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ROLE OF PHARMACIST IN ENHANCING APPROPRIATE USE OF THERAPEUTIC ANTIMICROBIALS IN SURGICAL WARDS

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ABSTRACT

The role of pharmacist in the patronage of inpatients evolved over time with enlarged assurance on patient interaction and collaborative care. Our study aimed to determine the role of pharmacists in enhancing appropriate use of antimicrobials in surgical wards. The study was designed as a randomized controlled study. Two hundred patients at the surgical wards of Jordan university hospital (JUH) were recruited. Patients were randomly assigned to intervention or control group. Patient files were reviewed and patients were interviewed. Length of stay, direct cost and number of readmissions were compared between two groups. The rate of antimicrobials related problems was (56%; 15%) in intervention groups before and after researcher's interventions respectively, with significant difference (p=0.0001). The rate of readmissions were (9%) in control group and (5%) in intervention group with significant difference (p=0.026). The net acquisition cost reduced for therapeutic antimicrobials as 33.08 JD (16.58%) per patient. The acceptance rate of researcher interventions was (73.3%). the mean length of stay was (8.9; 7.66) days in control group and intervention group respectively, with no significant difference (p =0.753). Our study demonstrates that the pharmacist intervention in surgery wards enhancing appropriate use of therapeutic antimicrobials, decrease direct cost of antimicrobials used and decrease readmissions rate. Most of the clinical pharmacist interventions were accepted by health care providers. Clinical pharmacist interventions non-significantly decreased the length of stay of patients**.**

KEYWORDS: Pharmacist, antibiotics, surgical wards, antimicrobial.

1-INTRODUCTION

The role of pharmacist in the patronage of inpatients evolved over time with enlarged assurance on patient interaction and collaborative care.

A clinical pharmacist is an important member of the antimicrobial multidisciplinary group. Working jointly with the infectious disease physician involved in patients' pharmacotherapy monitoring(Tonna, et al., 2008).

Several studies indicate that the clinical pharmacist cooperation with multidisciplinary teams have a considerable effect on improving the quality of drugs prescribing and costs. However, few studies view the role of the pharmacist in reducing inappropriate of therapeutic antimicrobials use in surgical wards (Kim, et al., 2014).

This study aim is to determine the role of pharmacists in reducing inappropriate therapeutic antimicrobials use and improving clinical outcome, patient safety and cost saving.

MATERIALS AND METHODS

2. METHODS

2.1. Study Design, period and site

The study was designed as a randomized, controlled, open label clinical trial, (interventional study), arried out over six months from April 2017 to October 2017 and conducted in surgery wards of Jordan University Hospital(JUH). JUH is the first academic teaching hospital in the Hashemite Kingdom of Jordan. It encompasses all major and sub- medical and clinical specialties, and is one of the largest hospitals in Jordan.

2.2. Ethical approval
The study was approved by IRB committee at the JUH (Appendix ***1***).

2.3. **Study setting**
Patients at the surgical wards of JUH who did meet the inclusion and exclusion criteria were enrolled in our study and were randomly assigned to intervention or control group, using the website www.randomization.com.

The consent form was written in Arabic and we designed it to summarize the following items: goal of the study, explanation of the methodology and manner of the study, advantage, confidentiality, and right to withdraw with no cost or effects on patients. During patient recruitment, the patient was informed that the purpose of the study was to study the role of the clinical pharmacist in enhancing appropriate use of antimicrobials on surgical ward. The informed consent form was signed by all participant patients, to ensure voluntary agreement of all participants.

2.4. Data source and study population
Patient files in the surgical ward and drug charts for inpatients admitted to surgical wards at (JUH) were reviewed by the researcher pharmacist. Then the patients were interviewed, the missing information was taken from them, they were contacted by telephone a month later in order to obtain follow up information.

2.5. Study criteria
Patients from surgery wards were enrolled into the study by considering following criteria.

A. Inclusion criteria
Patients on antibiotic therapy in surgical wards:
1. Patients of age above 18 years of either gender.
2. Patients who provided written informed consent to their participation in the research.

B. Excluding criteria
Patients on antibiotic therapy on surgical wards with any of the following:
1. Patients with dementia and cognitive impairment.
2. Immunocompromised patients.
3. Patients already included in the study will not be included for a second time in a following admission.
4. Patient of age below 18 years.
5. Pregnancy.

2.6. Data Collection
Patients were randomly assigned to one of the two groups (control and intervention group). Informed consent form was obtained after the patient satisfied the inclusion criteria. Then we collected the data from patient and patient s' records (as available and applicable) regarding the following:

2.6.1. Demographic and Administrative Information
Patients information related to the age, gender, height, weight, patient ID, admission date, discharge date, phone number were recorded. Other information includes the case summary and diagnosis, the past medical history / surgery, family and social history, life style and allergies/intolerances, acute and chronic medical problems were collected**.**

2.6.2. Laboratory data and vital signs
Vital signs were collected. Vital signs were taken to assess the general patient health and confirm health state improvement.

Specific parameters were collected as needed, to observe antimicrobial side effects, precaution and contra-indications. If we had any cause to think that a particular laboratory test was needed, it was discussed with the physician.

2.6.3. Used medications
All medications used before, at and after admission at the hospital were collected. This included the drug name (generic and brand), strength, frequency, route of administration, dose and indication. Route of administration, dose, start – stop and indication.

2.6.4. Antimicrobial Serum Concentration
Antimicrobial serum concentration was recorded.

2.7.5. Microbiological test results
Microbiological tests were used to confirm the rational use of antimicrobials.

2.6.5. Information regarding readmission within 30-days
We recorded number of readmission within 30-days and reason for readmission.

2.6.6. Assessment of Drug Drug Interactions and Adverse Drug Reaction (ADR)
We recorded the actual and potential interactions between medications taken by the patient, to treat or reduce the likelihood of occurrence recorded the Actual side effects of antimicrobial and identified the patient that is at risk for (ADR).

2.6.7. Antimicrobial Related Problems
Inappropriate antimicrobials use was evaluated according to IDSA guidelines, and the form that was been used for antimicrobial related problem was (Al-Azzam, et al., 2016) after modification.

2.8. Control Group
All antibiotics records of the patients were reviewed and compared with IDSA guidelines, taking into consideration the clinical data of the patients and patients in the control group was not undergo intervention by the clinical pharmacist.

2.9. Intervention Group

All antibiotics records of the patients was reviewed and compared with guidelines of antibiotic therapy, taking into consideration the clinical data of the patients.

Antibiotics related problems was filled in clinical pharmacist's consult note form and was discussed with the physician in order to modify the patients' treatment.

2.9. Follow up

All patients whether in control group or intervention group will be asked to provide a valid contact phone number(s), and were contacted after one month in order to determine the readmission and the mortality rate.

3. RESULTS

3.1. Study population

Four hundred eighty patients' medical files at surgical wards were reviewed**.** Out of these 480 patients, 273 (56.8%) had antimicrobials prescribed for them. Of the 273 patient who had been on antimicrobials, 209 patients were interviewed. Of the 209 interviewed patients, 200 (95.6%) patients agreed to participate in the study and signed the consent form while 9 (4.4%) patients refused to participate in the study.

These patients were then randomly allocated into an intervention and control group.

3.2. Length Of Stay (LOS)

Of the 200 patients studied, the mean length of stay was 8.28 days (range 2-34 days and SD 6.847).Of 100 patients in control group; the mean length of stay was 8.9 days ± 6.97. And of 100 patients in intervention group, the mean length of stay was 7.66 days ± 6.69 with no significant difference between two groups.

3.3. Number Of Readmission

Of 100 patients in control group, 9 patients (9%) were readmitted while 5 patients (5%) in intervention group were readmitted with significant deference between two groups.

3.4 Direct Cost Of Antimicrobials

The mean direct cost for therapeutic antimicrobials for those patients in control group was 199.47 JD (in public price cost). It was 166.39JD (in public cost) in intervention group. There was a significant difference (P < 0.048) between the two groups, with the net acquisition cost reduced for therapeutic antimicrobials as 33.08 JD per patient (16.58%) During study period.

Table 3.1: Patients' outcomes according control group and intervention subgroups.

	Control group N=100	Intervention subgroup		P value Between control group and intervention subgroup (with intervention)
		With interventions N=40	Without interventions N=60	
Number Of Readmission	9 (9%)	1 (2.5%)	4 (6.7%)	.005
Number Of DDI	18 (18%)	2 (5%)	8 (13.3%)	.021
Length Of Stay (LOS)(m)	8.90	7.33	7.88	.189
Antimicrobial Cost/ Patient - In Hospital Cost TC/H(m)	63.5	53.5	56.2	.05
Total Antimicrobial Cost / Patient - In Public Cost TC/P(m)	199.47 JD	155.4 JD	173.7 JD	.04

m=mean, LOS=length of stay, DDI=Drug-drug interaction .JD: Jordan dinar

3. 5 Antimicrobials related problems

The antimicrobials related problems in intervention group were 56% before intervention, after interventions it was decreased to 15% with significant difference

The antimicrobials related problems were 53% in control group, while they were 15% in intervention group and the difference between the two groups were significant.

Table 3.2: Type and frequency of drug related problem in control group.

drug related problem frequency	Control group	
	frequency	Percent
1) A need for additional diagnostic test.	1	1.9%
2) A problem in patients' adherence to Antimicrobial.	2	3.8%
3) The patient treatment should be stepped down.	5	9.4%
4) Duplication.	2	3.8%
5) Safety interactions issues.	4	7.5%
6) A current Antimicrobial is contraindicated/unsafe for patient condition and should be stopped, monitored, or replaced.	2	3.8%

7) The patient is at high risk of developing ADR and needs monitoring or prophylaxis.	2	3.8%
8) Allergic reaction or an undesirable effect: are there symptoms or medical problems that may be drug induced.	1	1.9%
9) The chosen Antimicrobial (s) is not (are not) cost-effective.	12	22.6%
10) Antimicrobial use without an indication.	6	11.3%
11) Untreated conditions that require pharmacological or non pharmacological therapy.	2	3.8%
12) Dosage regimen issue.	7	13.2%
13) The patient requires additional combination therapy or stepping up.	3	5.7%
14) The patient was not given instruction in or did not understand important information regarding his antimicrobial.	2	3.8%
15) A need for additional or more frequent monitoring.	2	3.8%
Total(f ,m)	53(.53)	100.0%

f : frequency, m: mean

3.6. Pharmacist intervention

Medical Care Team response to pharmacist interventions is shown in table 3.3 and 3.4

Table 3.3: Medical care team response to pharmacist interventions.

Pharmacist interventions	Intervention group	Percent
Agree	41	73.2%
Disagree	15	26.8%
Total	56	100%

Table 3.4: Interventions made and percentage achieved according antimicrobials related problems.

Antimicrobial Related Problems	Number of intervention	Number achieved	%
1- A need for additional or more frequent monitoring.	4	2	50%
2- The patient was not given instruction in or did not understand important information regarding his medications.	1	1	100%
3- The patient requires additional combination therapy or stepping up.	3	3	100%
4- Antimicrobial use without an indication.	5	4	80%
5- Dosage regimen issue.	10	9	90%
6- More effective Antimicrobial is available.	2	1	50%
7- The patient treatment should be stepped down.	5	4	80%
8- Duplication.	3	3	100%
9- Safety interactions issues.	6	4	66%
10- A current Antimicrobial is contraindicated/ unsafe for patient condition and should be stopped, monitored, or replaced.	1	1	100%
11- A safer Antimicrobial is recommended.	5	2	40%
12- The patient is at high risk of developing ADR and needs monitoring or prophylaxis.	3	2	66%
13- Efficacy interaction issue.	1	1	100%
14- The chosen Antimicrobial (s) is not (are not) cost-effective.	6	3	50%
15- Untreated condition	1	1	100%
Total	56	15	p. value =.0001

5. DISCUSSION

5.1. Length Of Stay (LOS)

The mean LOS of the 200 patients studied was 8.28 days (range 2-34 days and SD 6.847). which was similar to previous study that found the average LOS was 6–10 days (Anderson, et al., 2014).

Of the 60 patients in intervention subgroup (patients without interventions), the mean length of stay was 7.88 days and of the 40 patients in intervention subgroup (patients with interventions), the mean length of stay was 7.33 days without significant difference between two groups. Our study is similar to other study that was done by Nowak et al, (2012). The study of Nowak, et al. (2012) found no significant difference in LOS and mortality between pre and post intervention groups.

5.2. Pharmacist interventions

A total number of 56 researcher interventions were recorded in our study. The rate of researcher interventions per patient was (0.56) and number of patients who received at least one researcher interventions was 40 patients. This result was less than reported from other study (3.2 intervention per patient) (Khalili, et al., 2013). The difference is probably due to the fact that our study was limited to antimicrobials and did not count any intervention on other medicines used by the patient.

The acceptance rate of researcher intervention by healthcare provider team in the study was 73.3%. this rate is within the range reported from other studies (73–90%)(Bedouch, et al., 2008, Bondesson, et al., 2012).

5.3 Direct cost of antimicrobials

In our study, we demonstrated a mean of 8.5JD therapeutic antimicrobials cost per patient (13.4%) in public cost and 33.08 JD per patient (16.58%) in hospital. There was a decrease in mean direct antimicrobials cost after researcher interventions. This was much lower than the reduction reported in several other studies by (Gentry, et al., 2000) 30.8% reduction, (Gums, et al., 1999) median hospital costs were reduced by $2642/intervention, (Weant, et al., 2009) 32.9 % reduction. This might be due to differences in type and number of researcher interventions, differences in the study setting (surgical ward vs. neurosurgical ward).

5.4 Number Of Readmission

Of 100 patients in control group, 9 patients (9%) were readmitted while 5 patients (5%) in intervention group were readmitted with significant deference between two groups (p=.026).

The rate of readmission was reported to be 11.3% by Kassin et al(2012) as the percentage of readmission in surgery wards (Kassin, et al., 2012(Kassin, et al., 2012). This result is different from our finding; may be because of differences in co morbidities, setting, patients' condition and pharmacist interventions.

6. CONCLUSION

In conclusion, our study demonstrates that the pharmacist intervention in general surgery wards:

- Enhanced appropriate use of therapeutic antimicrobials.
- Decreased direct cost of antimicrobials used.
- Decreased readmissions rate.
- Most clinical pharmacist interventions were accepted by health care provider.

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