DRUG SCHEDULING FOR NURSES IN PRESCRIPTIONS AT SENTINEL HOSPITAL

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ABSTRACT: This study was aimed at identifying the distribution profile of intravenous medicine schedules and analyzing potential severe interactions due to the scheduling. A cross-sectional study with documentary analysis was undertaken. Approval was obtained from the ethics committee of the hospital where the research was developed between January and April 2008. The sample consisted of 135 prescriptions with 1847 doses. Results showed an average of 8.8 doses per prescription (±1.05) and 17.6 (±0.9) at the emergency and intensive care service, respectively. Scheduling was predominant in the evening hours (57.11%) in both sectors. Forty-three severe interactions were found, with a prevalence rate of 1.85 and an odds ratio of 5.7, in prescriptions with more than five drugs. The prevalent drugs involved in interactions with a potential for serious injury were sodium phenytoin, vancomycin and ranitidine hydrochloride. It is concluded that the prevalent scheduling within four hours favors the appearance of interactions even in prescriptions with up to five drugs.

DESCRIPTORS: Drug interactions. Nursing. Intensive care. Emergencies.

APRAZAMENTO DE MEDICAMENTOS POR ENFERMEIROS EM PRESCRIÇÕES DE HOSPITAL SENTINELA

RESUMO: Pesquisa que objetivou descrever o perfil do aprazamento de medicamentos intravenosos e analisar potenciais interações graves decorrentes do aprazamento. Estudo transversal, com análise documental, aprovado por comitê de ética de hospital onde se realizou a pesquisa, sendo coletados dados entre janeiro a abril de 2008. Amostradas 135 prescrições com 1847 doses. Os resultados mostraram uma média de doses por prescrição de 8,8 (±1,05) e 17,6 (±0,9) na emergência e terapia intensiva, respectivamente. Constatou-se predomínio de aprazamento no horário noturno (57,11%) em ambos os setores. Foram encontradas 43 interações graves com prevalência de 1,85 e 5,7 de *Odds Ratio*, em prescrições com mais de cinco medicamentos. Os medicamentos prevalentes envolvidos em interação, com potencial para dano grave foram fenitoína sódica, cloridrato de vancomicina, e cloridrato de ranitidina. Conclui-se que o aprazamento prevalente em quatro horários favorece o aparecimento de interações mesmo em prescrições com até cinco medicamentos.

DESCRITORES: Interações de medicamentos. Enfermagem. Terapia intensiva. Emergências.

APLAZAMIENTOS DE LAS MEDICACIONES POR ENFERMEROS EN PRESCRIPCIONES DEL HOSPITAL CENTINELA

RESUMEN: Estudio que tuvo como objetivos identificar el aplazamiento de horarios de las medicaciones hechos por enfermeros y analizar las potenciales interacciones medicamentosas graves encontradas. Estudio transversal con análisis documental, autorizado por el Comité de Ética, los datos fueron colectados entre enero y abril de 2008. La muestra fue compuesta por 135 prescripciones con 1847 dosis. Los resultados muestran un promedio de dosis por prescripción de 8,8 (±1,05) y 17,6 (±0,9) en el servicio de emergencias y terapia intensiva respectivamente. Se constató el predominio de dosis en horario nocturno (57,11%). Se encontró 43 interacciones graves con prevalencia de 1,85 con *Odds Ratio* de 5,7 para prescripciones con más de cinco medicamentos. Los medicamentos envueltos en interacciones fueron fenitoína sódica, cloridrato de vancomicina, cloridrato de ranitidina. Se concluye que el aplazamiento prevalente de cuatro horarios favorece el aparecimiento de interacciones incluso en las prescripciones con hasta cinco medicamentos.

DESCRIPTORES: Interacción medicamentosa. Enfermería. Terapia intensiva. Emergência.

INTRODUCTION

Among the resources available for patient treatment, medication use is one of the most frequent. Adverse events and drug-related errors are frequent in hospital contexts though.[1]

One type of error is related to issues involved in the simultaneous use of various drugs in clinical practice, and is intrinsically related to the risk of Drug Interactions (DIs). Polytherapy is justifiable when it permits the achievement of a synergistic therapeutic effect, thus enhancing the effectiveness of treatment, or when used to treat multiple coexisting diseases. These combinations, however, can result in unwanted drug interactions, triggering several problems, which can end up in treatment failure and adverse drug reactions. The simultaneous use of different drugs increases the possibility of interactions among drug, which can be explained by the progressive growth of possible combinations.[2]

In hospital contexts, this situation is a particular source of concern at units that receive severe patients, like Intensive Care Units (ICUs) and emergencies, where patients receive different drugs in the course of the hospitalization.[2]

With prescriptions that contain increasingly complex combinations, it has become very difficult to recognize Potential Drug Interactions (PDIs) in advance, which are those interactions in which the effect of the drugs involved can change, which may lead to unwanted results, increasing the incidence of adverse treatment effects without enhancing the therapeutic benefit. Although its results can be both positive (increased effectiveness) and negative (decreased effectiveness, toxicity or idiosyncrasy), PDIs are generally unpredictable and unwanted in drug therapy. Results reveal that the complications related to drug use are the most common type of adverse event in hospitalization (19% of patients); with 2-3% of hospitalized patients experiencing reactions specifically provoked by drug interactions.[3-4]

At ICUs, studies reveal that PDIS can affect between 44.3 and 95.0% of the patients.[5-9] Countless factors can provoke many of these interactions, one of which is scheduling. In Brazil, in one nursing study[7], scheduling is associated with the occurrence of PDIs. Other studies are limited to the therapeutic perspective and the quantification of potential drug interaction frequencies, without going deeper into the relation between these events and matters of habits, like the scheduling routine nursing adopts for example.[5-6,8-9]

Safe and precise medication scheduling is an important responsibility for nursing professionals, who still do this manually at most hospitals, following a fixed time routine that rarely considers the characteristics of the prescribed drug and/or the patient's clinical condition. Through the scheduling, the nurse organizes the drug therapy plan established for the patients and, at most hospitals, the time interval patterns is closely linked to the routine of nursing, medical and pharmaceutical care.

Scheduling into standardized, fixed times contributes to administer various drugs to the same patient at the same time, which can cause DI. Based on these concerns, this research was developed, which departed from the following problem: which are the potential severe drug interactions found in the prescriptions of critical patients, associated with the scheduling established by nurses? The proposed objectives were to describe the scheduling profile of intravenous drugs and analyze the potential severe drug interactions among intravenous drugs as a result of scheduling.

METHOD

This documentary research with a cross-sectional design was undertaken at an ICU and Emergency Unit of a hospital that is a member of the sentinel network in the city of Rio de Janeiro. Data were collected between January and April 2008. The intensive care and emergency units were chosen because that is where patients receiving multiple drugs are common. The selected sectors receive high demands from severe and potentially severe patients who receive intense drug therapy. The ICU and Emergency offer 12 and 30 beds, respectively. At the ICU, one nurse is available during the day shift, together with 21 nurses working shifts and 42 nursing technicians, distributed among seven different teams. At the Emergency unit, there are two nurses during the day, 21 nurses working shifts and 56 technicians per shift, distributed across seven different teams. Each team, at the ICU as well as the Emergency Unit, works 24hs per week.

After the medical prescription is released, which happens by 12hs, in routine practice at these units, the prescriptions are scheduled, go to the pharmacy and, by 14hs, it forwards the drugs for the next 24hs. No satellite inventories are present at the units. At the units, the nurse is responsible for scheduling the drugs, including intravenous medicines. Then, the prescription is released and the technician is responsible for preparing and administering the drug. Intravenous drugs were chosen because severe reactions happen rapidly through this route and can cause severe damage to the patients.

To know how many prescriptions should be analyzed, in the calculation of the sample, the mean number of prescriptions per month at the units was considered, and the formula was used for calculating samples in cross-sectional studies with finite populations. A 95% confidence level was adopted, with α of 0.05 and a critical value of 1.96, resulting in a minimum sample of 135 prescriptions. The data collection technique was documentary analysis. Prescriptions were selected that contained at least two intravenous drugs. From each prescription, only the contents related to the intravenous drugs and scheduling were registered. Intravenous drugs in the form of continuous infusion, in urgency and emergency situations, blood products or in examination situations were disregarded.

The potential drug interactions were identified and classified based on pairs of drugs scheduled at the same time, with support from the tool Drug Interactions, available in the database Micromedex Healthcare Series,[10] which is updated every three months. The advantages of this base are related to information about the drugs, their descriptions in terms of pharmacokinetics and pharmacodynamics, their indications and contraindications, adverse effects and drug interactions, among others.

The PDi classification according to the damage caused to the patient was used, which can be mild, moderate or severe. Severe interactions are potentially life threatening or can cause permanent damage. Moderate interactions are considered as those events that cause deterioration in the patient's clinical condition, demanding additional treatment, hospitalization or extended hospitalization; and mild interactions entail mild effects, which are slightly troublesome or go by unnoticed, but do not significantly influence the effect of therapy and do not require additional treatment.[11]

In this study, severe PDIs were chosen as the start of their action is short-term (within 24 hours); they can represent a risk for the patient's life, causing permanent damage or deterioration of the clinical condition; is accompanied by well established documents, based on scientific literature, and the probability of their occurrence in clinical practice is high.[11]

The data were organized in SPSS 14.0. The intravenous drugs scheduled at the same time were filtered and submitted to the tool Micromedex Drug Interactions. For statistical treatment, support was received from the project "*Junior* Statistical Solution" at UERJ. *Odds Ratio* with their respective Confidence Intervals (CI) were used to estimate the chance of finding PDIs, in function of the number of drugs prescribed, besides descriptive statistics. This study received approval from the hospital's ethics committee (CEP-HGB 22/07).

RESULTS

The results were obtained from 135 prescriptions, 64 (47.00%) from the Emergency and 71 (53.00%) from the ICU.

Scheduling profile

The findings showed 1847 scheduled doses, 592 (32%) doses from the Emergency and 1255 (68%) from the ICU. Prescriptions included 263 (35.54%) different drugs at the Emergency and 477 (64.45%) at the ICU. The mean number of drugs per prescription was 4.1(±1.05) and 6.7(±2.03), and the mean number of doses per prescription corresponded to 8.8 (±1.05) and 17.6 (±0.9) at the Emergency and ICU, respectively. Figure 1 presents the distribution of doses per hour at the two units.

Similarities were identified between the hours scheduled at both units, with the same peaks in both sectors. The ICU used more hours than the Emergency though. In both sectors, the drugs were scheduled in even hours. The data show that four hours concentrated the major part of medication administration during the day shift: 10h, 12h, 14h and 18h, and three hours during the night shift: 22h, 24h and 06h. At both units, 06h was the time that showed the highest concentration, with 369

and 170 doses at the ICU and Emergency, respectively. During the day shift, the highest frequent at the ICU was at 14h, with 209 doses and, at the Emergency, at 12h with 79 doses.

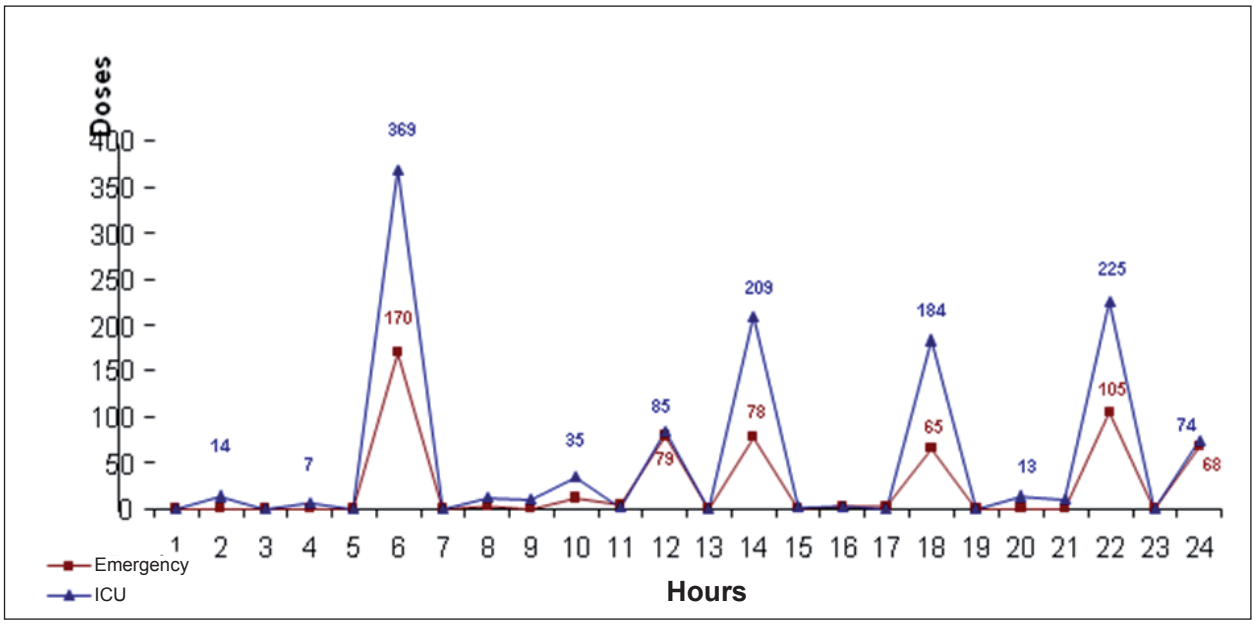

Figure 1 - Distribution of schedules doses per hour at the ICU and Emergency. Rio de Janeiro-RJ, 2008

Severe potential drug interactions

Forty-three severe PDIs were found in the 135 prescriptions analyzed. Table 1 displays the distribution of prescriptions with and without PDIs (including mild, moderate and severe cases, according to the number of drugs and sector). At the Emergency Unit, more cases of PDIs were found among prescriptions with up to five drugs. It should be reminded that this was also the unit that used less hours for scheduling, concentrating many drugs at 6h, 14h and 22h.

Table 1 - Prescriptions with and without PDI, according to the number of drugs, per prescription at the ICU and at the Emergency Unit. Rio de Janeiro-RJ, 2008

Number of drugs per prescription	Prescriptions at Emergency Unit (n=64)				Prescriptions at ICU (n=71)				Total (n=135)			
	Without DI		With DI		Without DI		With DI		Without DI		With DI	
	n	%	n	%	n	%	n	%	n	%	n	%
Up to five	**27**	42.19	**22**	34.38	9	12.68	10	14.08	36	26.67	32	23.70
More than five	**1**	1.56	14	21.88	9	12.68	43	60.56	10	7.41	57	42.22
Total	**28**	43.75	36	56.25	18	25.35	53	74.65	46	34.07	89	65.93

Eighty-nine prescriptions with PDIs were found and, when considering the number of drugs per prescription, the prevalence found corresponded to 1.85, with an *Odds Ratio* of 5.7 for prescriptions with more than five drugs, showing a six times higher chance of finding PDI (Table 2).

Table 2 –- Prevalence and *Odds Ratio* in prescriptions, according to the number of drugs, per prescription at the ICU and at the Emergency. Rio de Janeiro-RJ, 2008

Drugs per prescription	Prescriptions with PDI (n=89)	Prevalence	OR(CI)
Up to five	32	0.47	0.89(1.2-2.9)
More than five	57	1.85	5.70(2.3-6.8)

According to table 3, 43 PDIs were found with severe patient damage, all of them with an excellent documentation level, with twice as much cases of severe PDI at the ICU.

Table 3 - Frequency of severe PDI at the ICU and Emergency. Rio de Janeiro-RJ, 2008

Damage	Emergency		ICU		Total	
	n	%	n	%	n	%
Severe	13	30.23	30	69.76	43	100

Severe PDIs correspond to the combination of 17 and nine pairs of intravenous drugs, respectively, at the ICU and at the Emergency. In table 4, the pairs of drugs that were scheduled together at least twice are displayed.

Table 4 - Pairs of prevalent drugs involved in severe PDIs at the ICU and at the Emergency Unit. Rio de Janeiro-RJ, 2008

Severe PDI	Drug 1	Drug 2	n*
1	phenytoin	haloperidol	5
2	phenytoin	metoclopramide hydrochloride	4
3	phenytoin	metronidazole	4
4	phenytoin	ranitidine hydrochloride	3
5	vancomycin hydrochloride	ranitidine hydrochloride	3
6	vancomycin hydrochloride	meropenem	3
7	vancomycin hydrochloride	imipenem	3
8	ranitidine hydrochloride	tramadol hydrochloride	2
9	ranitidine hydrochloride	haloperidol	2

* number of times the pair of drugs was involved in PDI.

The prevalent drugs involved in severe PDIs were sodium phenytoin (n=16), ranitidine hydrochloride (n=10) and vancomycin hydrochloride (n=9).

DISCUSSION

Scheduling profile

In this study, scheduled doses were predominant during the night shift (57.11%), concentrated at 06h (29.18%) and 22h (17.86%). No scheduled doses were found at uneven hours. Few doses were found between 7h and 11h, between 15h and 17h and between 01h and 05h. The ICU and Emergency show a similar scheduling pattern, using four times, preferably (06h, 14h, 18h and 22h) to administer most of the drugs.

The above data are in line with another publication,[7] regarding the predominance of the nighttime as well as the distribution of hours with little or no scheduled doses in the morning, the middle of the afternoon and the late night.[7]

In most cases, the drug scheduling times depended on the hospital's organization to develop its activities. One example is that the first administration time during the day shift was at 14h, explained by the fact that, at that time, the medical routine had concluded the prescriptions and these had been forwarded to the pharmacy, which had forwarded the drugs to the units.

On the other hand, using four predominant times would also help nursing to control the drug dispensation as, in case of any error in the forwarding of the drug by the pharmacy, there would be time to correct the problem before the next dose. Nursing still controls drug dispensation errors, which is responsible for checking whether the forwarded drug corresponds to the medical prescription, in the collective as well as the individual dispensation system.

The present study data are probably due to institutional routines, such prevalent procedures in the morning, shift transfer, visits, elaboration of the prescription, dispensation and distribution of the drugs to the sectors.[12]

These findings seem to confirm the fact that the organization and execution of the scheduling at these sectors seem to be strongly adapted to the institutional routines, as an activity that seems to be hardly valued, although it demands knowledge to avoid potential drug interactions that can harm the patient's medication therapy. An organizational logic exists, in which nursing follows standardized times at the institution, without considering the possibility of drug interactions.[13]

Diversifying the times can be a strategy to reduce PDIs, suggesting the use of uneven times for medication scheduling. Although the literature does not specifically address how medication hours should be distributed, some drugs, like antibiotics for example, should be initiated as soon as they are prescribed to achieve the intended therapeutic benefit. That conduct was not observed in this research though. One frequent argument was that, to avoid forgetting a different time, the drug was administered at the even hours already standardized at the units.[13-14]

Drugs should be prepared in a safe environment, which could be where the nurses schedule the medication, so as to allow the professional to consult tables, protocols, in short, simple and practical resources to inform them about the most common PDIs involving intravenous drugs.[13-14]

It was verified that nursing professionals develop a *modo operandis* that makes everything work but that, in view of complex situations, with hardly agile systems, subject to inter-related decisions, a high probability of errors is expected.[13-14]

This form of organizing the scheduling confirms the idea that most errors that take place have systemic origins, which can be traced back to the work process. The systemic view of errors considers that human beings are fallible and that errors are consequences, instead of causes, thus attributing great importance to system safety.[12]

Severe potential drug interactions

Forty-three severe PDIs were found in the 135 prescriptions analyzed at the ICU and Emergency, in line with other studies.[15-17]

Although the mean number of drugs per prescription was lower than in other reference studies,[6,9] the concentration of many doses at 6h (n=369) and 24h (n=225) probably enhanced the occurrence of PDI, with a prevalence rate of 1.85 and an *Odds Ratio* of 5.7 in prescriptions with more than five drugs, that is, an almost six times higher chance of finding PDI in prescriptions with more than five drugs.

In one study, it is informed that patients using five drugs have a 50% probability of developing a drug interaction. When this number increases to seven, the probability rises to 100%.[16]

All prescriptions with more than ten scheduled drugs revealed PDI; this is in accordance with a research in which it was observed that 100% of the prescriptions with more than ten drugs showed drug interactions.[16]

As regards the medicines, it is known that some classes show a high probability of clinically relevant PDI, such as diuretics, analgesics, non-steroidal anti-inflammatory agents, anti-secretory drugs and benzodiazepines, which are responsible for 89% of clinically severe drug interactions.[16]

The prevalent drugs involved in severe PDIs were sodium phenytoin (n=16), ranitidine hydrochloride (n=10) and vancomycin hydrochloride (n=9). These PDIs will be discussed in further detail.

Sodium phenytoin (n=16)

Sodium phenytoin was scheduled at the same time at haloperidol, metoclopramide hydrochloride, metronidazole and ranitidine hydrochloride.

The highest frequency of interactions was observed between sodium phenytoin and haloperidol (n=5). These data coincide with another study, in which the highest prevalence of PDI

was found between these two drugs.[9] This PDI is predictable, has been well documented in the literature and is considered severe.[10-11,17]

Sodium phenytoin is an anti-convulsive agent used to control certain kinds of convulsions in epilepsy treatment. It does not have sedative effects in habitual doses. This interaction is considered severe, due to the risk of respiratory failure and bradycardia, with consequences like extended hospitalization and even patient death.[17-18]

Schedules were found that combined sodium phenytoin with metoclopramide hydrochloride. Available evidence suggests that the effect of the interaction between metoclopramide hydrochloride (both oral and venous) and sodium phenytoin can modestly increase the absorption speed of sodium phenytoin. This is due to the more rapid advance of sodium phenytoin to its absorption site in the presence of pro-kinetic agents like metoclopramide hydrochloride. This PDI is severe, as the serum levels of sodium phenytoin reach toxic heights, causing bradycardia due to changes in the electrolyte inflow, which can cause a reduction in the cardiac output.[10-11]

Schedules were found that combined sodium phenytoin with metronidazole. Sodium phenytoin accelerates the activity of the CYP3A4 enzyme in the cytochrome, responsible for the hepatic metabolism of metronidazole, resulting in its increased excretion, which can cause a drop in the plasma and tissue levels of metronidazole, compromising the control of the infection process. The PDI between these drugs is classified as severe patient damage as, in this interaction, the sodium phenytoin is dislocated from its connection sites and the free fraction of sodium phenytoin increases, which can favor epileptic crisis events.[11]

The scheduling of sodium phenytoin with ranitidine hydrochloride is classified as severe. Ranitidine hydrochloride, probably through metabolic stimulus, reduces the serum levels of sodium phenytoin, as well as its therapeutic effectiveness, increasing the risk of convulsion crises.[11]

Ranitidine hydrochloride (n=10)

Cases of scheduling were found between ranitidine hydrochloride and vancomycin hydrochloride, sodium phenytoin, tramadol hydrochloride and haloperidol.

Ranitidine hydrochloride belongs to the class of histamine receptor antagonists. Its main action is the reduction of acid gastric secretion, with few collateral effects. It is one of the drugs indicated for the prophylaxis and medication treatment of stress ulcer. Tramadol hydrochloride is a central-action opioid analgesic and a reuptake inhibitor of serotonin in the post-synaptic receivers and hyperpolarizes the neurons that transmit pain.[2,18]

This is a severe PDI, as the ranitidine hydrochloride, by inhibiting the metabolism, increases the serum levels of tramadol hydrochloride, with risks of apneic crises and bradycardia.

The PDI between ranitidine hydrochloride and haloperidol can cause severe patient damage, through the inhibiting effect of the ranitidine hydrochloride on the isozyme CYP3A4, reducing the hepatic metabolism, which can decrease the elimination of haloperidol and cause toxic serum levels of this drug. This can be particularly important with regard to the toxicity of the central nervous system, entailing alterations in the level of awareness, ranging from sleepiness to coma.[2,10]

The interaction between ranitidine hydrochloride and vancomycin hydrochloride is highly predictable, has been well documented in the literature and is considered extremely severe, as the metabolism of vancomycin hydrochloride is reduced, which can increase the serum vancomycin hydrochloride rate to toxic levels. This can cause renal cortex injury if the doses are not adjusted.[18]

The interaction between sodium phenytoin and ranitidine hydrochloride has been discussed earlier.

Vancomycin hydrochloride (n=9)

The findings showed that vancomycin hydrochloride was scheduled together with ranitidine hydrochloride (discussed earlier), imipenem and meropenem. The latter represent broader spectrum ß-lactam antibiotics and are the carbapenems available for clinical use in Brazil. The interaction between vancomycin hydrochloride and imipenem and meropenem is severe, for the same reasons for both antibiotics, as they cause an increase in the additive or synergic nephrotoxic effects the imipenem or meropenem when scheduled together with the vancomycin hydrochloride, in comparison with the isolated use of each of these agents.[17-20]

CONCLUSION

This study revealed that hardly any drugs are scheduled for administration in the morning, during visiting hours, late at night and during uneven hours. Four times are predominant, with a peak of doses at night. The odds ratio for PDI in prescriptions with more than five intravenous drugs corresponded to 5.7. Scheduling many drugs at few times seems to be more strongly associated with the way nursing is accustomed to organizing the work process to comply with the work load, as well as with a hardly agile medication system.

Three very common drugs in nursing practice that have a long history in daily hospital practice, with considerable literature about interactions, were responsible for most cases of severe PDI found: ranitidine hydrochloride, vancomycin hydrochloride and sodium phenytoin.

In that sense, the research served to reach an institutional diagnosis, alerting the nurses about the need to diversify times and modify routines to avoid severe PDIs.

Based on the collected data, the hospital where the research was undertaken started a training program that was focused on the main interactions and on how to change scheduling at the ICUs. During the training, protocols and tables with the main severe PDIs were used. Although they are known, these tables have not been that disseminated in the hospital nursing context. Nevertheless, these resources are efficient, cheap and easy to easy for any professional, provided that they are accessible at the place where nursing schedules the medication.

One orientation provided during the training was related to the intravenous administration of vancomycin hydrochloride and sodium phenytoin, rejecting the scheduling of these drugs together with any other medicine through the same route. Besides the aspects already mentioned about PDIs between vancomycin hydrochloride and the drugs found in this research, it is known that vancomycin hydrochloride can increase the risk of toxic reactions in the ears and kidneys, due to its interaction with many drugs, such as aminoglycosides, amphotericin, furosemide, among others. Similarly, sodium phenytoin interacts with a considerable number of drugs, prohibiting its intravenous administration together with other drugs.

The implementation of satellite units of the hospital pharmacy was suggested, so that nursing professionals can interact rapidly with pharmaceutical professionals, receiving their support and orientation with regard to scheduling doubts, among others.

Perhaps the ideal to avoid cases of scheduling that can provoke PDIs is the computerized prescription, including the medication schedule. Software has been developed exclusively to check for possible drug interactions, but this is not always within nursing's reach in the workplace. In addition, the use of computerized drug prescription systems, if associated with specific databases and calculators, allows physicians to instantaneously receive useful alerts about drug interactions while prescribing, preventing interactions provoked by mistaken scheduling. Sometimes, these alert systems can even suggest another drug, like substituting acetaminophen for salicylic acid, changing the pharmaceutical form or route. To implement this tool, however, some obstacles still need to be overcome, as it is expensive and needs a reasonable structure and health team training, a fact that undoubtedly explains its slow implementation in the hospital system.

Nurses should consider a severe PDI in function of a scheduling routine as a preventable error. Errors should serve as tools to promote the quality of the service delivered, drive institutional and professional changes, encourage non-punitive attitudes, permit the correction of system flaws and guarantee greater patient safety.

This research comes with important limitations, as the sampling came from a single hospital and the risk factors of the patients whose files were studied were not identified. Moreover, it was not monitored whether any actual damage occurred to the patients and not verified whether nursing interventions were needed. Also, the limited duration of the data collection restricts the generalization of the results.

Despite these limitations, this research offers advances for nursing, as its contributes to Brazilian literature on aspects of drug scheduling by nursing, confirming the almost exclusive use of even hours and the habit of not working based on protocols. For the hospital under analysis, it contributed by indicating the need for strategies to prevent errors due to scheduling, mainly involving intravenous drugs. Finally, elements were offered to study the relation among errors, work organization habits and institutional responsibilities, with

a view to improving the quality of patient care. Drugs should be understood as a therapeutic resource. Nurses are committed to the results of its use, and their management practices should guarantee safe medication administration processes.

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