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LITERATURE INTEGRATIVE REVIEW ARTICLE

NEEDLE-STICK STUFFS WITH SAFETY DEVICE FOR PREVENTION OF PERCUTANEOUS INJURIES: A LITERATURE REVIEW

MATERIAIS PERFUROCORTANTES COM DISPOSITIVO DE SEGURANÇA PARA PREVENÇÃO DE ACIDENTES PERCUTÂNEOS: UMA REVISÃO DA LITERATURA

MATERIALES PERFORO CORTANTES CON DISPOSITIVO DE SEGURIDAD EN LA PREVENCIÓN DE ACCIDENTES PERCUTÁNEOS: UNA REVISIÓN BIBLIOGRÁFICA

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ABSTRACT

Objective: to identify the literature on the use of needle-stick stuffs with safety devices for prevention of accidents. **Method:** descriptive study, of the type of integrative review of literature, with a survey of articles from the following databases: MEDLINE / PubMed, LILACS, Science Direct, SCOPUS, and Cochrane, from the research question << *Do the needle-stick stuffs with safety devices reduce percutaneous injuries among the health professionals?* >> For the sample, we elected 15 articles, presented in a figure. **Results:** the analysis of the eligible articles in this review showed a significant reduction in percutaneous injuries, ranging from 0.8% to 93% among healthcare professionals, with the use of objects with safety devices within their workplaces. **Conclusion:** needle-stick stuffs with safety devices reduce percutaneous injuries in the healthcare services; however, we should highlight the importance of active participation of high management, administration, coordination, and healthcare professionals from hospital institutions. **Descriptors:** Protective Equipment; Penetrating Injuries; Health Professional.

RESUMO

Objetivo: identificar a literatura sobre a utilização dos materiais perfurocortantes com dispositivos de segurança para prevenção de acidentes. **Método:** estudo descritivo, tipo revisão integrativa de literatura, com levantamento de artigos das seguintes bases de dados: MEDLINE/PubMed, LILACS, Science Direct, SCOPUS e Cochrane, a partir da questão de pesquisa << *Os materiais perfurocortantes com dispositivos de segurança reduzem os acidentes percutâneos entre profissionais de saúde?* >> Para amostra, elegeram-se 15 artigos, apresentados em uma figura. **Resultados:** a análise dos artigos evidenciou significativa redução dos acidentes percutâneos, com variação entre 0,8% a 93%, entre profissionais de saúde, com a utilização de materiais com dispositivos de segurança em seus locais de trabalho. **Conclusão:** materiais perfurocortantes com dispositivos de segurança reduzem os acidentes percutâneos nos serviços de saúde; entretanto, destaca-se a importância da participação ativa da alta direção, administração, coordenações e profissionais de saúde das instituições hospitalares. **Descritores:** Equipamentos de Proteção; Ferimentos Penetrantes; Profissional de Saúde.

RESUMEN

Objetivo: identificar la literatura sobre la utilización de los materiales perforo cortantes con dispositivos de seguridad en la prevención de accidentes. **Método:** estudio descriptivo, tipo revisión integrativa de literatura con levantamiento de artículos de las bases de datos MEDLINE/Pubmed, LILACS, Science Direct, SCOPUS y Cochrane, a partir de la cuestión de investigación << *Los materiales perforo cortantes con dispositivo de seguridad reducen los accidentes percutáneos entre los profesionales sanitarios* >> Para muestreo, se eligieron 15 artículos, presentados en una figura. **Resultados:** el análisis de los artículos seleccionables en esta revisión denotó una significativa reducción de los accidentes percutáneos con variación entre 0,8% al 93%, entre profesionales sanitarios, con el empleo de materiales con dispositivos de seguridad en sus locales de trabajo. **Conclusión:** materiales perforo cortantes con dispositivos de seguridad reducen los accidentes percutáneos en los servicios sanitarios, aunque se destaca la participación activa de la alta dirección, administración, coordinaciones y profesionales sanitarios de las instituciones hospitalarias. **Descriptores:** Equipos de Protección; Heridas Penetrantes; Profesional Sanitario.

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INTRODUCTION

The needle-stick stuffs used in health services for patient care, such as needles and blades, may represent a potential risk for the occurrence of occupational injuries among health care workers, through the breaking of the cutaneous-mucous barrier.¹

Among health professionals, the nursing team represents the group most affected by percutaneous occupational injuries, considering that these professionals are responsible for direct care to the patients, by performing several procedures which involve the manipulation of needles and blades. However, other professional categories such as doctors, laboratory technicians and medicine students and / or of nursing also have potential risk of being targeted by needle-stick objects due to the activity performed, the labor sector and the possible disbelief in the own risk of occurrence of accidents.²⁻⁶

Upon the occurrence of percutaneous injuries, in their workplaces, health professionals are exposed to the pathogens, including hepatitis B virus (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV), which are transmitted by direct contact with blood and body fluids, especially with needle-stick stuffs (sharps).²

The Center for Disease Control and Prevention (CDC) estimates the occurrence of about 385.000 accidents per year, in the United States, related to the needle-sticks stuffs among health workers.²

In Brazil, although there is not systematic data on the occurrence of accidents involving needle-sticks, some studies point out to a high incidence.⁶ Despite high levels, it is known that most accidents among the healthcare professionals are not reported, making this index is below the amounts disclosed.²

It is noteworthy that, in addition of the recording of occurrences with accidents involving sharps, of the existence of underreporting and possible risks of contamination, it is important to consider the psychological and emotional aspects of accident victims and their families, and furthermore the financial cost.²

Given the high incidence of percutaneous occupational injuries in healthcare services in the United States, the Occupational Safety and Health Administration (OSHA), an agency focused on Safety and Health at Work established preventive measures to get a reduction of these accidents.¹

One of the main strategies adopted to reduce occupational injuries among health professionals is the use of safety devices on the needle-stick stuffs. Such devices are similar to conventional materials and are characterized by easy handling, automatic shooting and self-retraction of the needle, reducing or even blocking the risk to the professional during the execution of a procedure.²

In 2001, the OSHA established the mandatory use of sharps with safety devices in American healthcare services. Data from this agency showed 34% reduction of needle-stick injuries in following year to the publication of the Law of national obligation of safety devices.¹

In Brazil, the Regulatory Norm nº 32 (NR 32), from the Ministry of Labour and Employment, specifically addresses some aspects of safety to workers' health in the healthcare services. Regarding measures to prevent percutaneous injuries, the NR 32 establishes the use of sharps with safety devices to replace the conventional ones.⁷

Although the NR 32 requires the use of safety devices, it is not possible to observe, in practice, a culture of prevention of occupational accidents with sharps among the health professionals in everyday of institutions, as well as training and proper use of such devices.⁸

It should be noted that the mandatory use of safety devices occurs about ten years in the United States and, in Brazil, despite the legislation in force, it is clear that, until this present time, most of the health establishments have not used these devices yet, leading health professionals to participate in the breach of a law, by not knowing it and / or ignore it.

In this perspective, besides the lack of knowledge on the legislation, it appears that non-use of these safety devices can be related to other factors, such as: lack of commitment of health institutions with the safety and health of workers and, lack of knowledge on reduction of percutaneous accidents with the use of such devices.

Thus, this study is justified by the need to alert health professionals on the importance of instituting strategies to reduce percutaneous injuries in healthcare services and subsidizes them in fulfilling the NR 32.

For driving this integrative review, we formulated the following question: Do the needle-stick stuffs with safety devices reduce percutaneous injuries among the health

professionals?

OBJECTIVE

- Identify the literature on the use of needle-stick stuffs with safety devices for prevention of injuries.

METHOD

For performing this article, we choose the integrative literature review, which allows associating and synthesizing results of researches on a theme, orderly, collaborating to deepen this theme. Furthermore, this methodology favors gathering of evidence that are focused on the reasons for the practice in service.⁹

We conducted a search for original articles in the languages - English, Spanish and Portuguese - in the following databases: Medical Literature (MEDLINE / PubMed), Latin American and Caribbean Health Sciences (LILACS), Science Direct, SciVerse SCOPUS (Database of Research Literature) and Cochrane library, which would have been published between 2001 and May 2011. The definition of the start date of the search for articles was due to the fact that this year is the publication year of American law that established the mandatory use of needle-stick stuffs with safety devices in healthcare services of that country (USA), which is the benchmark for this study.

The descriptors controlled according to the nomenclature DeCs / Mesh that we used were: protective equipment; penetrating injuries; and health professional. The descriptors abovementioned and associations among these were performed in English and Portuguese.

After careful reading of the title and the abstract of articles found online, we selected those who met the inclusion criteria: original articles published between 2001 and May 2011, which aimed to evaluate the use of safety devices in healthcare services in tertiary care and / or with approach of evidence of the reduction of accidents involving needle-stick stuffs. We excluded review articles and those ones that were not related to the proposed theme. Thus, obeying the criteria for inclusion and exclusion, we elected 15 articles.

In the analysis of the articles, the following categories of healthcare professionals were included: nurses, nursing assistants and nursing technicians, doctors from several sectors of the hospital environment, including the emergency departments, intensive care

unit; unit of clinical medicine; surgical unit; room surgery; and blood transfusion service.

RESULTS

In this review, we used 15 articles and all of them were in English and met the inclusion criteria previously established.

From the analysis of publications, nine were found only in the database of PubMed and six in the databases of PubMed and Science Direct.

In the databases we did not find national articles (from Brazil) associated with the use of needle-stick stuffs with safety devices and its relation to the reduction of percutaneous injuries in healthcare services. Possibly, it has happened because the NR 32 is a relatively new standard in our country - Brazil.

As for the nationalities of the studies, there was a predominance of American articles (6), followed by French (3), English (2), Scottish (1), New Zealander (1), Australian (1), Spanish (1).

In the analysis of the selected articles, the following categories of health professionals were included: nurses, nursing assistants and nursing technicians, doctors from several sectors of the hospital environment, including the emergency departments, intensive care unit; unit of clinical medicine; surgical unit; room surgery; and blood transfusion service.^{3-5,10-21}

It was found that the greater use of sharps and the execution of invasive procedures arose from the nursing team, and this category was the most assessed among the studies.²⁻⁶

The needle-sticks with safety devices which were evaluated or tested were: high steel needles (scalps), tubes for blood collection, syringes with hypodermic needles, catheters for venipuncture retractable lancets, retractable needles, arterial-venous fistula needles, suture needles, intravenous catheters.^{3-5,10-20}

In the studies we evaluated several invasive procedures (injections, blood collection, capillary blood glucose, arterial puncture, intravascular catheterization and sutures), three of which referred, specifically, to phlebotomy (blood collection and / or venipuncture).^{3-5,10-20}

In 10 of the articles we found that, in the use of safety devices in healthcare services, the professionals involved received prior guidance and training.^{4,5,10,11,15-8,20,21}

After the use of sharps with safety devices, the studies (7/15) that evaluated directly the reduction of occurrence accidents with needle-stick stuffs showed a decrease of their number, varying from 0.8% to 93%, in a follow-up period and monitoring between six months and seven years.^{3-5,10-12,15-20}

For those ones (2/15) that indirectly have monitored the occurrence of accidents involving percutaneous lesions after introduction of sharps with safety devices, we proposed a reduction estimate model of accidents with a range from 56% to 80%.³⁻⁴

It was observed that, even with the use of sharps with safety devices, a significant number of accidents had occurred in (8/15) of the studies. These accidents, possibly, were related to mechanical failure in the use of safety devices, such as non-activation of the safety mechanism; the misuse of the device by the health professional; lack of motivation by professional in using non-conventional stuffs, which was evidenced by the low risk perception and ineffective training, considering that the triggering of some devices depends on the human factor.^{4,5,10-13,15,16}

In only one of the articles the occurrence of percutaneous injuries was monitored, which used safety device system in sharps. Such paper emphasized the activation mechanism (active or passive) of the devices. It was found that devices with passive mechanisms, that is to say, those that are automatically activated and, that does not depend on the human factor, were more effective in preventing needle-stick injuries in relation to those who need to be activated manually by the health professional.¹³

Furthermore, it is noteworthy to highlight that nine analyzed studies have associated and considered relevant the programs of continuing education in service and training of health workers, as one of the preventive measures to the reduction of occupational accidents involving sharps. Other measures should be valued, such as: the use of gloves, use of proper containers for disposal of needle-stick waste, disclosure of reports with surveillance data and monitoring on the situation of accidents for health professionals and, above all, an ongoing evaluation of the impact of use of such devices within the workplaces.^{4,5,10,11,13,16-18,20}

The high cost of materials with safety devices, in comparison to conventional stuffs, was appointed in five of the studies as a blocker factor for their use. Nevertheless,

studies on the cost-benefit of using these devices deserve a further analysis, considering the effective safety of these devices and direct and indirect costs in the occurrence of lesions (possibility of work leave, serologic exams, pharmacological treatment and emotional trauma of professionals in face of the uncertainty of a possible contamination).^{5,10,11,16,17}

Figure 1 shows the synthesis of the studies included in this review.

Author/ Year	Objective	Main Findings
Reddy et al, 2001 ⁽²⁰⁾	Evaluate the effect of the introduction of devices of safety engineering in controlling of needle-stick injuries among the healthcare workers.	-Reduction of accidents with sharp objects during six years of surveillance; -Effectiveness of the devices, although the study has its limitations: presence of conventional devices and lack of detailing on the accidents.
Alvarado- Ramy et al, 2003 ⁽⁴⁾	Analyze the safety devices in preventing accidents and lesions associated to the phlebotomy.	- Safety devices used have reduced needle-stick injuries in comparison to the conventional ones; - Safety devices, professionals training and participation in the selection of these can be effective in the prevention of percutaneous lesions; - Safety devices are useful measures in reducing accidents.
Sohn et al 2004 ⁽¹⁵⁾	Evaluate if the use of device of safety engineering modifies the notification of accidents.	-Yearly reduction of 61.9% of percutaneous injuries; -The intervention that occurred was associated to the intensive education of professionals.
Rogues et al 2004 ⁽¹⁰⁾	Determine the effectiveness of 2 protective devices in preventing of needle-stick injuries among the healthcare workers.	7.4% reduction of percutaneous injuries and 48% in the overall rate of injuries with syringes; - The use of the safety devices is not the only one strategy in reducing accidents, should be associated to the education of health professionals.
Waclawskiet al 2004 ⁽¹⁹⁾	Identify alternative instruments which, if were used, they would improve the worker safety.	Average of accidents that happened: - 63% with sharps; - 27% needles (50% hollow needles); - 65% could have been avoided with the use of safety devices.
Sohn et al, 2004 ⁽⁵⁾	Evaluate the effect of the use of safety devices in the epidemiology of cutaneous lesions.	-Reduction between 61.5% and 74.5%, and it was greater in procedures of insertion of needled catheters.
Adams et al, 2006 ⁽¹⁷⁾	Evaluate the effect of the introduction of several safety devices of hypodermic needle on the number of reports of needle-stick injuries.	18% reduction of accidents post-educational program and 70% with the use of safety devices; - Detected problems with the devices: 85% activated pre-disposal, a parcel without activation; - It is important to sensitize the professionals for acceptance of new technologies.
Cullem et al 2006 ⁽³⁾	Estimate the proportion of reports on needle-stick injuries which could be avoided, either by introducing of safety device, guidance or both.	- Accidents in venipuncture: 39% during the procedure, 27% after the procedure and before disposal of the device; 21% during disposal. -All accidents by venipuncture / injection could be preventable (56% and 80%) by the use of safety devices; 52% and 56% with adherence of existing norms; 72% and 88% with both interventions.
Azar-Cavanagh et al 2007 ⁽¹⁶⁾	Evaluate the effect of the introduction of a device designed to prevent needle-stick lesions in healthcare professionals.	- 50% reduction of accidents with intravenous needles; -Increase in accidents with suture needles; -Safety device reduces needle-stick injuries, but training and continuing education are essentials.
Valls et al 2007 ⁽¹¹⁾	Study on the effectiveness of safety devices intended to prevent percutaneous injuries.	93% reduction in the risk of percutaneous injuries; - Safety device have reduced accidents in the emergency sectors; but to have real impact, it should be supported by qualification for the professionals and continuing education.
Lamontagne et al 2007 ⁽¹²⁾	Evaluate the devices of safety engineering, regarding their effectiveness in preventing needle injuries in healthcare services.	75% reduction in the risk of needle-stick injuries, but 23 accidents have occurred even during the use of safety devices; - Accidents during phlebotomy were (4x) lesser with the use of safety devices in comparison to the conventional ones.
Whitby et al, 2008 ⁽⁸⁾	Monitor the needle-stick injuries for 2 years after the introduction of safety devices.	Average reduction of 49% of accidents with hollow needles. - The deployment of safety devices with acceptable financial cost is possible.
Grimmond et al 2010 ⁽²¹⁾	Address the hypothesis that containers with advanced engineering can reduce the accidents involving needles.	Reduction of accidents after deployment of container with advanced engineering (0.8%).
Tosini et al 2010 ⁽¹³⁾	Evaluate the incidence of needle-stick injuries among the different models of safety devices: automatic, semi-automatic, and manually activated in healthcare services.	Among the most effective types of safety devices, in this order are the following triggering drives: passive, active and semi-active.
Jagger et al 2010 ⁽¹⁴⁾	Analyze the percutaneous injuries from 87 hospitals from the U.S. between 1993 and 2006, comparing accident rates in surgical and non-surgical environments, before and after validation of the law.	- 31.6% reduction of accident within the non-surgical sector; - 72.7% with suture needles, scalps and disposable syringes; - Despite the legislation and technological advances of safety: - The accidents increased in 6.5% (surgical room) - Significant decrease of accidents (non-surgical sector).

Figure 1. Synthesis of publications included in the integrative review according to the first author, publication year, objective and main findings.

DISCUSSION

In the studies analyzed, it was found that the nursing team was the most assessed category of health professionals in studies, by representing the most affected group by percutaneous injuries, also by being the one with the greatest responsibility for direct care to the patients, performing several procedures that involve handling of needles and blades.²

Accidents reported in a Reference Center for Worker's Health have revealed that the category of nursing assistants was the most affected, with 54.2% of episodes; followed by nursing technicians with 17%; nurses with 11.8%; and assistants for general services, with 6.5% of occurrences.²³ One study within the emergency department of a hospital showed that of the 96 accidents among professionals assessed, the highest percentage of them were concentrated among technicians / assistants of nursing (49%), followed by general surgeons (34.4%), general practitioners (8.3%), neurosurgeons (6.3%) and nurses (2.1%), and in the grouping by profession, we found that more than half of accidents were reported by nursing team, while the doctors have suffered 49% of the accidents.²⁴

Although this review makes clear that the use of objects with safety devices reduce the percutaneous lesions, one realizes that most authors emphasize that this is one of the important tools for prevention and reduction of needle-stick injuries in healthcare services; however this strategy should be associated to the other measures, such as:

- Continuing education in health:

According to the *Workbook for Designing, Implementing and Evaluating a Sharps injury prevention program*, from CDC, a planning to reduce needle-stick injuries involves the implementation of several interventions, among them, we should note the one for establishing and monitoring programs for qualification in service.²

In the analysis of accidents involving nursing students, there was a range (decrease) from 50.5% to 25.2% in the occurrence of needle-stick injuries after introduction educational program for prevention of such accidents.²⁴ In a survey that evaluated the impact of surveillance and education program on the rate of accidents involving sharps among healthcare professionals in a tertiary care hospital, it was observed that: there was a trend in the

increase in lesions in the pre-intervention period (2002-2004), but with significant reduction of accidents in the post-educational intervention period (2006- 2007).²⁵

- Personal Protective Equipment (PPE):

The PPEs are used in order to protect workers in a general manner. It is a task of the employer company the free supply of PPEs, according to the risk that the employee is exposed, being recommended for activities that favor the contact with biological agents: the gloves, capes, masks and goggles (protection glasses), boots and an appropriate box to disposal of the needle-stick objects.^{7,26}

- Safety culture:

According to CDC, institutions with strong safety culture, that is to say, the perception of workers with regard to the value assigned by the institution to the safety at work, organizational climate, may or show reductions in accident rates regardless of their origin.²

One of the points raised as blocker factor to the replacement of conventional sharps for equipment of safety engineering in health services is the higher cost of these devices. But, we should also consider the financial costs before the occurrence of skin lesions which expose the health's worker to the risk to biological material.

The direct costs of occupational accidents with exposure to biological material are associated to the prophylactic treatment and follow-up of injured workers, and it should be estimated a spending between \$ 71 and \$ 5,000 in the United States of America. It is important to highlight the costs of hard measurement, such as the emotional cost, related to the feelings from workers and their families, such as: fear, anxiety and worry, arising from the risk of acquiring diseases, besides social spending resulting to the seroconversion of harmed individual.²

As predicted, we did not find studies conducted in Brazil. There was a prevalence of American studies. This finding, possibly, could be explained by the wide dissemination, in the United States, of mandatory use of the safety devices in healthcare services, in force since the year of 2001.

Given this context, it should be inferred as potential difficulties for the implementation of safety devices in Brazil, the lack of disclosure of their mandatory use, lack of interest by the institutions and lack of knowledge of healthcare professionals, or even their lack of involvement with the issue,

considering that the obligation of the use of such devices is still recent.

The involvement of health institutions in assessing and meeting the fulfillment of the NR-32 is urgent, in its social and political aspects, as well as instruments for greater pressure and participation of the councils and agencies which drive the health occupations and, even from society in a general way.

CONCLUSION

The needle-sticks stuffs with safety devices reduce the percutaneous injuries, when compared to the use of conventional needle-stick stuffs. Therefore, they are effective tools in the prevention of occupational accidents related to the exposure to the blood pathogens in healthcare professionals, since they are combined with other strategies.

For that their use occurs effectively, some preventive measures are necessary, such as: continuing education and in service and, qualification for the workers to a proper use of these devices, mainly, aimed at reducing accidents and, crucially, the involvement and active participation of high management, coordination and of healthcare professionals.

Throughout this process, it should be highlighted the important role of the nurse professional in selection and evaluation of devices, education in service, training and involvement of the team in the elaboration and fulfillment of the prevention program of injuries involving needle-stick stuffs.

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