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# Risk factors in the management of antimicrobial agents in nursing

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**ABSTRACT.** Current retrospective, descriptive, document-based study identified the risk factors in the administration of antimicrobial drugs by the nursing team. The hospital records at the Hematology and Oncology clinics of patients treated with antimicrobial agents in a hospital in the center-western region of the state of Minas Gerais, Brazil, between January 2008 and December 2011, were analyzed. Data were investigated with IBM program, Statistical Package of Social Sciences (SPSS) 21.0 and inferential statistics. Chi-square and Fisher´s exact tests were employed to assess the differences between the categorical variables. Risk factors related to the administration of antimicrobial agents by the nursing team comprised lack of records of phlogistic infection signs; inadequate schedules for the administration of antimicrobial drugs; lack of precaution and isolation measures and of swab sampling. Continuous education programs for nurses, focusing on safe administration of antimicrobial agents, are highly relevant.

**Keywords:** biotechnology, hospital, medications, nursing.

## Fatores de risco na administração de antimicrobianos pela enfermagem: questões bioéticas

**RESUMO.** Este estudo foi realizado com o objetivo de identificar fatores de risco na administração de antimicrobianos pela equipe de enfermagem. Estudo retrospectivo, descritivo, de análise documental, no qual foram incluídos os prontuários de pacientes que foram tratados com antimicrobianos em um hospital do Centro-Oeste de Minas Gerais, Brasil, e que pertenciam às clínicas de hematologia e oncologia no período de janeiro de 2008 a dezembro de 2011. Os dados coletados foram analisados por meio do programa *IBM. Statistical Package for Social Sciences (SPSS) 21.0* e estatística inferencial. Para verificar diferenças entre as variáveis categóricas, recorreu-se a testes de Qui-quadrado e Exato de Fisher. Identificaram-se como fatores de risco relacionados à administração de antimicrobianos pela equipe de enfermagem: falta de anotações sobre sinais flogísticos de infecção; inadequações nos horários de administração dos antimicrobianos; falta de adoção de medidas de precaução e isolamento e de coletas de swabs. Assim, tornam-se relevantes programas de educação continuada voltados para enfermeiros, com enfoque na administração segura de antimicrobianos.

**Palavras-chave:** biotecnologia, hospital, medicamentos, enfermagem.

## Introduction

Antimicrobial agents are biotechnological drugs that limit pathogen growth or their destruction. Their use in clinical practice and in health institutions has changed the natural course of infections and caused positive changes against infectious diseases (Carneiro et al., 2011). Although their use has increased in more than 50% during the last 30 years and approximately 14% during the last five, the occurrence of resistant microorganisms has also risen (Fagan, Maehlen, Lindaek, & Berild, 2012).

Further, the unnecessary or inadequate employment of these drugs is associated with toxicity, increase in diseases and high costs of health care, coupled to their involvement in occurrences related to patients´ safety (Silva & Cassiani, 2013). On the other hand, studies from the point of view of Nursing on the risks in the inadequate administration of antimicrobial drugs are rare in the literature. Since risks consist in probable grave occurrences against the patient´s health, the use of methods for risk analysis may provide knowledge on existing issues and their main causes, and the subsequent recommendation of corrective and preventive measures (Silva & Cassiani, 2013).

Risk factors related to the management of antimicrobial agents by the nursing team is thus highly

relevant due to the possibility of great harm to patients, the environment and increase of microbial resistance. Current assay identifies risk factors in the management of antimicrobial drugs by the nursing team.

## Material and methods

Current retrospective, descriptive and document-based analysis was conducted in a big general hospital in the central and western region of the state of Minas Gerais, Brazil, which attends patients of the Brazilian Health System (SUS), health insurances and paying persons. The reference hospital attends a population from 57 neighboring towns, of which 70% are SUS patients. Statistics show that there are approximately 15,200 hospitalizations/month, including patients suffering from cancer, a joint venture with the Association against Cancer of the Western region of Minas Gerais (ACCOM). The institution comprises 398 beds shared by patients attended by SUS, health insurances and paying patients, featuring 190,000 first aid procedures, 15,200 hospitalizations, 13,600 surgeries and 3,000 births annually.

The Hospital is also equipped with a Committee for the Control of Hospital Infection (CCIH) and a Service for the Control of Hospital Infection (SCIH). The former is composed of two physicians from the Adult Intensive Care Center and from the Children Intensive Care Center, a member of the Hospital´s General Management, an infectologist and a nurse.

The internal organizational structure of the latter committee comprises two physicians specialized in Infectology, one of whom is the technical specialist of the service, two nurses, one of whom is responsible for the coordination of the service, and a member from the administration board. The service is bound by internal routines and norms, with specific protocols for adult and children ICUs, special protocols for the use of antimicrobial drugs-prophylaxes, following Law 2616 published on the 12/5/1998 by the Ministry of Health. Its activities include training in continuous education once every three months or according to the institution´s needs, on infection rates throughout the epidemiological scanning undertaken by the SCIH nurses in the sectors. Training is provided to all professionals, particularly nurses.

Data were retrieved from the hospital records at the Medical and Statistical Archive Service (SAME), focusing on patients treated at the adult and children oncological clinic and at the hematological clinic.

The clinical charts of patients treated at the oncological clinic were selected since patients underwent several diagnostic and therapeutic procedures that prolonged their stay in the hospital, coupled to several re-hospitalizations. Therefore, the focused population is more exposed to colonization by antimicrobial-resistant microorganisms (Santos et al., 2012).

The criteria for the selection of the 203 charts included patients from the cancer or hematological clinics, using antimicrobial drugs, with nursing information between 2008 and 2011. A Collection Pathway, constructed for data harvesting from the records, was based on data in the literature on nursing activities related to the dispensing of antimicrobial drugs. Data on medical prescriptions for antimicrobial drugs were collected, related to nursing activities (dispensing) by nursing annotations.

Data were categorized, codified, registered and analyzed according to data bank and by programs IBM. Statistical Package for Social Sciences (SPSS) 21.0 and Excel version (21) 2010. Analyses were undertaken following descriptive statistics and given in contingency tables. Chi-square test and Fischer´s exact test were employed to assess differences in frequency distribution of variables, in cases where one of the 2x2 cells was lesser than or equal to 5.

The recommendations of the Brazilian Health (CNS/MS) 196/1996 were complied with for the ethical aspects of research on human beings. Research project was submitted to the Committee for Ethics in research prior to the start of data collection (Approval n. 288517). Since research was retrospective, the declaration of free consent was not asked, although secrecy and anonymity of the participants were guaranteed.

## Results

Participants´ age bracket ranged between 3 and 44 years (39.5 ± 26), with 55.2% males and 44.8% females. Mean permanence period in the hospital was 15 days, with a maximum of 99 days (DP = 16); mean period using antimicrobial drugs ranged between 7 and 9 days.

Among the main diagnoses, there was a high prevalence of Acute Myeloid Leukemia (AML), with 68 patients (33.5%), followed by aplastic anemia, lymphomas, thrombocytopenia, and multiple myeloma. Hematological diseases were the main reasons for hospitalization with 172 patients (84.7%) (Table 1).

Data revealed that 133 (65.5%) patients from the oncological and hematological clinics had health complications and that 113 (55.7%) of the charts did not have any annotations on phlogistic signs made

by the nursing team. Complications were observed in 90 (44.3%) patients, among which may be mentioned 25 (12.3%) ulcers caused by pressure; 43 (21.17%) had urinary infections and 22 (10.83%) had pneumonia. In the case of phlogistic signs, only charts with nurse´s annotations for inflammation (hotness, redness, tumor, pain and loss of function) were considered.

**Table 1.** Distribution of the number of patients according to hospitalization and medical diagnoses, between January 2008 and December 2011, Divinópolis, Minas Gerais State, Brazil, 2013.

| Variables | Frequency | Percentage |
|---|---|---|
| Hospitalization | | |
| Hematology | 172 | 84.7 |
| Surgical Oncology | 6 | 3.0 |
| Clinical oncologya | 16 | 7.9 |
| Others | 9 | 4.4 |
| Total | 203 | 100.0 |
| Diagnosis | | |
| Acute Myeloid Leukemia | 68 | 33.5 |
| Acute Lymphoblast Leukemia | 48 | 23.6 |
| Febrile neutropenia | 28 | 13.8 |
| Others | 59 | 29.1 |
| Total | 203 | 100.0 |

Note: Data retrieved from hospital records by MV2000/SAME

Further, 153 (75.4%) patients under analyses, of whom 28 (13.8%) presented febrile neutropenia, were not kept in preventive isolation.

It must be observed that ten (5%) prescriptions were incomplete, or rather, they lacked either the dosage of the medicine or the time for its dispensing. In fact, 21 (10.3%) prescriptions were hand written. Most prescriptions (n = 198; 98%) were legible since most (n = 169; 87.2%) were written electronically (Table 2).

**Table 2.** Distribution of conditions, mode and type of prescriptions in patients´ records in the oncology and hematology clinics, between January 2008 and December 2011, Divinópolis, Minas Gerais State, Brazil, 2013.

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Illegible | 3 | 1.5 |
| Legible | 198 | 97.5 |
| Partially legible | 2 | 1.0 |
| Total | 203 | 100.0 |
| Prescription mode | | |
| Complete | 193 | 95.0 |
| Incomplete | 10 | 5.0 |
| Total | 203 | 100.0 |
| Type Of Prescription | | |
| Written by hand | 21 | 10.3 |
| Written electronically | 169 | 87.2 |
| Mixed type | 13 | 2.5 |
| Total | 203 | 100.0 |

Note: Data of patients´ charts analyzed by MV2000/SAME

Table 3 shows that, although most antimicrobial drugs (n = 142; 70%) in medical prescriptions were checked as dispensed, the number of inadequacies, especially the timetable for their dispensing, was a rather frequent item. In fact, 33 (16.3%) were not dispensed at the right time as ordered, but according to the timetable conditioned by the nursing team on duty at that time.

Table 4 forwards results of Chi-square test and Fischer´s exact test to verify whether there were any differences among hospitalized or not hospitalized patients according to the variables: prescription mode; annotation of phlogistic signs, dispensing at the right time; isolation. No statistically significant difference occurred in both situations.

**Table 3.** Behavior of the nursing team with regard to nursing in clinical records of the Oncology and Hematology clinics between January 2008 and December 2011, Divinópolis, Minas Gerais State, Brazil, 2013.

| Variables | | Frequency | Percentage (%) |
|---|---|---|---|
| Timetable corresponding to | Yes | 86 | 42.4 |
| checked time | No | 117 | 57.6 |
| Situation of antimicrobial drug | | | |
| Suspended | | 5 | 2.5 |
| Dispensed | | 142 | 70.0 |
| Not dispensed | | 33 | 16.2 |
| Dispensed or changed | | 10 | 4.9 |
| Not dispensed or suspended | | 12 | 5.9 |
| Suspended and changed | | 1 | 0.5 |
| Total | | 203 | 100 |

Note: Data retrieved from clinical charts analyzed by MV2000/SAME

**Table 4.** Results of Chi-square test and Fischer´s exact test for differences in hospitalized and non-hospitalized patient, according to the variables: prescription mode, annotation of phlogistic signs, correct dispensing time, isolation between 2008 and 2011, Divinópolis, Minas Gerais State, Brazil, 2013.

| Re-hospitalization | No | | Yes | | $\chi^2$ | |
|---|---|---|---|---|---|---|
| Prescription mode* | N | % | N | % | P(A) | P |
| Complete | 26 | 86.6 | 16 | 94.9 | 0.103 | 0.604 |
| Incomplete | 1 | 3.3 | 9 | 5.1 | | |
| Dispensing on time** | | | | | | |
| No | 15 | 15.0 | 8 | 22.2 | 2.985 | 0.225 |
| Yes | 85 | 85.0 | 28 | 77.8 | | |
| Annotation of phlogistic signs** | | | | | | |
| No | 12 | 10.6 | 15 | 16.6 | 1.589 | 0.219 |
| Yes | 101 | 89.3 | 75 | 83.3 | | |
| Isolation* | | | | | | |
| No | 23 | 15 | 4 | 8 | 1.616 | 0.150 |
| Yes | 130 | 85 | 46 | 92 | | |

*Fishe´s exact test; **Chi-square test; P (A) Accumulated probability for Fisher´s exact test.

Table 5 demonstrates results of Chi-square test and Fischer´s exact test for differences between patients who died and who survived, according to the variables: annotation for phlogistic signs, hospitalization period and demand for swabs.

The table above reveals a high percentage of blanks with regard to annotations of phlogistic signs in the hospital records of patients who died (n = 84; 74.3%) and who survived (n = 49; 54.4%). There is statistically significant difference between these patients ($\chi 2 = 8; 764; p \leq 0; 002$), or rather, the lack of annotations for phlogistic signs was greater in the group of hospital records of patients who survived when compared to that of patients who died.

**Table 5.** Results of Chi-square test and Fischer´s exact test for differences between patients who died and who survived, according to the variables: annotation for phlogistic signs, hospitalization period and demand for swabs, between 2008 and 2011, Divinópolis, Minas Gerais State, Brazil, 2013.

| Death | No | | Yes | | $\chi^2$ P(A) | P |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| Annotation of phlogistic signs* | | | | | | |
| No | 84 | 74.3 | 49 | 54.4 | 8.764 | 0.002* |
| Yes | 29 | 25.7 | 41 | 45.6 | | |
| Hospitalization period** | | | | | | |
| = Or< 15 days | 97 | 68.3 | 36 | 59.0 | 1.631 | 0.132 |
| = Or >16 days | 45 | 31.7 | 25 | 41.0 | | |
| Demand of swabs*** | | | | | | |
| No | 110 | 63.2 | 5 | 56 | 6.109 | 0.026* |
| Yes | 64 | 36.8 | 4 | 44 | | |

*if p ≤ 0.05; **Chi-square test; ***Fisher´s exact test; P (A) accumulated probability by Fisher´s exact test.

Table 5 also reveals that in the case of the variable demand of swabs, 4 (44%) belonged to patients who died. Difference between the groups was statistically significant ($\chi2 = 6$; 109; $p \leq 0.026$), or rather, the number of demands for swab collection was greater in patients who died when compared to that of patients who survived. Table 6 shows results for Chi-square test and Fischer´s exact test to verify differences between patients with disease complications, according to the variables annotations of phlogistic signs, dispensing at the right timetable, hospitalization period, demand for swabs and isolation.

Lack of annotations on phlogistic signs was greater in patients with no complications (n = 60; 53%) when compared to patients with complications (n = 10; 11%) (Table 6). There was a statistically significant difference among the groups ($\chi2 = 8$; 764; $p \leq 0.0001$) for this variable.

**Table 6.** Results for Chi-square test and Fischer´s exact test with regard to differences between patients with disease complications, according to the variables annotations of phlogistic signs, dispensing at the right timetable, hospitalization period, demand for swabs and isolation, between 2008 and 2011, Divinópolis, Minas Gerais State, Brazil, 2013.

| Complications | No | | Yes | | $\chi^2$ P(A) | P |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| Annotation of phlogistic signs** | | | | | | |
| No | 60 | 53 | 10 | 11 | 39.090 | 0.000* |
| Yes | 53 | 47 | 80 | 89 | | |
| Dispensing at the right hour** | | | | | | |
| No | 31 | 31 | 24 | 28 | 23.924 | 0.024* |
| Yes | 69 | 69 | 62 | 72 | | |
| Hospitalization period** | | | | | | |
| = Or <15 days | 60 | 42 | 10 | 16 | 12.631 | 0.000* |
| = Or >16 days | 82 | 58 | 51 | 84 | | |
| Demand for swabs*** | | | | | | |
| No | 50 | 28.8 | 2 | 22 | 30.428 | 0.000* |
| Yes | 124 | 71.2 | 7 | 78 | | |
| Isolation*** | | | | | | |
| No | 58 | 38 | 12 | 24 | 3.227 | 0.050* |
| Yes | 95 | 62 | 38 | 76 | | |

*If p ≤ 0.05; **Chi-square test; ***Fisher´s exact test; P (A) Accumulated probability of Fisher´s test.

In the case of dispensing antimicrobial drugs on the hour, the patients´ records in which there was no drug dispensing at the right timetable showed that 31 (31%) belonged to patients with no complications and 24 (28%) belonged to those with complications. There was statistically significant difference between the groups ($\chi2 = 23$; 924; $p \leq 0.024$).

In the case of the variable hospitalization period, patients with complications were hospitalized for a shorter time or for a 15-day period when complications occurred (n=10; 16%). Difference between groups was statistically significant ($\chi2 = 12$; 631; $p \leq 0.0001$).

The group with complications demanded swabs (n = 2; 22%), similar to the group without any complications. Fifty (28.8%) of patients´ records also reported this demand. There was a statistically significant difference between groups with and without complications ($\chi2 = 30$; 428; $p \leq 0.0001$).

## Discussion

Carneiro et al. (2011) also identified mean age of 39.5 ± 10.6 years for patients treated with antimicrobial drugs and demonstrated that pediatric age bracket and that of over-50-years population were the most indicated for antimicrobial therapy, due to the immunologic state and associated co-morbidity, even though no difference between genders occurred in the use of the drugs. The authors also identified a predominance of males, with 56.0%, corroborating results in current analysis.

Studies on hospitalization period in 15 government- and private-run hospitals in Belo Horizonte MG Brazil showed that total mean hospitalization period was 18 days: 67% of patients were hospitalized between 1 and 15 days; 14% between 16 and 30 days and 19% for more than one month (Gomes, Bastos, Matozinhos, Temponi, & Meléndez 2011). A study in a hospital in the state of Rio Grande do Sul, Brazil, revealed that antimicrobial therapy duration averaged 9 (± 2.1) days, whereas average prophylactic therapy lasted 2 ± 1.2 days (Carneiro et al., 2011). The above studies demonstrated that hospitalization time was longer for patients undergoing antimicrobial therapy (Carneiro et al., 2011; Gomes et al., 2011). Results agree with those in current analysis.

It should be underscored that colonization by multi-resistant microorganisms is due to prolonged hospitalization period in hospital, considered to be an important factor for the dissemination of microorganisms (Moura & Gir, 2007).

Leukemia was the most frequent diagnose in patients treated with antimicrobial drugs. According

to Boing, Vargas, & Boing (2007), malign leukemia had high hospital costs and ranked second in average hospitalization duration. Although it is not the disease with the highest mortality rate, leukemia requires high cost therapy on the pharmacological market, coupled to a combination of drugs, blood transfusions and hospitalizations that demands high permanence rates and re-hospitalizations. The above pathologies in hematological clinic are directly related to the febrile neutropenia described as secondary physiological reaction to cytotoxic chemotherapy. It is actually a medical emergence with immediate pharmacological intervention comprising wide spectrum antimicrobial drug caused by a morbomortality-related prognostic. This fact corroborated results in current study since the highest prevalence in the use of antimicrobial drugs was identified in patients from oncological and hematological clinics.

According to Bellesso, Costa, Chamone, & Llacer (2010), febrile neutropenia is a complication in chemotherapy-treated patients and may be fatal. Infection risks may increase according to the prolonged period with neutropenia. Patient´s isolation is recommended till a better definition in the treatment against the microbial agent. Since in this case patients are immunosuppressed, they are exposed to new bacteria of the hospital microbiota. Wide spectrum antimicrobial drugs are recommended immediately due to its high mortality complications. However, results showed that 13.8% of patients treated with antimicrobial drugs had febrile neutropenia but were not isolated in the hospital isolation ward.

Precaution measures or isolation by the nursing team is highly relevant. The onset of bacterial resistance to antimicrobial drugs causes multiresistant strains which are difficult to combat and which require total adhesion to precaution standards and isolation measures by health professionals in the assistance of hospitalized patients (Moura & Gir, 2007).

Since they are risk factors, several deficiencies were registered in the case of annotations for phlogistic signs by the nursing team. Based on results of inferential tests, clinical assessment of signs of infection by the nursing team is obviously important. However, a great number of complications occurred in the group which featured annotations. This fact may be related to the lack of measures for the prevention of complications associated with hospital infections. Deficiencies in annotations on phlogistic signs by the nursing team may worsen the hospital infection issues described as predominant in oncological patients. In fact, the nursing team should select priority strategies in the prevention of these diseases (Sanhudo, Moreira, & Carvalho, 2011).

No illegible medical prescriptions for antimicrobial drugs were identified in current analysis since prescriptions were electronically printed. However, Gimenes et al. (2011) underscore that electronically written prescriptions do not totally eliminate the possibility of mistakes in the process of drug dispensing. Errors may occur at the moment of filling the prescription form since the system provides means to copy prescriptions to facilitate the doctor´s administration of diseases. Actually, it is of great concern for all the health team since the prescribed drugs may bring about irreversible adverse events for the patients, including death. According to Gimenes et al. (2011), lack and omission of information at the moment of writing the prescription may cause mistakes by the health team during the treatment. The absence of a necessary item in the prescription induces mistakes in drug dispensing.

In the case of the doctor´s role in prescription writing, it should be enhanced that prescriptions are of primary relevance in the prevention and detection of adverse events mistakes in dose and time. Illegible or incomplete prescriptions, lack of protocols and institutional standardization of nomenclature of the prescribed drugs, copies, abbreviations and erasures contribute towards the occurrence of risk factors in drug dispensing (Gimenes et al., 2010).

There is a risk factor when the nursing team dispenses drugs outside the timetable prescribed in the doctor´s prescription. Since such behavior negatively affects the antimicrobial cycle and interferes in the enzyme inhibition process, some bacteria become insensitive to certain antimicrobial drugs and may inactivate a determined enzyme. Antimicrobial drugs with mechanisms on the enzyme inhibition become inactive due to the lack of a specific combat site (Guimarães, Momesso, & Pupo, 2010).

The determination of timetable in the dispensing of antimicrobial drugs in hospitals is the exclusive role of the duty nurse. The duty nurse in responsible for avoidance of mistakes in drugs with regard to the prescribed timing by the physician. However, the specific nurse should have knowledge on the characteristics of the therapy and the clinical conditions of the patient to avoid drug-drug and drug-food interactions and other medicine incompatibilities (Rodrigues & Oliveira, 2010).

Risk factors may be caused by communication failures between the health teams, resulting in

mistakes in drug dispensing such as overdose, suspended drugs and anticipation of timetable or delays in dispensing (Santana, Sousa, Soares, & Avelino, 2012). However, it should be underscored that, based on inferential tests, there was no direct co-relationship between the variables re-hospitalizations and death when compared to timetable in drug dispensing by the nursing team. No difference between the variables re-hospitalization and death was detected

Another risk factor detected in current analysis comprised the lack of solicitation and collection of swabs by nurses. Swabs for collecting biological material from wounds and infected ulcers are the most commonly method used by nurses. The collection of swabs is highly relevant. One study emphasizes that 54% of health professionals specialized in wound care in the United States use swabs as a technique for the collection of material to identify microorganisms causing infectious processes. However, the technique is employed by a specialized health professional since flaws in any step during collection of the material for microbiological assessment may cause error in the identification of the etiological agent and inappropriate treatment may be meted out (Ferreira & Andrade, 2006).

In their studies on swab samples with infected wounds, Ferreira, Santos, & Sampaio (2004) identified 46 colonies of microorganisms, averaging 2.3 colonies per wound, by this technique, which is highly important for the adequacy of antimicrobial agents.

Several microbial agents may emerge in cultures undertaken by swab collection of secretions even though most bacteria have no clinical importance. There is no indication for culture when there is no evidence of any infection site. The collected material is relevant for the choice of an antimicrobial agent rather than for diagnosis (Kempfer et al., 2010).

It is thus highly relevant that the health team, especially nurses, handles and dispenses antimicrobial drugs in hospitals. The health team should dialogue and reflect on the risks involving such practices. The consent of all parties is required when ties exist on the type of antimicrobial drug and the best dispensing time, among others (Oliveira & Garrafa, 2011).

According to Corbellini, Schilling, Frantz, Godinho, & Urbanetto (2011), the safe dispensing of drugs depends on the health professional in the nursing team, who has to attend to six points in dispensing: correct drug, correct dose, correct patient, correct method, correct time and correct prescription. Risk factors related to errors by the team working directly on the patient in drug dispensing may bring to patients severe harm, liabilities due to long hospitalization period, need for diagnostic and therapeutic interventions, and even death, caused by complications acquired during the hospitalization period.

A reflexive and interdisciplinary process should be proposed and shared by the teams involved within the assistance system for adequate activities in health care that involve the well-being of the patient. It must be a discussion by the institution´s permanent team on the possibility of occurrences of risk situations within the process of antimicrobial drug dispensing and the methodology for the identification and assessment of events related to incorrect handling and dispensing (Dalmolin & Goldim, 2013).

## Conclusion

The following risk factors related to the dispensing of antimicrobial drugs by the nursing team are lack of annotation on phlogistic signs of infection; inadequate timetable in drug dispensing; lack of precaution and isolation measures; swab collection.

The above factors cause risks and harm to patients and environment, and increase microbial resistance. Continuous education programs for nurses focusing on the safe dispensing of antimicrobial drugs are relevant.

Current study does not forward general terms on the phenomenon under analysis due to different institutional contexts and identified limitations. In fact, the small number of patients´ hospital records is the main limitation. Results in current analysis do not deal with all the aspects on the theme. Further exploratory and quantitative studies should be undertaken and studies on a qualitative approach are also worth doing to explore the causes and motivations in the identified risk behaviors.

## References

Bellesso, M., Costa, S. F., Chamone, D. A. F., & Llacer, P. E. D. (2010). Triagem para o tratamento ambulatorial da neutropenia febril. *Revista Brasileira de Hematologia, 32*(5), 402-408.

Boing, A. F., Vargas, S. A. L., & Boing, A. C. (2007). A carga das neoplasias no Brasil: mortalidade e morbidade hospitalar entre 2002-2004. *Revista da Associação Médica Brasileira, 53*(4), 317-322.

Carneiro, M., Ferraz, T., Bueno, M., Koch, B. E., Foresti, C., Lena, V. F., … Lazaroto, D. M. (2011). O uso de antimicrobianos em um hospital de ensino: uma breve

avaliação. *Revista da Associação Médica Brasileira, 57* (4), 421-424.

Corbellini, V. L., Schilling, M. C. L., Frantz, S. F., Godinho, T. G., Urbanetto, J. S. (2011). Eventos adversos relacionados a medicamentos: percepção de técnicos e auxiliares de enfermagem. *Revista Brasileira de Enfermagem, 64*(2), 241-247.

Dalmolin, R. S., & Goldim, J. R. (2013). Erros de medicação em hospitais: considerações a partir da Bioética. *Revista da Associação Médica, 59*(2), 95-99.

Fagan, M., Maehlen, M., Lindaek, M., & Berild, D. (2012). Antibiotic prescribing in nursing homes in an area with low prevalence of antibiotic resistance: compliance with national guidelines. *Scandinavian Journal of Primary Health Care, 30*(1), 10-15,

Ferreira, A. M., Santos, I., & Sampaio, C. E. P. (2004). O cuidado de enfermagem nos procedimentos de coleta para análise microbiológica de feridas: aplicabilidade de duas técnicas. *Arquivo de Ciências da Saúde, 11*(3), 137- 141.

Ferreira, A. M., & Andrade, D. (2006). Swab de feridas: recomendável? *Revista de Enfermagem da Universidade do Estado do Rio de Janeiro, 14*(3), 440-446.

Gimenes, R. E., Marques, T. C., Teixeira, T. C. A., Mota, M. L. S., Silva, A. E. B. C., & Cassiani, S. H. B. (2011). Administração de medicamentos, em vias diferentes das prescritas, relacionada à prescrição médica. *Revista Latino Americana de Enfermagem, 19*(1), 1-7.

Gimenes, R. E., Mota, M. L. S., Teixeira, T. C. A., Silva, A. E. B. C., Opitz, S. P., & Cassiani, S. H. B.(2010). Segurança do paciente na terapêutica medicamentosa e a influência da prescrição médica nos erros de dose. *Revista Latino Americana de Enfermagem, 18*(6), 1-7.

Gomes, F. S. L., Bastos, M. A. R., Matozinhos, F. P., Temponi, H. R., & Meléndez, G. V. (2011). Avaliação de risco para úlcera por pressão em pacientes críticos. *Revista da Escola de Enfermagem da USP, 45*(2), 313- 318.

Guimarães, D. O., Momesso, L. S., & Pupo, M. T. (2010). Antimicrobianos: importância terapêutica e perspectivas para a descoberta e desenvolvimento de novos agentes. *Química Nova, 33*(3), 667-679.

Kempfer, C. B., Hörner, R.; Tizotti, M. K., Martini, R., Rodrigues, M. A., Kuhn, F. T., … Roehrs, M. C. S. M. (2010). Culturas de secreções de pele: estudo de prevalência e sensibilidade aos antimicrobianos em um hospital universitário. *Revista Saúde, 36*(1), 57-66.

Moura, J. P., & Gir, E. (2007). Nursing staff knowledge of multi-resistant bacterial infections. *Revista Acta Paulista Enfermagem, 20* (3), 351-356.

Oliveira, S., & Garrafa, V. (2011). Princípios éticos e a prevenção das infecções hospitalares. *Revista Brasília Médica, 48*(1), 48-49.

Rodrigues, M. C. S., & Oliveira, L. C. (2010). Erros na administração de antimicrobianos em unidade de terapia intensiva de hospital de ensino. *Revista Eletrônica de Enfermagem, 12*(3), 511-519.

Sanhudo, N. F., Moreira, M. C., & Carvalho, V. (2011). Tendências da produção do conhecimento de enfermagem no controle de infecção em oncologia. *Revista Gaúcha de Enfermagem, 32*(2), 402-410.

Santana, J. C. B., Sousa, M. A., Soares, H. C., & Avelino, K. S. A. (2012). Fatores que influenciam e minimizam os erros na administração de medicamentos pela equipe de enfermagem. *Enfermagem Revista, 15*(1), 122-137.

Santos, S. L. V., Sousa, T. K., Costa, D. M., Lopes, L. K. O., Pelejad, E. B., Sousa, D. M., … Pereira, M. S. (2012). Infecciones asociadas a la atención de salud en un hospital de oncología brasileño: análisis de cinco años. *Revista Enfermería Global, 11*(25), 8-17.

Silva, A. E. B. C., & Cassiani, S. H. B. (2013). Análise prospectiva de risco do processo de administração de medicamentos anti-infecciosos. *Revista Latino-Americana de Enfermagem, 21*(spe), 233-241.

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