Impact of the inpatient infectious disease consultations at a tertiary care university hospital

Rami Waked (✉ ramiwaked12@hotmail.com)

Universite Saint-Joseph <https://orcid.org/0000-0001-8280-6638>

Danielle Jaafar

Centre Hospitalier Intercommunal de Villeneuve Saint Georges

Marie Chedid

Universite Saint-Joseph

Gebrael Saliba

Universite Saint-Joseph

Elie Haddad

Universite Saint-Joseph

Jacques Choucair

Universite Saint-Joseph

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Abstract

The role of the infectious disease specialist continues to evolve. The purpose of this study is to demonstrate the value of infectious disease consultation in the inpatient setting. **METHODS** This is a prospective cohort study that took place in a tertiary care university hospital. During the period from April to June 2016, 224 cases of patients receiving antibiotics in the hospital with the request of an infectious diseases' consultation, were evaluated. The following variables were assessed: the referring department, purpose of the consultation, the antibiotic used before requesting the infectious diseases consultation, the antibiotic modifications after the infectious diseases' visit (changing the type, dose or range of the antibiotic when applicable, modifying the duration of antibiotic use), whenever the antibiotic usage was switched to a mono or bi-therapy. **RESULTS** The most frequent requesting departments were Oncology (23.2%) and Urology (21.4%). The purpose of the consultations was diagnosis (29%), therapy (41%), both diagnosis and therapy (21%), and prophylaxis (9%). An infectious diseases consultation was given at a rate of 4.9 consultations per 100 hospitalized patients. Antibiotic was discontinued in 14.7% of cases. There was no indication for the antibiotic treatment in 11.6% of cases. Modifying the antibiotic therapy was done in 25.4% of cases. Adjusting the antibiotic dosage was done in only one case. Carbapenem antibiotics were discontinued in 31.6% of cases and Quinolones discontinuation accounted for 22.7% of cases. **CONCLUSION** Infectious disease consults contributed to the optimization of the diagnostic and therapeutic approaches for suspected or confirmed infections in hospitalized patients.

Background

Global antimicrobial resistance is growing and poses a public health threat. (1) Patients with infections caused by multidrug resistant bacteria have a higher risk of poor outcomes and death compared to patients with non-resistant bacteria. (2) The rate of multi-drug resistant bacteria is increasing while new antimicrobial drugs are not being developed as rapidly. (3) Prolonged and misuse of antibiotics in the healthcare setting has been demonstrated to increase the spread of resistant bacteria. (4)

Antibiotic stewardship programs (ASPs) are programs that optimize antibiotic usage. They are defined by the Infectious Diseases Society of America as "coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy and route of administration". (5) Several studies reported the importance of such programs to decrease the economic cost and improve effectiveness of the antibiotic usage. (6,7) The role of the infectious disease (ID) specialist has been constantly evolving during the past decade. (8) The ID consultant is not only required to assist in the diagnosis, management and treatment of patients, but also to manage the hospital's infection control. (9,10)

The aim of this study is to emphasize the role of infectious disease specialists in providing consultations to patients admitted to a tertiary care hospital.

Methods

This is a prospective cohort study that took place in a tertiary care university hospital located in Beirut, Lebanon. This hospital accounts for a total of 430 care beds. The analysis was conducted on a period of 3 months from April to June 2016. During the study period, the ID department consisted of 3 full-time ID consultants and two

fellow residents. The ID consultations are typically initiated by a primary (“attending”) physician. The antibiotic control policy of the hospital is that broad-spectrum antimicrobials are restricted, and their use requires approval by an infectious disease physician.

The population studied was all adult patients (18 years and older) that were admitted during that period (April to June 2016) with an infection (primary or secondary) for whom an initial formal ID consultation request was made. All stays transferred to the ID department were excluded from this study. Only adult patients receiving antibiotics were selected. There was no direct patient approach and cases were followed through an electronic medical record. Each unique admission was considered as the unit of analysis. There were 224 cases during that period. The medical committee of the hospital (Hotel Dieu de France, Beirut, Lebanon) approved this study.

The electronic and paper medical records (DX care version 7.7.2) were assessed between April to June 2016 searching for an infectious disease consultation. The following variables were collected using a standardized data collection form: the referring department, purpose of the consultation, the antibiotic used before the infectious diseases consultation was requested, the antibiotic modifications after the infectious disease’s visit (changing the type, dose or range of the antibiotic when applicable, modifying the duration of antibiotic use), whenever the antibiotic usage was switched to a mono or bi-therapy. All analyses were performed using Excel version 16.0 (Microsoft Corporation).

Results

During the study period, 224 cases of patients receiving antibiotics for an infection in the hospital with the request of an ID consultation, were evaluated. The mean age of the population was 63 years with a standard deviation of 17.9 and a median of 67. The characteristics of the population can be found in table 1. The most frequent requesting from medical departments was Oncology (52 patients) and the most frequent requesting from surgical departments was Urology (48 patients).

The following results were obtained:

The purpose of the consultations was diagnosis (29%), therapy (41%), both diagnosis and therapy (21%), and prophylaxis (9%). An ID consultation was given at a rate of 4.9 consultations per 100 hospitalized patients.

Antibiotic was discontinued in 14.7% (33 patients) of cases. There was no indication for the antibiotic treatment in 11.6% (26 patients) of cases. Modifying the antibiotic therapy was done in 25.4% (57 patients) of cases (whenever empirically, after the results of a culture, or based on guidelines).

Changing to a broader spectrum antibiotic was carried in 23 patients whereas changing to an antibiotic with a narrower spectrum of action was conducted in 29 cases. Adjusting the antibiotic dosage was done in only one case. Carbapenem antibiotics were discontinued in 31.6% of cases (31 out of 98 patients) and Quinolones discontinuation accounted for 22.7% of cases (5 out of 22 patients). Prolonging or shortening the duration of the antibiotic therapy was carried in 7 and 13 cases respectively. A dual antibiotic therapy was indicated in 3.57% of patients (8 cases). Changing the treatment to a monotherapy was performed in 54.1% (13 out of 24 cases). Antibiotic was already started in 132 cases (59%) before an ID consultation was requested. 87 (39%) cases were on antibiotics listed in the restricted antimicrobial list of the hospital. Details are shown in table 2. The top referring departments are detailed in table 3. ID diagnosis are shown in chart 1.

Discussion

This study performed over a short period of time shows the impact of the antibiotic stewardship programs and ID consultations on the reduction of the inpatient antibiotic consumption. The percentage of antibiotic discontinuation obtained (14.7%) was slightly lower than the one seen in other studies. (11,12) The most frequent requests for ID consultations came from the Oncology department, probably reflecting the complexity and disease severity of these patients.

The population in this study shows that the most common sites of infection were urinary (32%) followed by pulmonary/ENT infections (18%) and skin and soft tissue infections (17%) respectively. The rate of ID consults per admission (4.9/100 admissions) is comparable to the one in other studies. (13)

There is a rise in the multidrug resistant germs especially in the hospital setting. (14–17) Prior antimicrobial therapy, especially with a broad-spectrum agent, has been demonstrated to be a risk factor for multi-drug resistant infections. (16) A multidrug resistant infection is associated with an increased mortality rate. (16,18) A wide variety of nosocomial infections may occur in patients during their stay in the hospital. This study demonstrates the importance of the infectious disease consultation in preventing these complications: 14.7% had their antibiotic discontinued, 25.4% had an antibiotic modification, carbapenem and quinolones usage was reduced.

This study features the importance of the infectious disease consultation in patients receiving antibiotics during their hospitalization. It highlights the discontinuation in antibiotic treatment when not indicated, the adjustments brought to the treatment and to its duration. It also demonstrates the competence of the infectious diseases specialists in sparing the antibiotics with broad spectrum of action (specially the carbapenem). Protocols for antibiotic use for the most frequently encountered conditions should be implemented to reduce the dependency on ID advice.

The various purposes of ID consultations shown in this study illustrates the diversity of their work: from antibiotic prophylaxis, antibiotic stewardship, diagnosis to individual patient management.

Several articles in the literature describe the importance of the ID consultants' activities and roles in the hospital. (13,19) They play a major role in the diagnosis, optimal use of antimicrobials and prevention of infections in certain populations.

There are some limitations to this study: One limitation is that it was conducted at a single center, and the results may not apply to other settings with different consultation styles. It did not evaluate the cost effectiveness nor the outcome of patients. This study lacks to determine the effect of the ID consultations' intervention on patients' bacterial colonization.

Conclusion

Infectious disease consultation in patients receiving antibiotics during their hospitalization is very important in terms of adjusting the treatment and its duration. Infectious disease specialists contribute to optimization of the diagnostic and therapeutic approaches for suspected or established infections. Our data shows the diversity of

work of ID specialists. ID clinicians currently have challenging work that requires a considerable knowledge of infectious diseases and frequent interaction with other subspecialists and clinicians.

List Of Abbreviations

ASPs: Antibiotic stewardship programs

ID: Infectious disease

ENT: Ear Nose Throat

Declarations

Ethics approval and consent to participate:

The medical committee of the hospital (Hotel Dieu de France, Beirut, Lebanon) approved this study.

Consent for publication:

Not applicable.

Availability of data and materials:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests:

The authors declare that they have no competing interests

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Authors' contributions:

DJ collected the data. RW carried the sequence alignment and drafted the manuscript. DJ and EH helped to draft the manuscript. MC participated in the design of the study. JC and GS conceived the study and participated in its design and coordination. All authors read and approved the final manuscript.

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Tables

Table 1: Characteristics of the 224 patients followed by the infectious disease specialist during this study

Characteristics	Number of patients
Neoplasm ^a	90
Arterial hypertension	67
Diabetes	40
Chronic kidney disease	17
End stage renal disease	17
Immunosuppression ^b	7

a- Neoplasm includes solid and hematologic cancers; b- Immunosuppression consisted of patients treated for Crohn's disease, renal transplant, myasthenia gravis and a case of severe combined immunodeficiency

Table 2: Different characteristics of the 224 patients receiving antibiotics followed during their stay in the hospital

	Antibiotic discontinuation	Changing the antibiotic class	Carbapenem discontinuation	Quinolone discontinuation	Changing to an antibiotic with a broader spectrum of action	Changing to an antibiotic with a narrower spectrum of action
No (No. (%) of cases)	190 (84.8)	167 (74.5)	67 (68.3)	17 (77.2)	201 (89.7)	195 (87)
Yes (No. (%) of cases)	33 (14.7)	57 (25.4)	31 (31.6)	5 (22.7)	23 (10.2)	29 (13)
Total (No. of cases)	224	224	98	22	224	224

	Antibiotic dosage adjustment	Prolonging the duration of treatment	Shortening the duration of treatment	Antibiotic not indicated	Dual antibiotic needed instead of monotherapy	Monotherapy needed instead of dual antibiotic therapy	Antibiotic already started before ID consult	Antibiotic used listed in the restricted antimicrobial list of the hospital
No (No. (%) of cases)	223 (100)	217 (96.8)	211 (94.2)	198 (88.4)	216 (96.4)	211 (94)	92 (41)	137 (61.1)
Yes (No. (%) of cases)	1 (0)	7 (3.1)	13 (5.8)	26 (11.6)	8 (3.57)	13 (5.8)	132 (59)	87 (38.8)
Total (No. of cases)	224	224	224	223	224	224	224	224

Table 3: Number of infectious disease consultations per referring department

Referring department	Total number of patients	Referring department	Total number of patients
Oncology	52	Gynecology	10
Urology	48	Orthopedics	7
Cardiology	21	Endocrinology	4
Gastroenterology	15	Neurosurgery	3
Neurology	11	Cardiac surgery	4
Pulmonology	14	Otolaryngology	3
Nephrology	14	Dermatology	2
General surgery	14	Rheumatology	2

Figures

Figure 1

Chart 1: Shows the ID diagnosis of the 224 patients receiving antibiotics (percentage) 1-Urinary infections; 2- Pulmonary and Ear Nose Throat (ENT) infections; 3-Skin and soft tissue infections; 4-Gastrointestinal tract; 5- Perioperative prophylaxis; 6-Undetermined infections; 7-Febrile neutropenia; 8-Bacteremia; 9-Neurologic tract infections; 10-Gynecologic tract infections