

NOSOCOMIAL INFECTION IN LONG-TERM CARE FACILITIES. A SURVEY IN A BRAZILIAN PSYCHIATRIC HOSPITAL

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SUMMARY

Nosocomial infection among male patients in a public psychiatric hospital was studied and the definitions for use in long-term care facilities were employed for diagnosis. The overall nosocomial infection rate was 6.7 per 1,000 day inpatients; 55.6% of these infections were identified in the respiratory tract, 50% of them being respiratory viral diseases; 38.9% of the nosocomial infections involved the eyes, ears, nose, throat and mouth, and 5.6% involved the skin and soft tissues. The epidemiological characteristics and the main clinical alterations of these inpatients were also identified.

KEYWORDS: Nosocomial Infection; Psychiatric Hospitals; Long-Term Care Facilities

INTRODUCTION

During the last decade, increasing special attention has been devoted to the study of Nosocomial Infection (NI) in Long-term Care Facilities (LTCFs), giving rise to many reports and doubts. The initial problems were the widely different realities of these institutions, which include chronic disease hospitals, rehabilitation centers, psychiatric hospitals, institutions for the mentally retarded, nurseries, sheltered accommodations, retirement homes, and especially nursing homes (NHs). NHs are a type of geriatric clinic providing care for old people, especially old women who need special nursing care. However, NHs are not common institutions in Brazil.

Most American LTCFs function like hospitals but are not equipped with complex facilities, or with a large number of qualified professionals as found in hospitals. In Brazil there are no sufficient published data that might permit definitive conclusions similar to those reached for American LTCFs.

The types of infection observed in LTCFs differ according to the types of facilities and resident population involved. They represent a mixture of infections that would be expected to occur in the community, infections that are common in hospitals and infections that occur during epidemic outbreaks^{15,26}.

Studies conducted on LTCFs have emphasized the difficulty in diagnosing infections through the criteria of the Centers for Disease Control (CDC) for hospitals in general, which depend on a support infrastructure for laboratory diagnosis and radiology services that are not commonly available at LTCFs. Thus, LTCFs often obtain these

services from other clinics or even from another hospital, with consequent problems of utilization and delays. Other problems that interfere with the diagnosis and investigation of NI in LTCFs are the lack of routine notes in the patients' medical records, less precise diagnoses and the often not fully justified prescription of antibiotic treatment^{20,21,22}. Again, the Brazilian reality has not been well documented with respect to these characteristics, with little information available about the real functioning conditions of LTCFs.

In view of these difficulties and in an attempt to improve the investigation of NI in LTCFs, definitions were made based on the peculiarities of these institutions and their use has been stimulated, so that they can be appraised in the routine of several types of institutions at different locations^{12,13,16,18,23,24}.

Specifically concerning psychiatric hospitals, an American exploratory study demonstrated significant inadequacies in the definition and investigation of NI¹¹. Evaluations conducted in Brazil by Commissions of Hospital Infection Control and the assessment of data obtained by the Coordination of Sanitary Surveillance of Belo Horizonte and Metropolitan Area also revealed difficulties in the detection of NI at psychiatric hospitals with the methods currently used^{3,5,7,14,28}. Little is known in Brazil about NI affecting psychiatric patients and studies conducted with methodological rigor are necessary.

PATIENTS AND METHODS

The study was conducted uninterruptedly from October 1995 to April 1996¹ when Belo Horizonte and its Metropolitan Area counted with seven psychiatric hospitals and 44% of the beds for mental patients in Minas

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Table 1
Definitions for the identification of infections in LTCFs

I. Respiratory Tract Infections

A – Common Cold Syndromes/Pharyngitis - at least two signs or symptoms: 1 – runny nose or sneezing, 2 – stuffy nose (congestion), 3 – sore throat, hoarseness or difficulty in swallowing, 4 – dry cough, 5 – swollen or tender glands in the neck.

B - Influenza - presence of two criteria: 1 - fever ($\geq 38^{\circ}\text{C}$), 2 - at least three of the following ones: chills; headache or eye pain; myalgias, malaise or loss of appetite; sore throat; new or worsened dry cough.

C - Other lower respiratory tract infections (Bronchitis, Tracheobronchitis) - at least three signs or symptoms: 1 – new or worsened cough, 2 – new or increased sputum production, 3 - fever ($\geq 38^{\circ}\text{C}$), 4 – pleural pain, 5 – new or worsened findings upon pulmonary auscultation, 6 – one of the following indications of worsening of the breathing pattern: new or worsened shortness of breath, respiratory rates (tachypnea) > 25 irp/m or worsened mental status or worsened functional status.

D - Pneumonia - presence of the following two criteria: 1 – a typical chest radiography demonstrating probable pneumonia, or an infiltrate, 2 – two of the signs or symptoms described for “other infections of the lower respiratory tract”.

II. Urinary Tract Infection

A – Symptomatic Urinary Infection - patient without an indwelling urinary catheter - at least three signs or symptoms: 1 - fever ($\geq 38^{\circ}\text{C}$) or chills, 2 – new or increased burning pain on urination, frequency or urgency, 3 – recent flank or suprapubic pain or tenderness, 4 – change in the characteristics of urine, 5 – worsening of mental or functional status (recent or increased incontinence) .

B – Symptomatic Urinary Infection – patient with an indwelling catheter - at least two of the above signs or symptoms except item 2.

III. Eye, Ear, Nose and Mouth Infections

A – Conjunctivitis - presence of one criterion: 1 – purulent secretion from one or both eyes for at least 24 hours, or 2 – new or worsened conjunctival hyperemia, with or without itching or pain, for at least 24 hours.

B – Otitis - presence of one criterion: 1 – a medical diagnosis of otitis, 2 – new episode of drainage from one or both ears, 3 – non-purulent drainage must be accompanied by additional symptoms, such as earache or redness.

C - Mouth and Perioral Region - a single criterion: a diagnosis by a physician or dentist.

D - Sinusitis - a single criterion: diagnosis by a physician.

IV. Skin Infection

A – Cellulitis, Infected Soft Tissues and Wound - presence of one criterion: 1 – pus at a wound, skin, or soft tissue site, 2 - at least four of the following signs or symptoms: fever ($\geq 38^{\circ}\text{C}$) or worsening of mental / functional status and/ or of the affected site, presence of new or increasing: heat, redness, edema, sensitivity or pain, serous drainage.

B – Fungal Skin Infection - presence of two criteria: 1 - maculopapular eruption, 2 - physician diagnosis or laboratory confirmation.

C – Herpes Simplex or Herpes Zoster Infection - presence of two criteria: 1 – vesicular rash, 2 – physician diagnosis or laboratory confirmation.

D – Scabies - presence of two criteria: 1 – a maculopapular and/or itching rash, 2 – physician diagnosis or laboratory confirmation.

V. Gastrointestinal Tract Infection

A – Gastroenteritis - presence of one criterion: 1 – two or more loose or watery stools in addition to what is normal for the patient within a 24-hour period, 2 - two or more episodes of vomiting within a 24-hour period, 3 – a stool culture positive for *Salmonella*, *Shigella*, *E. coli* O157:H7 or *Campylobacter* or a toxin assay positive for the *C. difficile* toxin and at least one symptom or sign of gastrointestinal infection (nausea, vomiting, abdominal pain or tenderness, diarrhea).

VI. Systemic Infection

A – Primary Bloodstream Infection - presence of one criterion: 1 – two or more blood cultures positive for the same organism, 2 – a positive culture with an organism not thought to be a contaminant and at least one of the following signs or symptoms: fever ($\geq 38^{\circ}\text{C}$); recent hypothermia ($< 34.5^{\circ}\text{C}$); a fall in systolic blood pressure > 30 mm Hg from baseline; worsening mental or functional status.

B – Unexplained Febrile Episode - a single criterion: two or more fever episodes annotated in the medical record ($\geq 38^{\circ}\text{C}$), at least 12 hours apart during any 3-day period with no known infectious or noninfectious cause.

Adapted from McGEER, A. *et al.* Definitions of infection for surveillance in long-term care facilities. *Amer. J. Infect. Control*, 19: 1-7, 1991.

Gerais. The study was carried out at the Raul Soares Institute (RSI), a public psychiatric hospital in Belo Horizonte belonging to the Hospital Foundation of the State of Minas Gerais (FHEMIG), at the time with 114 beds, 60 for males and 54 for females. A specific ward was devoted to the study in order to insure rigorous control of external and internal conditions. The ward has 30 beds for males and 85.2% of patients were hospitalized for a maximum of 45 days. Mean patient age was 32.8 years, with a median of 30.0 years; 55.6% were white, 77.8% single, and 68.5% had incomplete primary education. The main occupation was in the transformation industry and civil construction (27.0%), most subjects being bricklayers; 23.1% were unemployed. About 52.8% of them received at most one minimum wage, 53.7% were unregistered workers and 33.3% were no longer working or were retired.

The following diagnoses were made by psychiatrists on the basis of the International Disease Code (IDC), version 9, which was being used at the time: schizophrenic psychosis (45.4%), alcoholic or drug psychosis (22.2%), non-organic psychoses (13.9%), affective psychoses (7.4%), oligophrenia (6.5%), organic psychoses (4.6%). With respect to patient habits, 63% were smokers, 21.3% were daily alcohol drinkers, 16.6% were illicit drug users, and 12% were homosexuals or bisexuals. Most of the patients (79.7%) did not report or did not know about the use of preservatives or reported their occasional use in their sexual relations.

The patients were submitted to complete clinical examination up to 72 hours after admission to the LTCF, so that Community Infections (CI) could be diagnosed and not considered to be hospital infections later on. Blood count, blood sedimentation rate, routine urinalysis, feces parasitology and chest telerradiography were performed as auxiliary diagnostic tests of CI and to serve as the basis for rigorous future follow-up. The diagnosed clinical pictures were treated and the infections recorded as community ones.

The patients were submitted to weekly clinical controls, in the presence of any medical event and at discharge, for a total of 536 clinical controls, with about 70.4% of them being submitted up to 5 clinical controls. All the clinical evaluations were performed by the same investigator in an attempt to obtain more uniform observations and clinical examinations. Patients readmitted within less than 90 days or coming from another hospital were excluded from the study in an attempt to avoid confusion between current and previous NI.

The definitions used to identify NI were those published by McGEER *et al.* and by SMITH & RUSNAK in 1991 and are summarized in Table 1^{12,23}.

The patient sample was calculated using the EPINFO 6.0 software and the data sent by the psychiatric hospitals in the reports received by CVS. For a reported mean prevalence of 7%, with a tolerated error of 0.03 and a level of significance of 5% ($p = 0.05$) the calculated sample consisted of 108 patients. Data were analyzed statistically by the Chi-square and exact Fisher tests, followed by the Mann-Whitney test when necessary.

The patients' medical records were reviewed weekly in parallel in an attempt to evaluate the contribution of the traditional "Active Search", based on diagnostic clues such as fever, use of antibiotics an

complementary tests, to the diagnosis of NI. The presence of other information in the medical records that might be related to NI and the reports of patient entering and leaving the hospital were also recorded.

NI rates were calculated on a patient/day basis as follows: NI rate = total number of nosocomial infections/patient - day x 1000 (patient - day = number of admitted patients + admissions - discharges). The patient-day calculation was performed and the sum of the daily rates was used to calculate the monthly rates. Other rates were calculated using the event of interest as the numerator and the total NI rate x 100 as the denominator.

The study was conducted according to regulation no. 6 of the Council of International Organization of Medical Sciences which specifically refers to the ethical norms for research on individuals with mental or behavioral disorders that may have difficulty in providing appropriate informed consent¹⁷. All patients were informed about the study and how it would be conducted and individual decisions were accepted.

RESULTS

The main alterations found upon physical examination at admission to the hospital involved the teeth (69.4%) and the skin (64.8%). The major clinical symptoms reported by the patients were specific and/or uncharacteristic pain (18.6%), pruritus (5.5%), refusal to eat and/or anorexia (4.6%), toothache (4.6%), nausea and/or vomiting (3.7%), weakness and/or malaise (3.7%), cough (2.8%), and headache (1.9%). The main psychiatric symptoms recorded were agitation (45.4%), delirium (38.9%), aggressiveness (31.5%), insomnia (14.8%), depression (9.3%), and mental confusion (9.3%). The main clinical diagnosis other than infection was traumatic injury at various body sites and of varying intensity, which was detected in 22.6% of the patients with a diagnosis.

A total of 139 CI were diagnosed in the sample of 108 psychiatric patients at the beginning of the study and are summarized in Table 2.

Table 2
Community infections diagnosed in psychiatric patients admitted to the Raul Soares Institute, Belo Horizonte, Minas Gerais, from October 1995 to April 1996

TYPE OF INFECTION	NUMBER	PERCENT DISTRIBUTION (%)
Verminoses	67	48.2
Skin and Soft Tissue	45	32.4
Sexually Transmissible Diseases	15	10.8
Eyes, Ear, Nose,		
Pharynx and Mouth	8	5.7
Respiratory Tract	4	2.9

Note: scabies infection and pediculosis were included in the skin and soft tissue category, and carrier signs and symptoms were included in the STD category.

Table 3

Nosocomial infections diagnosed in psychiatric patients admitted to the Raul Soares Institute, Belo Horizonte, Minas Gerais, from October 1995 to April 1996

TYPE OF INFECTION	NUMBER	PERCENT DISTRIBUTION (%)
Common cold (viral disease)	9	50.0
Conjunctivitis	3	16.7
Otitis	3	16.7
Pharyngitis	1	5.6
Pneumonia	1	5.6
Folliculitis	1	5.6
Total	18	100

Eighteen NI were diagnosed in these 108 patients, and two infections were detected in two patients during hospitalization (Table 3). The overall NI rate was 6.7 per 1000 patients-day, ranging from 9.7 to 4.5 per 1000 patients-day during the six months of the study.

Of the 18 NI diagnosed, 9 (50%) were treated with antibiotics routinely used at the time at the psychiatric hospital and in the FHEMIG network, i.e., topical chloramphenicol for conjunctivitis and otitis, intramuscular (IM) benzatin penicillin for pharyngitis and folliculitis, and IM penicillin G procaine/potassium penicillin G for pneumonia. The approximate cost per dose/treatment was: R\$ 3.37/3.57 for chloramphenicol eyedrops, R\$ 5.71/5.71 for topical chloramphenicol, R\$ 4.50/4.50 for benzatin penicillin, and R\$ 3.26/65.20 for penicillin G procaine/potassium penicillin G (20 vials). Viral infections were treated with rest and oral hydration. Antithermal and analgesic medications such as acetylsalicylic acid and dipyrone were used, as well as a systemic decongestant such as isopropramide iodide, phenylpropanolamine hydrochloride or chlorphenamine maleate, but only when necessary and for short periods of time. No deaths occurred during the study.

The notes found in the medical records of patients with a diagnosis of NI considered to be "diagnostic clues" that could be used for traditional Active Search were: fever (1), which coincided with a diagnosis of pneumonia, and the use of antimicrobial agents (9), which coincided with diagnoses of conjunctivitis, otitis, pharyngitis, folliculitis and pneumonia. These Active Search notes corresponded to 50% of the diagnoses of NI made in this study.

The procedures considered invasive were surgery (1), sutures (4) and the use of intravenous medication (7). Of the notes written in the medical records, 39.8% had been recorded by other professionals, especially nurses, and referred to complaints about signs or symptoms and medical history. The nursing notes coincided with 16.7% of the diagnoses of NI.

With respect to patient movement, a survey of the medical records showed that 51.9% circulated throughout the internal and external areas of the hospital, 26.9% through the ward and the internal patio, 13.9% were free to leave the hospital and to spend the weekend outside, 4.6%

were limited to the ward, and 2.8% frequented the day hospital. The correlation between patients allowed or not to move freely in the hospital or in the community during their hospitalization and the diagnoses of NI showed a p value of 0.4896.

An auxiliary search for NI was later conducted by reviewing the medical records after hospital discharge. Up to six months after the end of the study, 33.3% of patients had returned to the hospital, where they had been readmitted, seen in the emergency room, in the day hospital or in the outpatient clinic. Data that might be correlated with the previous hospitalization or NI were not detected in these medical records.

The diagnoses of NI were made up to the 3rd week of hospitalization in 55.5% of cases, and up to the 5th week in 72.2% of cases.

The main correlations detected between the clinical-epidemiological data for the 108 hospitalized and investigated psychiatric patients and the occurrence of NI were: being a smoker and drinking alcohol on a daily basis, longer times of hospitalization and number of clinical controls, psychiatric symptoms such as agitation, clinical complaints of pain and/or discomfort due to traumatic injury that included excoriations or cuts, and the use of the antipsychotic agent haloperidol. These data are presented in Table 4. No significant correlation was detected between the cited variables and the acquisition of hospital infection (p<0.05).

DISCUSSION

The NI rates detected in the present study were similar to those reported for American LTCFs, which range from 2.6 to 7.1 per 1000 patient-day^{9,10,19,21,29}. The hospital studied here is public, with a clientele of lower acquisitive power. It should be pointed out that public hospitals, as well as university hospitals tend to present higher NI rates. These are the hospitals that usually treat patients who are debilitated due to their socioeconomic deficits. Public institutions often occupy old buildings that are poorly maintained and their administration is cumbersome and involves excessive bureaucracy which causes rigidity in the decision-making process, with negative effects on patient care^{24,30}.

The NI diagnosed in the present study showed no complications and all treatments applied were simple. The antibiotics prescribed, which

Table 4

Main correlations between the data obtained for psychiatric patients admitted to the Raul Soares Institute, Belo Horizonte, Minas Gerais, from October 1995 to April 1996 and nosocomial infections

CHARACTERISTIC	p VALUE	TEST USED
Smoking	0.1890	Exact Fisher
Alcohol	0.2620	Exact Fisher
Time of hospitalization	0.1034	Mann-Whitney
Number of clinical controls	0.1649	Chi-square
Psychiatric symptoms	0.2176	Chi-square
Clinical symptoms	0.2401	Chi-square
Use of antipsychotic drugs	0.0737	Chi-square

were used on a standard basis at the institution, are among those of lower cost on the market. No intolerance or similar untoward events were observed. In view of the possible difficulty in administering medication to agitated psychiatric patients who do not collaborate and of the need to update the local standards, the possibility of prescribing antibiotics for short periods of time and of injectable, preferably intramuscular, use should be taken into account when calculating the cost/benefit ratio.

The procedures considered invasive and selected for the routine control of NI are rare in psychiatric hospitals. Attention should be paid to the administration of intravenous medication and to the use of sutures at these institutions due to the high incidence of traumatic injuries. In the present study, no invasive procedures had been used for any of the NI diagnosed.

Psychiatric medical records differ from those kept at general hospitals. The notes are summarized, not always recorded daily and are often written by persons who are not directly responsible for patient treatment. Thus, research on NI should be expanded in the form of weekly Active Search for the notes written in the medical records, especially nursing notes which were those that most coincided with the diagnoses of NI, i.e., in 16.7% of cases.

The NI observed among the patients studied here were not directly related to their free movement through the hospital. The data did not show a correlation between free access to the various hospital sectors or contact among patients and an increased risk of NI. However, this question is complex in terms of monitoring and should receive special attention because of the risk of contributing to epidemic outbreaks.

The criteria defined and suggested for LTCFs (McGEER, A. *et al.* and SMITH, P. W. & RUSNAK, P. G.) are the only ones specifically elaborated for LTCFs and published with the support of specialists and epidemiologists. In general, they have proved to be adequate for the identification of NI in psychiatric hospitals. They are largely based on clinical examination which, ideally, should be performed as soon as possible, with an evaluation of organic conditions and concomitant clinical diseases and with the identification of NI. Other professionals, nurses in particular, could be trained to help with the identification of NI, especially skin infections and infestations. The major alterations detected upon physical examination involved the skin and these conditions, if not promptly and correctly treated, are definitely at risk to develop secondary infections.

In the application of the criteria suggested for LTCFs, care should be taken in identifying and appraising some signs and/or symptoms and their interrelations with the peculiarities of psychiatric patients. For example, symptoms and/or signs described in the definitions as worsening of mental or functional status, an uncharacteristic malaise and the loss of appetite or anorexia may also be correlated with the base psychiatric diseases of the patient or with his habits, such as drug addiction and/or insomnia. These symptoms, indeed, deserve a separate study.

Finally, the importance of CI diagnosis should be stressed in order to prevent their false assignment to NI. Particularly important are verminoses and sexually transmissible diseases, detected and reported in high percentages among these patients. Their treatment leads to

improved general condition, whereas lack of treatment leads to potential contamination^{2,6,8,27}. Specific approaches and preventive measures should be implemented at these institutions.

RESUMO

Infecção hospitalar em instituições de longa permanência. Pesquisa em hospital psiquiátrico brasileiro

Foi estudada a Infecção Hospitalar (IH) em pacientes masculinos internados em hospital psiquiátrico público e as definições sugeridas para uso em instituições de longa permanência (ILPs/Long-Term Care Facilities-LTCFs) foram utilizadas para diagnóstico das IH. A taxa global de IH foi de 6,7 por 1000 pacientes-dia, 55,6% das infecções foram identificadas no trato respiratório, sendo que 50% dessas eram viroses respiratórias; 38,9% das IH relacionavam-se aos olhos, ouvidos, nariz, garganta e boca e 5,6% a pele e partes moles. As características epidemiológicas e as principais alterações clínicas desses pacientes também foram identificadas.

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