Proposal to Reduce Nosocomial Infections in Different Hospitals of Tucuman, Argentine

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Abstract: The economic situation of many countries or regions, determines the reuse of single-use medical devices as a daily reality in the sanitary centers, being *Staphylococcus* and *Pseudomonas* the bacterial genders of more incidences in crossed infections for the processed medical devices. The aim of this study, was to determine the suitability of a Pharmacist as boss of the sterilization services from public hospitals of San Miguel of Tucuman and their relation with Organization norms and Operation of sterilization centers and processing of materials. The sterilization section in three of the four considered hospitals was handled by specialist pharmacists and in the remaining by a suitable employee, but without related studies to sterilization. The hospital A carried out statistical studies, about HAI, at the statistic section; in the B the HAI control was carried out by the infectology service and in C and D these controls were carried out in oral form and were not taken any statistical data. The head of sterilization area did not take part, in no considered hospital, controlling HAI; he did not have knowledge of how the HAI control was made, nor of the percentage-HAI incidences. From that information the authors elaborated Forms for Control of Hospital Acquired Infections and epidemiologic studies of them.

Key words: Nosocomial infections, hospital-acquired infections, public hospitals, sterilization center

INTRODUCTION

The institutions of health are visited daily by ambulatory patients or by those with clinical symptoms requiring hospitalization; both groups may receive treatment of illnesses or attention of other suffering damages. For this reason, these institutions present areas with high levels of non pathogenic and pathogenic microorganisms, which, with more frequency than expected, can be transmitted by the personnel of the hospital, by the medical teams or by the surgical instruments used during treatments or from a patient to another patient.

The healthy man possesses three systems of antimicrobial defense: A peripheral system of protection, the inflammatory reaction and the immune system; situation that is altered in the ambulatory or hospitalized patients.

The hospital can be considered an ecosystem where the sick, weak, traumatized man, contact with a microbial universe that, although it is reduced, it will represent an infection risk. These contagious risks originate the well known, Hospital-Acquired Infections (HAI) or nosocomial infections and defined like illnesses acquired in the hospital environment but not resulting from the reasons by which the patient was inpatient. These infections can appear between 48 h and 4 days after a patient was admitted in the hospital or in another health-care unit. These infections can be caused by microorganisms, between them bacteria, viruses, fungi, or parasites and, depending on the causal agents involved, HAI may be localized or generalized. In the first case, the nosocomial infections are limited to a specific part of the body and have local symptoms; in the second case they include systemic symptoms (Pittet *et al.*, 2000; Pratt *et al.*, 2001; Ayliffe and Mitchell, 1993).

The survival of an immunocompetent individual into a multiform-microbial environment comes from its harmonious development and from the perfect function of its mechanisms of defense (specific and not specific). In this way, only microbial specie able to surpass the mechanisms of the host's defense and after a microbial-successful contact, cellular and metabolic disorders (signs of the infectious illness) will be induced. For this reason,

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it is considered that the classification about pathogenic and non pathogenic microorganisms is absolutely relative. Generally the hospital microbial levels, in front of the constant aggression on the part of antibiotics and other antimicrobial agents, evolve toward the resistance and/or develop a series of mechanisms to escape from the host's natural defense mechanisms, in order to establish favorable conditions for installation, development, persistence and transmission to another host.

The hospital-acquired infections constitute an important problem of health, not only for the patients and the personnel of the hospital but also for the community and the State. Several studies revealed that the incidence of them is comprised between 5 and 10% (Pittet *et al.*, 2000; Pratt *et al.*, 2001; Ayliffe and Mitchell, 1993; Smyth *et al.*, 1997). The patients suffering this type of infections generally present some individual characteristics as the age, alterations in their defense mechanism due to their base illness or to treatments with immunosupresor-drugs. Also the invasive procedures for diagnoses or therapies and/or inadequate personal hygiene predispose to acquire infections inside the hospital (Bischoff *et al.*, 1998; Donowitz *et al.*, 1979; Guerrant *et al.*, 1976, 1977).

The hospital-acquired infections are manifested mainly as respiratory infections caused by *Pseudomonas aeruginosa*, infections of the urinal tract caused by *Escherichia coli* or *Candida albicans* due to the reuse of catheters and hemodialysers and as surgical-infected wound by *Staphylococcus aureus* (King *et al.*, 1999; Lundberg *et al.*, 1996; Marciniak *et al.*, 2003).

The economic situation of many countries or regions, determines that the reuse of single-use medical devices is a daily reality in the sanitary centers, being *Staphylococcus* and *Pseudomonas* the bacterial genders of more incidences in crossed infections for the processed medical devices. The catheters of small lumen are the most committed regarding removal of the biofilm (system constituted by microorganisms and substances extracelulares in association with the support that contains them) because the interstices prevent their manual cleaning. The reuse of intra vascular catheters, in our country, is related to endotoxic reactions by presence of pyrogens. All the problems, above mentioned, derive of applying inappropriate technical procedures; for this reason the step of cleaning and disinfection of the medical materials before sterilization must be considered as very important.

The sterilization services must intensify efforts to prevent, to diminish or to avoid the hospital acquired infections, which represent a research subject and a permanent concern of the public health in the world.

The first link is located in the education of the sanitary personal in its group about the correct use of the existent resources.

The aim of this research, was to determine the suitability of a Pharmacist as boss of the sterilization services from public hospitals of San Miguel of Tucuman and their relation with Organization norms and Operation of sterilization centers and processing of materials. From that information the authors try to elaborate Forms for epidemiologic studies of Nosocomial Infections.

MATERIALS AND METHODS

The Public Hospitals considered in this research were namely A, B, C, D and E. To obtain information from five public hospital of San Miguel de Tucuman, Argentine, the used resources were:

- The norms organization and operation of sterilization centers and processing of materials in the assistance establishments, according to Ministerial Resolution N° 209/96 (Argentine),
- Semi structured surveys to the boss of each sterilization service hospital. The design of the survey considered the Norma specifically 209/96 for the organization and operation of the areas of sterilization of the assistance establishments,
- Designs of forms for epidemiologic studies based on guidelines established by the WHO (World Organization of the Health).

RESULTS AND DISCUSSION

The semi-structured survey was carried out in four of five Public Hospitals and the obtained answers are detailed in Table 1.

The information was obtained, starting from the surveys allowed by selecting four excellent aspects of the Sanitary Centers, with the purpose of expressing the current situation of the areas of Sterilization of the main hospitals.

The characterization of the different Sterilization stations are detailed in the Fig. 1.

Our results, obtained from four-considered public hospitals, showed that two of them fulfill the Normative in higher percentage than 50% (A and B Hospitals) and the remaining (C and D) fulfill percentages among 30-40%. Also those responsible employees of A and B Hospitals expressed the presentation of projects to improve their current executions. It is necessary to point out that those responsible agents of C and D Hospitals didn't demonstrate interest in varying their current situations toward the implementation of improvements.

The sterilization section in three of the four considered hospitals was handled by specialist pharmacists and in the remaining by a suitable employee, but without related studies to sterilization.

Table 1: Interview completed by boss of sterilization of public hospitals of san miguel of tucumán carried out according to national norma 209/96

| Questions | Hospitals of San Miguel De tucuman | | | |
	A	B	C	D
Covering of risk	Level 1	Level 1	Level 2	Level 1
Centralized system	Yes	Yes	No	No
Boundary of areas	Yes	Yes	Yes	No
Infrastructure conditions	Good	Good	Regular	Bad
Registrations of area movements	Partial	Partial	Partial	Partial
Adequate human resources	No	No	Yes	No
Laundry of the material	Manual	Manual	Manual	Manual
Machineries and recipients transporters	Good	Good	Regular	Bad
Validation of the equipment	Yes	No	No	No
Knowledge of Norma 209/96	Yes	Yes	Yes	No
Epidemiology of HAI	Yes	Yes	No	No

Table 2: Statistical studies of the Hospital-Acquired Infections (HAI) carried out in the different hospitals

| Statistical studies of hospital- acquired infections | Public Hospital | | | |
	A	B	C	D
Yes	✓	✓		
No			✓	✓

The hospital A carried out statistical studies, about HAI, at the statistic section; in the B the HAI control was carried out by the infectology service and in C and D these controls were carried out in oral form and were not taken any statistical data (Table 2). The head of Sterilization area did not take part, in no considered hospital, controlling HAI; he did not have knowledge of how the HAI control was made, nor of the percentage-HAI incidences.

Proposal of statistical study about Hospital-Acquired Infections (HAI): The results obtained from the surveys demonstrated that didn't have statistics data about hospital-acquired infections, which were detected in the hospitals. The use of the following forms (Table 3) could be a useful way for gathering data about HAI studies. The Forms will be carried out in the different services of the hospital and it will allow us to detect which are the HAI more frequent, the room that presents bigger incidence of the HAI, to control if that area this near one to the place of waste, like is the circulation of patient and visitors, the contamination of the environment, etc (Table 3). It will also allow us to detect the conditions and characteristics in which the patients presented bigger probability of contracting HAI; the internments and the patient's re-internments, as well as the type, number and the doses of antibiotics, that were used for each patient. In addition, this whole study will detect the cost per patient, whichever money HAI represent for the hospital and for the state.

This model forms (Table 3) can allow improvements that don't imply big expenses, but that if they will be reflected, in benefit to the hospital and in the quality of the patients' life that they enter to the hospital (Doebbeling *et al.*, 1991; Rose *et al.*, 1977).
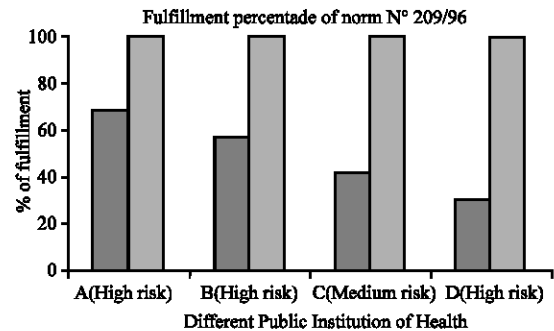

Fig. 1: Execution of the norm N° 209/96 in public hospital os San Miguel of Tucuman, Argentine

Of the surveys we can conclude that no public institution fulfills in 100% the Norm N°209/96 and for this reason is difficult to infer quality and safety in the hospital services. Several improvements didn't apply, not only by lack of economic resources but also by lack of knowledge (Wenzel, 2003).

The sterilization sections directed by Pharmaceutical Bosses (specialist in Sterilization), are more orderly and more organized, as indicate the Table 1 and the Fig. 1. In the different hospitals, other services like infectology section carries out controls of HAI. However, the head of the area sterilization, does not participate nor discusses the results about HAI. For this reason cannot carry out, at the sterilization section, a control of HAI. The Model Form for Infections, detected as HAI, can include different types of infections, as the following:

- Urinary Infection associated to catheters urinals for more than 24 h;
- Endometritis puerperal post-childbirth by Caesarean;
- Endometritis vaginal post-natural childbirth;
- Pneumonia associated to ventilation mechanics;
- Infection of sanguine torrent associated to Central Veined Catheter (CVC);
- Infection of sanguine torrent associated to outlying veined catheter (CVP);
- Intestinal infections;

Table 3: Instructions for filling the model form

Parameters	Description
Correlative number	N° that is assigned to each case of study, starting from 001
N° Clinical History	N° assigned by the Hospital to the patient
Service	Service where the patient was hospitalised. If it was in more than one, to consign the Service where he/she went into for their entrance diagnosis
Age	Age in years, or months as it corresponds
Sex	Man, woman
Condition (caso/control)	To point out if the information corresponds to a case of Study or a patient Control
Main diagnosis	To indicate the diagnosis that motivated the entrance to the Hospital
N° of diagnoses	To indicate the total N° of diagnoses that consign the patient's Clinical History, included the main diagnosis
Total days hospitalization	To indicate the total N° of days of the patient's hospitalization, included all the services
N° days ICU	To indicate the total N° of days of the patient's hospitalization in the Intensive Care Unit, exclusively
N° surgical interventions	To indicate the total N° of surgical interventions carried out and if it was the reason from their entrance to the Hospital
N° surgical re-interventions	To indicate the total N° of surgical reintervenciones carried out during their internment
N° microbiologic cultures	To indicate the total N° of microbiologic studies carried out during their internment
Antibiotic 1	To indicate the name of the first Antibiotic indicated by the doctor, according to the patient's Clinical History and the total dose in grams indicated for all their period of internment. To indicate drug and laboratory.
Antibiotic 2	To indicate the name of the second Antibiotic indicated by the doctor, according to the patient's Clinical Total-
Total-Received dose	History and the total dose in grams indicated for all their period of internment. To indicate drug and laboratory.
Antibiotic 3	To indicate the name of the third Antibiotic indicated by the doctor, according to the patient's Clinical History
Total-Received dose	and the total dose in grams indicated for all their period of internment. To indicate drug and laboratory.
Antibiotic 4	To indicate the name of the fourth Antibiotic indicated by the doctor, according to the patient's Clinical History
Total-Received dose	and the total dose in grams indicated for all their period of internment. To indicate drug and laboratory.
Total-Received dose Final condition of the Patient (He/She lives or not)	To indicate if the patient survived the internment, or he/she died before the medical discharge

Hospital: To write name and address of the Hospital where the study is carried out, Town: To write city where the study is carried out, Country: To write country to write city where the study is carried out, Infection type: To point out the HAI that corresponds, according to enclosed list

- Infections associated to surgery of bones;
- Infections associated to burns.

The results obtained in this research, underline the necessity to re-organize many directions of the sterilization areas; gradually each non-graduate boss must be replace by a Specialist Pharmacist and starting from it, to strengthen the quality and safety of the hospital services including epidemiologic studies of HAI.

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