylaxis .

Especially in clean surgery, the surgeons gave antibiotic prophylaxis in cases, even though it was not recommended [27, 28]. The surgeons were afraid of surgical-site infections so they used longer courses of antibiotics as they falsely believed that keeping antibiotics in the bloodstream of a post-operative patient was a good precaution against infection.

A recently published study [32] confirmed the increased risk of *C. diff.* diarrhoea with longer duration for many of the commonly used antibiotic classes. In general 1-3 days caused a lower risk than 4-6 days which caused a lower risk than 7 or more days, for some classes these differences were significant.

The dose of antibiotic prescribed in different age groups illustrated in table 7. The differences in doses range according to body weight and age is clear for antibiotic prescribed although the dose of Claforan in children less than 6 years is high compared with their ages and weights.

The distinction between prophylaxis and treatment influences the choice of antimicrobial and duration of therapy. Appropriate antimicrobial selection, dosing, and duration of therapy differ significantly between these two situations. A regimen for antimicrobial prophylaxis ideally involves one agent and lasts less than 24 hours. Treatment regimens can involve multiple antimicrobials with durations lasting weeks to months depending on desired antimicrobial coverage and the surgical site [16].

In our survey, about 27% of patients received prophylactic antibiotic while 73% receiving therapeutic antibiotic. Most of cases admitted with appendicitis, cholecystitis, chronic tonsillitis, hemorrhoids…etc necessitating prophylactic therapy while cases that involve repair of hernia, closed fracture in which antibiotic prophylaxis is not recommended but in our survey, patients receiving a prophylactic dose of antibiotic preoperatively (for clean-contaminated and contaminated surgeries) continuo on antibiotic therapy as long as their stay in the hospital and this pattern doesn't coincide with the standard guidelines for antibiotic prescription [16].

The patients treated with antibiotic should be monitored on daily bases to assess the effectiveness of antibiotic (the antibiotic should be stopped and changed to another type if there is no response within 72 hour from initiation of therapy), to switch the antibiotic route from intravenous to oral 24 hour after improvement of patient clinical state (well, can take oral medications and with normal body temperature) and to stop therapy if the patient taking an adequate course [16]. In our survey only 6 patients (from 303) switched to oral therapy and prolongation of intravenous therapy by this way increase the risk of side effects, consuming more nursing time, increase patient incompliance and increase cost of therapy.

Conclusion

The rate of antibiotic prescription as well as the rate of antibiotic misuse are high in this hospital. The antibiotic selection in the hospital is optional and not according to any guidelines or recommendations. The utilization of culture and sensitivity studies is absent and antibiotic prescription is almost totally empirical. The precious 3rd generation cephalosporins are indiscriminately used leading to more cost and more importantly risk of emergence of resistant pathogens.

Recommendations

1- The management and the Medical Advisory Committee can give authority to hospital pharmacists to prospectively review and provide clinical advice to ensure appropriate use of antibiotics and other therapeutic agents.

2- The Medical Advisory Committee and Drugs and Therapeutics Committee should support a process of clinical review to support best practice guidelines as described in the contemporaneous edition of Therapeutic Guidelines: Antibiotic.

3- The ministry of health through its infectious disease consultation committee can compose a guide illustrating the principle of antibiotic therapy and the standard guidelines for antibiotic prescription and distributed into all health directorate in the country.

4- Certain antibiotic combinations mentioned in our study required to be reviewed for its effectiveness over single agent and whether they are scientifically approved or not.

5- The preoperative antibiotic prophylaxis is nearly absent not only in our hospital but also in majority of Iraqi hospital, so we should encourage preoperative administration of antibiotic which prevent postoperative surgical site infection, enhance wound healing, reduce stay time in the hospital and decrease postoperative antibiotic prescription. Also we can illustrate the importance of preoperative antibiotic prophylaxis through conducting a study consisting of two groups, one of them taking preoperative dose of antibiotic and the other is not and compare the results.

6- Each hospital can implement a study like our study to compare its antibiotic prescription pattern with the standard guidelines.

7- Similar studies can be done in other departments like internal medicine department, gynecology department, pediatric department…etc.

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