Journal of Nursing
Revista de Enfermagem
UFPE On Line
ISSN: 1981-8963

INTEGRATIVE REVIEW ARTICLE

USE OF ANTIMICROBIAL IN INSTITUTIONS OF LONG STAY FOR THE ELDERLY: LITERATURE REVIEW

O USO DE ANTIMICROBIANOS EM INSTITUIÇÕES DE LONGA PERMANÊNCIA PARA IDOSOS: REVISÃO DE LITERATURA

USO DE ANTIMICROBIANOS EN INSTITUCIONES DE LARGA ESTANCIA PARA PERSONAS MAYORES: REVISIÓN DE LA LITERATURA

Juliana Ladeira Garbaccio[1], Alanna Gomes Silva[2], Adriana Cristina Oliveira[3]

ABSTRACT

Objective: to identify the literature about prevalent infections in elderly residents in long-stay institutions and the most prescribed antimicrobials, predisposing factors and consequences for misuse of these drugs. ***Method:*** an integrative review, with the research question << As has been the use of antimicrobials in long-stay institution for the Elderly? >> Were identified from descriptors controlled and uncontrolled, 10 articles indexed at Pubmed, CINAHL, Scopus, Science Direct. The analysis involved the author, year, journal, goal, key considerations and level of evidence. ***Results:*** among the most prescribed classes of antibiotics are fluoroquinolones and β-lactams, due to the higher prevalence of urinary tract infections not being shown the controlled use of these drugs. ***Conclusion:*** as a result of the use is reflected in the selection of resistant organisms and impacts on morbidity mortality in the elderly. Moreover, it was found that there is a lack of scientific evidence. ***Descriptors:*** Establishing Long Term Elderly; Inadequate Prescription; Elderly

RESUMO

***Objetivo*:** identificar a literatura sobre as infecções prevalentes em idosos residentes em instituições de longa permanência e os antimicrobianos mais prescritos, os fatores predisponentes e consequências para o uso indevido destes medicamentos. ***Método*:** revisão integrativa, com a questão de pesquisa << Como tem sido o uso de antimicrobianos em Instituição de Longa Permanência para Idosos? >> Identificaram-se, a partir de descritores controlados e não controlados, 10 artigos indexadas às bases de dados Pubmed, Cinahl, Scopus, Science Direct. A análise envolveu a autoria, ano, periódico, objetivo, principais considerações e nível de evidência. ***Resultados*:** dentre as classes mais prescritas de antibióticos estão as fluorquinolonas e os β-lactâmicos, devido a maior prevalência de infecções do trato urinário não sendo evidenciado o uso controlado destes medicamentos. ***Conclusão*:** como consequência do uso reflete-se para a seleção de microrganismos resistentes e impactos na morbi mortalidade em idosos. Ademais, constatou-se que há escassez de evidências científicas. ***Descritores*:** Instituição de Longa Permanência para Idosos; Prescrição Inadequada; Idoso.

RESUMEN

Objetivo: identificar la literatura sobre las infecciones prevalentes en ancianos residentes en instituciones de larga estadía y los antimicrobianos más prescritos, los factores predisponentes y las consecuencias por el mal uso de estas drogas. ***Método:*** revisión integradora, con la pregunta de investigación << Como ha sido el uso de antimicrobianos en instituciones de larga estancia para los ancianos? >> Se identificaron descriptores controlados y no controlados, 10 artículos indexados en Pubmed, CINAHL, Scopus, Science Direct. Se analizaron el autor, el año, la revista, el objetivo, las consideraciones clave y nivel de evidencia. ***Resultados:*** entre las clases más prescritos de antibióticos fluoroquinolonas y β-lactámicos, debido a la mayor prevalencia de infecciones del tracto urinario no se muestra el uso controlado de estos medicamentos. ***Conclusión:*** como resultado de la utilización se refleja en la selección de los organismos y los impactos sobre la morbimortalidad en los ancianos resistentes. Por otra parte, se encontró que hay una falta de evidencia científica. ***Descriptores:*** Establecer a Largo Plazo Mayores; Inadecuada Prescripción; Ancianos.

[1]Nurse, PhD Professor, Post-graduate Program, School of Nursing, Federal University of Minas Gerais/UFMG. Belo Horizonte (BH), Brazil. E-mail: julianaladeira@pucminas.br; [2]Graduate Student, School of Nursing, Catholic University of Minas. Belo Horizonte (BH), Brazil. E-mail: alannagomes96@yahoo.com.br; [3]Nurse, Professor Post-Doc, School of Nursing, Federal University of Minas Gerais/UFMG, CNPq. Belo Horizonte (BH), Brazil. E-mail: adrianacoliveira@gmail.com

INTRODUCTION

Population aging is occurring sharply characterized as a phenomenon challenging the Brazil and the world with regard to the real needs of the reorganization of the economic, social and public health.[1]

Aging often brings the institutionalization of elderly people in long-stay institutions for the elderly (LTCF), which aims at the comprehensive care for the elderly, dependent or not and usually do not present physical conditions, psychological and social support to remain in their own homes. These conditions are related to changes in own health senescence or senility. Elderly people who reside in LTCF, besides the risk factors linked to senescence, have to live with other seniors, share physical areas such as bedrooms, bathrooms, dining areas and some activities that favor the spread of infectious agents.[2]

Senescence is that the decrease in immune response associated with conditions such as malnutrition, presence of multiple chronic diseases, polypharmacy and use of immunosuppressants. Some changes of aging are categorized in denominations Big Geriatric Syndromes: immobility, postural instability, iatrogenic, incontinence and impaired brain / cognitive disability. These syndromes bring functional limitations in the elderly who may prescribe the use of invasive devices (catheters, urinary catheters, mechanical ventilation, enteral feeding catheters, tracheotomy), the occurrence of ulcers by immobility, incontinence and changes in body thermoregulation. Directly or indirectly affect the geriatric syndromes in elderly health, which can trigger infectious processes and with it the use of antimicrobials.[3]

In this context, some infections become unsatisfactory prognosis with relapsing implying the need for antimicrobial therapy for long periods of time.[1]

In the United States about 1,6 to 3,8 million infections occur each year in the LTCF. The incidence rates for the most common infections, such as respiratory tract, urinary tract and skin, producing estimates from 0,16 to 2,57; 0,10 to 1,20 and 0,05 to 1,15 infections year, respectively, in this country. The wide range of infections and the resulting costs illustrate the challenge for epidemiology and its impact on ILPI, because currently there are few data and surveillance systems for infections in these institutions.[1,4]

Services like health care, despite the medical care provided to residents, ILPI lack of infrastructure for diagnosis of infections as a laboratory for isolation of microorganisms. On the other hand there is some evidence in the literature that the prescription of antibiotics in ILPI been occurring without control and problems in administration and access to medicine, facts that predispose to selection of resistant microorganisms.[5]

In this sense there are few studies on the characterization of antimicrobial use in LTCF in Brazil and other countries determining a noticeable gap in knowledge on this subject therefore asks itself: as has been the use of antimicrobials in LTCF? Another point is the lack of programs for the rational use of these medications and control of infections in these institutions that are troubling situations considering the possibility of selection of resistant organisms in the community.

Therefore the objective is to analyze scientific works nationally and internationally on prevalent infections in elderly nursing home residents as well as the most prescribed antibiotics and predisposing factors for misuse of these drugs and their consequences.

METHOD

It was a search for an integrative literature, to refer to the method that provides the knowledge synthesis and incorporation of research results into clinical practice and healthcare.[6]

The descriptors (DeCs) controlled, in Portuguese, English and Spanish, were: Institution of Long Term Elderly, Prescription inadequate, Elderly, antibacterials, antifungals, antivirals. As uncontrolled descriptors: Microbial resistance, Antimicrobial. They all (controlled and uncontrolled) were used separately in the database to determine the relevance of the particular subject descriptor. There was greater amount of work related to the descriptors Antimicrobials (1.464.584), Infection Control (1.203.807), antibacterials (596.909), however, in isolation, not allowed to find specific items of interest matter. From the association between all descriptors controlled and uncontrolled, directing to focus on the problem were identified by means of an exploratory reading of the summary / abstract, 80 articles and from analytical reading of texts the final sample was composed of 10 articles (Figure 1).

To survey items were used libraries: Portal Capes and VHL (Virtual Health Library) and databases: Lilacs (the Latin American and Caribbean Health Sciences), Pudmed, Science Direct, Cochrane Library, CINAHL and Scopus. Inclusion criteria were all original articles related to "Antimicrobial use in LTCF"

regardless of the year of publication and research method employed, excluding all others.

A careful analysis of the articles involved authorship, year, journal, goal, key considerations and level of evidence. The levels of evidence are characterized hierarchically depending on the adopted methodological approaching. For their determination we adopted the classification into six levels. Level 1: evidence resulting from the meta-analysis (randomized controlled trials), Level 2: evidence from studies with experimental design; Level 3: evidence of quasi-experimental studies; Level 4: Evidence from descriptive studies (not experimental) or qualitative approach; Level 5: evidence from case reports or experience; Level 6: evidence-based or consensus opinions of experts. Admittedly the level 1 is the one that presents the greatest scientific credibility and how the other presents a variation of AD-related design, being classified as a study that has adequate delineation and D, who has flaws and confidence in the results must be questioned.[7]

RESULTS

Ten articles were selected from the inclusion criteria and obtained the bases CINAHL (2/10), Science Direct (1/10), Pubmed (6/10), Scopus (1/10). Regarding the research design found that 30% were cohort (3/10), 10% case-control (1/10) and 60% descriptive (6/10), published in the United States (7), Norway (1), Germany (1) Finland (1), not being found in any language or Portuguese in Brazil.

All publications analyzed only considered the use of antibiotics in LTCF, not evaluating antifungal and antiviral. Antibiotics were recorded in the surveys used as a prophylactic and therapeutic.

The infections are prevalent in LSIE urinary tract infection (19% and 66%), respiratory (20% to 59%) and skin (5% to 13%). Different antibiotics were administered to treat these infections, the most prescribed fluoroquinolones (5% to 38%), ciprofloxacin, norfloxacin, ofloxacin, levofloxacin, trovafloxacin, grepafloxacin, β-Lactam (1.2% to 43.2%) ampicillin, cloxacillin, piperacillin, ticarcillin, penicillin V, penicillin G, amoxycillin and clavulanic acid, trimethoprim, trimethoprim sulfametaxol sigma-clav, amoxicillin, tetracyclines (5% to 12%) doxycycline, macrolides (10% to 16%) erythromycin, clarithromycin and azithromycin, and cephalosporins (6.7% to 24%): cephalexin.[8-17]

In 90% of the articles did not present data on the timing of administration, dose, route, or the prescriptions of antibiotics, however 60% of them infer the misuse of these drugs based on physiological characteristics of seniors who own tendency for greater use of antibiotics and the lack of human resources in the LTCF, causing medical records incorrectly and optimization problems in prescribing and use of antibiotics.[8,11-2,14,16-7]

In 50% of the studies analyzed in this review was detailed interference of the lack of human resources and physical infrastructure in LTCF in the appropriate use of antimicrobials as: reduced medical participation in the actions and policies of the institution and the absence of the charts of elderly residents, lack of knowledge about infection control for all categories of health professionals, high staff turnover, limited financial resources for infection control, restricting access to services microbiology laboratories, clinical analysis and diagnostic radiology. The consequence for such problems denote the possibility of insufficient clinical information that can directly influence the appropriate drug therapy that becomes essentially empirical in LTCF. [8,11,15-17]

The concern for the possibility of selection of resistant microorganisms in ILPI consequently the inappropriate use of antibiotics is indicated in 60% of studies can involve patient safety, quality of care and rising costs for health care, higher rates of hospitalization and medication consumption.[8,9, 11-4]

Was reported in 30% of articles of a high frequency of administration of antibiotics, especially of β-lactam there is a potential risk for selection of resistant Staphylococcus Aureus (MRSA) in LTCF, which carries a growing concern about the use of these drugs this population.[8,13-4]

In 70% of the articles was suggested to develop strategies to ensure the quality of prescriptions and provide the optimization of the use of antibiotics in LTCF, among them, infection control programs and implementation of guidelines for the rational prescription of antibiotics.[8,10-15]

Of the studies reviewed, 50% mentioned that there are few studies that depict the situation of antimicrobial use in LTCF, but it was possible to evaluate mainly the absence of data that can determine and characterize the improper prescription of antibiotics and other antimicrobials in these places.[9,11,14-6]

Authors/ Year/ Country	Delineation/N. of ILPI/ Period	Objectives	Main results	Evidence level
Zimmer et al, 1986, USA	- Descriptive - 42 ILPI - April to May 1983	To determine the prevalence and appropriateness of use of systemic antibiotics in LTCF in Rochester, NY	Sample of 2,238 elderly, 7.7% in systemic antibiotic: trimetripim-sulfametaxol (43%), amoxicillin (18.5%), nitrofurantoin (14%) cephalexin and sulfonamides (12%).	IV
Warren et al, 1991, USA	- Description - 53 ILPI - February 1985 to January 1986	Measure the prevalence, incidence, characteristics and classes of antibiotics prescribed in LTCF.	Sample elderly 3899, 54% in antibiotic use: sulfonamides (34%), penicillin (19%) and cephalosporins (16%).	IV
Mylotte, 1999, USA	- Cohort - 4 ILPI - May 1996 to August 1996.	Describe the methods that were used to monitor the use and cost of antibiotics.	Was not cited a sample of elderly residents. Antibiotics most frequently prescribed: fluoroquinolones (26%), trimethoprim-sulfametaxol (35%), amoxycillin (30%), cephalexin / erythromycin (10%).	III
Loeb et al, 2001, Canada	- Cohort. - 22 ILPI - November 1996 to October de1997	To determine the incidence, variability of use and prescription of antibiotics.	Sample of 3,556 elderly, 66% in use of antibiotics: trimethoprim-sulfamethoxazole (17%), ciprofloxacin (17%), amoxicillin (13%), cephalexin (9%).	III
Loeb et al, 2003, USA and Canada	- Cohort - 50 ILPI - February 1998 to June of 1999	Determine antibiotic use and risk factors for microbial resistance in LTCF.	Sample elderly 9156, 79% in antibiotic use: fluoroquinolones (20%), cephalosporins (24%) and penicillin (17%).	III
Blix et al, 2006, Norway	Description - 133 ILPI - January to December 2003	To analyze the prevalence and patterns of use of prescribed antibiotics.	Was not cited a sample of elderly residents. Most prescribed antibiotics: penicillin (28%), trimethoprim-sulfametaxol (18%), B-lactam (16%), tetracycline (12%).	IV
Benoit et al, 2008, USA	- If control - 73 ILPI - September 2001 to February 2002	Describe the prescribing patterns of antibiotics in LTCF.	Aged sample 4780, 42% for antibiotic use: fluoroquinolones (38%) cephalosporins (11%), and macrolides (10%).	III
Blix et al, 2010, Norway	- Description - 44 ILPI - April to May 2006.	Describe the use of antibiotics LSIE among residents, according to the diagnosis, the therapy of choice, dosage and duration of treatment.	Sample of 1,473 elderly, 15% in the use of prophylactic antibiotics. Most prescribed antibiotic: penicillin (48.3%).	IV
Pakyz et al, 2010, USA	- Description -1174 ILPI - August 2004 to January 2005	To evaluate the prevalence and classes of antibiotics used.	Sample of 13,507 elderly, 68% in antibiotic use: fluoroquinolone (23.4%), nitrofurantoin (12.3%), levofloxacin (12.1%), ciprofloxacin (7.4%) and cephalexin (6.7% .)	IV
Mcclean et al, 2011, Europe	- Description - 85 ILPI - April and November 2009	Investigate the prescription of antibiotics in LTCF in countries across Europe.	Sample of 10,388 seniors in April and 9,430 seniors in November. Most prescribed antibiotics: April - trimethoprim (11.4%) and Amoxi-clav (11.1%). November - Amoxi-clav (12.2%), nitrofurantoin (12.2%).	IV

Figure 1. Publications associated with antimicrobial use in long-stay institution for elderly, 1986-2011.

DISCUSSION

The elderly due to increased susceptibility to changes in consequence biological and behavioral characteristic of aging may have more frequent infections.[5] In 70% of the articles analyzed urinary tract infections, respiratory and skin were more common in the elderly residents in LTCF , which is consistent with the literature that portrays these anatomical sites as the most implicated in infections of this clientele.[18-9,2]

The urinary tract infections were the most prevalent in the LTCF residents (19% to 66%) possibly due to increased functional disability, represented especially by urinary

incontinence caused by the unstable detrusor muscle of the bladder, increased waste and post voiding contractions This involuntary organ. Other factors that predispose to urinary tract infection are prostatic hypertrophy and decreased bactericidal activity of secretions, and the use of urethral catheters, which may act as risk factors for bacteremy and uremy.[5,19]

Following in the urinary tract, the respiratory tract had a prevalence of 20% to 59% in the analyzed articles. The lungs suffer loss of ability to elastic recoil of the alveolar surface area and mucociliary clearance, as well as the decreased compliance of the chest wall, respiratory muscles and the cough reflex. Furthermore the use of feeding tubes may entail the risk of respiratory infection in the processes aspiration episodes.[5,20]

Skin infections accounted for 5% to 13% of infections in the elderly and factors associated with predisposition were immobility, which provides higher pressure, friction, shear skin with many different surfaces. The moisture of the skin, urinary and fecal incontinence, malnutrition and reduced time of health care for the elderly, increase the risk for developing ulcers and other skin lesions.[1]

Thus, the infections often require drug treatment and prescription of antibiotics rationally should consider the clinical and microbiological characteristics of each infection. The recommendations of antibiotic therapy according to the sites of infection in the elderly, are in Table 2 and based on this information it was noticed one line with those contained in 40% of the articles evaluated in this review, pointing the treatment of respiratory infections with amoxicillin, penicillin and erythromycin; urinary tract infections with trimethoprim/sufametaxol and fluoroquinolone (norfloxacin, ciprofloxacin), and skin infections with cephalexin.[11,14-7]

The same above items (40%) brought the divergent information mentioned in Figure 2, since many antibiotics prescribed were not the first choice for the treatment of infections. So there were prescriptions of sulfonamides, penicillins and cephalosporins to treat urinary infections, fluoroquinolones and tetracyclines for respiratory infections and cloxacillin and cephalosporin for skin infections, but the alternative therapies can be used in case of unavailability or high cost of those first choice, however the articles did not indicate the reasons for the approaches adopted.[11,14,16-7]

Infection	Microbial agents involved	Recommended treatments
Upper respiratory tract	- β-hemolytic Streptococcus; - Streptococcus pneumoniae; - Haemophilus influenzae; - Some gram-negative and anaerobic bacteria.	- Penicillin when there culture or pharyngeal streptococcal screening documenting the presence of Streptococcus group A. - Trimethoprim / sulfametaxol or amoxicillin can be used in cases of sinusitis. - Fluoroquinolones are rarely indicated for infections at these sites.
Lower respiratory tract	- Streptococcus pneumonia (more common in pneumonia in LTCF); - Chlamydia pneumoniae, Legionella pneumophila and Mycoplasma pneumoniae (in patients with dry cough); - Haemophilus influenzae (chronic lung disease).	- Pneumonia: trimethoprim / sulfamethoxazole, oxiciclina, amoxicillin, macrolides (erythromycin, clarithromycin, or azithromycin). - Infections by anaerobic microorganisms and mixed (aerobic and anaerobic): Clindamycin can be combined with sulfamethoxazole / trimethoprim.
Urinary Tract	- Escherichia coli, - Enterobacteriaceae: Proteus, Klebsiella, Enterobacter, Enterococos, Pseudomonas (Pseudomonas aeruginosa).	- Symptomatic urinary tract infection: Trimethoprim / sulfametaxol. - Infection with gram-negative bacilli: fluoroquinolones. - Infections Enterococci: Amoxicillin.
Skin infection	- Staphylococcus aureus; - Enterobacteriaceae: Proteus, Escherichia coli, Pseudomonas aeruginosa; - Streptococcus groups A and particularly ¤-hemolytic;	- Amoxicillin-clavulanate as first choice and trimethoprim / sulfamethoxazole or fluoroquinolones, dicloxacillin or cephalexin. In institutions with a high prevalence of methicillin-resistant Staphylococcus aureus, vancomycin consider.

Figure 2. Major infections attack the elderly, related microorganisms and antibiotic therapy recommended. Source: Nicolle, 2000.

The most commonly prescribed antibiotic class of studies was reported in the β-lactam (1.2% to 43.2%), this can be explained by using traditional safety and effectiveness of such antibiotics showing broad spectrum of activity against gram-negative organisms and Gram-positive organisms. However as with any antimicrobial overuse has serious health threats and in the case of β-lactam emergence of methicillin-resistant Staphylococcus aureus (MRSA).[18]

The indiscriminate use of antibiotics was cited by 60% of the articles, but without the presentation of data collected to confirm this statement as improper use of antibiotics is defined by the choice of drug, dosage or administration time incorrect.[8-14] Possibly there are situations without the use of antimicrobial characteristics evaluation of the

drug and the infecting organism, the difficulties encountered in the context of the functioning of the LTCF, among them the lack of health professionals, the threshold for displacement of older people to health centers and limit assistance and resources for further examinations especially laboratorial / microbiological.[8,11,15-7]

The workload of medical care, nursing services and assistance with other health professionals in ILPI is not clearly regulated, being cited factors for predisposition to empirical antibiotic therapy.[18,21]

Another aggravating factor, described in 70% of articles was the absence in most programs LTCF infection control, so the monitoring of antimicrobial use is not common, as well as the training of health professionals who work in them on this subject. [8, 10-5] Recommendations for the benefit of these drugs in LTCF are limited, since most of the time they are directed to hospitals or clinical criteria based on the population not targeted elderly and virtually no relevant clinical trials are available that define the optimal treatment regimen for institutionalized elderly.[5]

Microbial resistance as the main result of the misuse of antibiotics was reported by 60% of the articles analyzed. [8,9,11-4] Being a present reality and currently monitored not only in hospitals but in all levels of health care, for example, in outpatient clinics, specialty clinics and also in the community since the recovery of Staphylococcus aureus resistant Methicillin source community (CA-MRSA).[18,21]

In 30% of the articles were inference of the possibility of selection of MRSA in LTCF.[8,13-4], due to the constant use of antibiotics these institutions were considered reservoirs of MRSA, but are still controversial forms of transmission of this organism in these environments, with some hypotheses as cross-transmission through health care, the environment or colonization of the elderly when it undergoes a period in hospital becoming infected or colonized.[22]

Articles (50%) also discussed the lack of well-designed studies conducted to examine the use of antimicrobials in LTCF, making comparisons and policy settings under this level of health care.[9,11,14-6] It should be noted that the rational use of antibiotics is an emerging challenge and its controlled use is a way to avoid the failure of regimens for microbial resistance. When there is evidence of misuse of antibiotics by means of scientific research, behaviors and health programs are themselves justified.[1,23]

CONCLUSION

Ten articles were analyzed, representing a small number of studies on the use of antimicrobials in LTCF were not found Brazilian publications on the subject. Thus, we see the real need for research in these institutions and especially outlining national studies.

It was observed that the use of fluoroquinolones antibiotic class and β-lactams were justified by frequent infections that affect the elderly especially those of the respiratory tract, urinary tract and skin. There line antibiotics used to treat infections of criteria defined for the main use of antibiotics in the elderly. Thus, for the treatment of respiratory infections were prescribed amoxicillin, penicillin and erythromycin; urinary tract infections with trimethoprim / sufametaxol and fluoroquinolone (norfloxacin, ciprofloxacin), and skin infections with cephalexin.

Evident in the studies analyzed concern about the misuse of antibiotics, because it represents a direct impact on drug therapy represented by compromising effective treatment and indirect problems by optimizing the use of antibiotics, failures in the records of health professionals, and the possibility there selection of resistant microorganisms in the LTCF, which is the biggest concern of the misuse of antibiotics.

REFERENCES

1. Smith PW, Benne G, Bradley S, Drinka P, Lautenbach E, Marx J et al. SHEA/APIC Guideline: Infection prevention and control in the long-term care facility [Internet]. 2008 [cited 2012 Jan 07];29(9):[about 29p.]. Available from: http://www.apic.org/Resource_/TinyMceFileManager/Practice_Guidance/id_APIC-SHEA_GuidelineforICinLTCFs.pdf

2. Bentley DW, Bradley S, High K, Schoenbaum S, Taler G, Yoshikawa TT. Practice Guideline for Evaluation of Fever and Infection in Long-Term Care Facilities. Clin Infect Dis [Internet]. 2000 [cited 2012 Jan 07];31(3):[about 13p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11017809

3. Moraes EM, Marino MCA, Santos RR. Principais Síndromes Geriátricas. Rev Med Minas Gerais [Internet]. 2010 [cited 2012 Feb 10];20(1):[about 12 p.]. Available from: http://www.observatorionacionaldoidoso.fiocruz.br/biblioteca/_artigos/196.pdf

4. Strausbaugh LJ, Joseph CL. The Burden of Infection in Long-Term Care. Infect Contr Hosp Epidemiol. 2000; 21(10):674-9.

5. Nicolle, L. Antimicrobial Use in Long-Term Care Facilities. Infect Contr Hosp Epidemiol. 2000 [cited 2012 Jan 07];17(2):[about 9p.]. Available from: http://www.shea-online.org/Assets/files/position_papers/Abx-LTCF96.PDF

6. Sousa MT, Silva MD, Carvalho R. Revisão integrativa: o que é e como fazer. Einstein [Internet]. 2010 [cited 2011 Dec 02];8(1):[about 4p.]. Available from: http://apps.einstein.br/revista/arquivos/PDF/1134-Einsteinv8n1_p102-106_port.pdf

7. Stetler CB, Morsi D, Rucki S, Broughton S, Corrigan B, Fitzgerald J et al. Utilization-focused integrative reviews in a nursing service. Appl Nurs Res [Internet]. 1998 [cited 2012 Feb 15];11(4):[about 11p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9852663

8. Mcclean P, Hughes C, Tunney M, Goossens H, Jans B. Antimicrobial prescribing in European nursing homes. J Antimicrob Chemother [Internet]. 2011 May [cited 2012 Jan 07];66(7):[about 7p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21596722

9. Blix HS, Bergman JS, Schjtt J. How are antibacterials used in nursing homes? Results from a pointprevalence prescription study in 44 Norwegian nursing homes. Pharmacoepidemiol drug saf [Internet]. 2010 June [cited 2012 Jan 07];19(10):[about 5 p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20712026

10. Pakyz AL, Dwyer LL. Prevalence of Antimicrobial Use among United States Nursing Home Residents: Results from a National Survey. Infect Contr Hosp Epidemiol. 2010 June 31(6):661-2.

11. Benoit SR, Factors Associated with Antimicrobial Use in Nursing Homes: A Multilevel Model. Geriatrics [Internet]. 2008 Nov [cited 2012 Jan 07];56(11):[about 5p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19016937

12. Blix HS, Roed J, Sti MO. Large variation in antibacterial use among Norwegian nursing homes. Scand J Infect Dis [Internet]. 2007 [cited 2012 Jan 10];39(6-7):[about 5p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17577815

13. Loeb MB, Craven S, McGeer AJ, Simor AE, Bradley SF, Low, DE *et al*. Risk Factors for Resistance to Antimicrobial Agents among Nursing Home Residents. Am J Epidemiol [Internet]. 2003 [cited 2012 Jan 10];157:[about 7p.]. Available from: http://aje.oxfordjournals.org/content/157/1/40.full.pdf

14. Loeb MB, Simor AE, Landry L, Walter S, McArthur M, Duffy J *et al*. Antibiotic use in Ontario Facilities That Provide Chronic Care. J Gen Intern Med [Internet]. 2001 June [cited 2012 Jan 10];16(6):[about 7p.]. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1495221/

15. Mylotte JM. Antimicrobial prescribing in long-term care facilities: Prospective evaluation of potential antimicrobial use and cost indicators. Am J Infect Control. 1999; 27(1):10-9.

16. Warren JW. Incidence and characteristics of Antibiotic Use in Aged Nursing Home Patients. Geriatrics. 1991 Oct 39(10): 963-72.

17. Zimmer JG, Bentley DW, Valenti WM, Watson NM. Systemic Antibiotic use in Nursing Home a Quality Assessment. Geriatrics. 1986 Oct 34(10): 703-10.

18. Hujer AM, Bethel CR, Hujer KM, Bonomo RA, et al. Antibiotic resistance in the institutionalized elderly. Clin Lab Med [Internet]. 2004 [cited 2012 Feb 05];24(2):[about 18p.]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15177844

19. Richards CL Jr, Steele L. Antimicrobial-Resistant Bacteria in Long-Term Care Facilities: Infection Control Considerations. J Am Med Dir Assoc [Internet]. 2003 [cited 2012 Feb 05]; 4(3): [about 4p]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12854983

20. Nicolle LE, Strausbaugh LJ, Garibaldi RA. Infections and Antibiotic Resistance in Nursing Homes. Clin Microbiol Rev [Internet]. 1996 [cited 2012 Feb 10]; 9(1): [about 17p.]. Available from: http://cmr.asm.org/content/9/1/1.short?related-urls=yes&legid=cmr;9/1/1

21. Richards CL Jr. Preventing Antimicrobial-Resistant Bacterial Infections Among Older Adults in Long-term Care Facilities. J Am Med Dir Assoc [Internet]. 2005 [cited 2012 Feb 10]; 6(2): [about 8p]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15871891

22. Eveillard M, Guillou J. Methicillin-resistant Staphylococcus aureus (MRSA) in the

institutionalized older patient. Rev Clin Gerontol. 2009 Feb 19(1): 13-23.

23. Cabral EV, Poveda VB. Perfil Microbiológico e Resistência Bacteriana em Unidade de Tratamento Intensivo. J Nurs UFPE on line [Internet]. 2008 Oct/Dec [cited 2012 Feb 25]; 2(4):[about 8p]. Available from: http://www.ufpe.br/revistaenfermagem/index.php/revista/article/viewFile/320/pdf_395

Submission: 2012/06/28
Accepted: 2013/04/07
Publishing: 2013/05/15

Corresponding Address

Alanna Gomes da Silva
Graduação em Enfermagem
Departamento de enfermagem
Pontifícia Universidade Católica de Minas Gerais
Rua Alzira Torres, 1197 / Nações
CEP: 38900-000 – Bambuí (MG), Brazil