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Audit of standardized precautionary and contact practices in the Intensive Care Unit*

Auditoria de práticas de precauções-padrão e contato em Unidade de Terapia Intensiva

Auditoría de prácticas de precauciones estándar y contacto en Unidad de Cuidados Intensivos

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ABSTRACT

Objective: To evaluate the structure and adherence to the standardized and specific precautionary measures of health professionals in the Intensive Care Unit of a teaching hospital in the Federal District of Brazil. **Method:** A descriptive, cross-sectional and prospective study. A structured questionnaire was used via observations which recorded the practices of professionals with Individual Protection Equipment and indications of precautions. The chi-square test was applied, and the p-value was calculated. **Results:** A total of 52 professionals participated in the study, and 445 care procedures were observed in 36 audit sessions. The average adhesion rate for equipment use was 72.72%, with 94.91% for gloves, 91.43% for aprons, 80% for masks and 24.56% for safety glasses. When there was no indication and no personal protective equipment was used, the average rate was 68.01%, with 30.77% for gloves, 87.58% for aprons, 57.58% for masks, and 96.13% for safety glasses. Contact precautions were unnecessarily indicated for 35% of patients. **Conclusion:** Good adherence to using gloves, aprons and masks were observed, but there was poor adherence to using safety glasses and unnecessary use of masks and admission contact precautions.

DESCRIPTORS

Infection Control; Intensive Care Units; Health Personnel; Universal Precautions; Professional Practice; Patient Safety.

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INTRODUCTION

Healthcare-Associated Infections (HAI) are a "major problem for patient safety because their impact may result in prolonged hospitalization, long-term disability, increased antimicrobial resistance and mortality, and additional financial burden on the health system, patients and family. It is currently estimated that for every 100 inpatients, at least 7 in developed countries and 10 in developing countries will acquire HAI"[1-2].

Due to the high occurrence of multiresistant pathogens and the high frequency of invasive procedures in Intensive Care Units (ICUs), good precautionary practices are paramount in the care of critical patients[1-5].

Standardized precautions include a group of infection prevention practices indicated for the care of all patients, regardless of suspicion or confirmation of infection, such as: hand hygiene, correct use of Personal Protective Equipment (PPE), patient accommodation in a place according to risk, respiratory hygiene or coughing etiquette, safe handling of sharps, safe handling/collection of clothing and waste, cleaning and disinfection of surfaces and items, and safe injection practices[3-5].

Special precautions should be added to standard precautions involving three categories according to the transmission mode of the infectious agent, namely: contact, droplet and aerosol precautions. These precautions are used when the transmission route(s) of the infectious agent is not completely discontinued by the use of the standardized precautions[3-5].

Recent US and European publications dealing with measures to control and prevent the transmission of multiresistant bacteria in hospitalized patients include promotion of hand hygiene, contact precautions and active screening cultures. Additionally, the need for alert systems which enable identifying patients known to be colonized at admission, rigorous environmental cleaning practices and effective antimicrobial use management system are highlighted[4-5].

Periodic evaluations of processes involving the prevention and control of HAI in health services are recommended[3-5]. Studies which have evaluated the use of PPE and recommendations of isolations used an interview technique and questionnaires to identify professionals' self-reported knowledge and practices[6-8]. However, direct observations on audits by trained observers are also used, and generally show lower adherence rates than self-reported reports[9-10].

Studies which have evaluated the context of hand hygiene practice point to the disadvantages of direct observation, such as the time required to perform the observations, the need for a capable and trained professional, the lack of a standardized method for observations, and the risk of bias when evaluating work shifts, and mainly the subjection to the Hawthorne effect, which refers to the change of the attitude or behavior of the professional when they know they are being observed[11-12].

In monitoring indicators, additional efforts are necessary to collect accurate information on what the phenomenon wishes to measure. It is not enough to only measure outcome indicators, as the involved structures and processes also need to be evaluated[9]. Therefore, in a situation of high HAI rates which are considered indicators of results, it is necessary to perform audits on the involved processes and structures, especially in teaching hospitals in which initial and continued training of students, residents and health professionals are being conducted.

An audit in the health area aims to obtain necessary information to control the quality of services and provides subsidies for improving and managing health actions in order to achieve greater efficiency[13]. As this is a relatively recent activity in Brazil, there are few studies addressing the theme, thereby pointing out the relevance and the need for research that contributes to knowledge in this health field and to nursing knowledge.

In view of the above, the following research question emerged: what is the adequacy of precautionary indications and adherence to the use of PPE in the care of critical patients? Thus, this study aimed to evaluate the structure and adherence to standardized and specific precautionary measures of health professionals in the Intensive Care Unit of a teaching hospital in the Federal District of Brazil.

METHOD

Study design

A descriptive, cross-sectional and prospective study with a quantitative approach.

Scenario

The study was conducted between September and December 2015 in a teaching hospital, considered medium-sized with 257 active beds, located in the city of Brasília, Federal District (DF), Brazil. The adult ICU was chosen as the research scenario, which had 10 active beds and is intended for the care of acute clinical and surgical patients at the time of the study.

The full-time staff who provided direct care to patients in this unit during the data collection period consisted of 31 nursing technicians, 10 nurses, 9 physicians and 5 physiotherapists, totaling a population of 55 employees.

The health professionals on the ICU's full-time/permanent staff who were directly involved in patient care included in the study were comprised of intensive care physicians, nurses, physiotherapists and nursing technicians, who accepted the invitation to participate in the study and signed the clear and Informed Consent Form (ICF). Professionals who were on medical leave, leave of absence or other leave were excluded during the data collection period.

Data collection

A primary data source was used and two questionnaires were applied. The first was a structured and self-administered questionnaire for collecting variables related to the demographic, professional and educational characteristics of the research participants.

The audit sessions of adherence to precautionary practices were carried out by direct observation of professionals in the unit in a non-participatory manner and without obscuring the presence of the observer. These sessions relied on research assistants who underwent prior theoretical-practical training in order to reduce the Hawthorne effect and to blind the principal investigator at this stage of the study.

A structured checklist questionnaire was constructed based on the validated indicators of the Quality Assessment Manual of the Hospital Infection Control Practices of the Center for Epidemiological Surveillance of São Paulo (*Manual de Avaliação de Qualidade das Práticas de Controle de Infecção Hospitalar do Centro de Vigilância Epidemiológica de São Paulo*)[9]. The new questionnaire used in this study was previously tested at the hospital in a pilot study conducted by the lead investigator in 2010. The instrument was adapted to the needs of the study and to the reality of the ICU to be used in the auditing sessions. The following data were recorded in the questionnaire: (1) availability of PPE in the unit (non-sterile procedure and apron/gloves at the bedside, mask and safety glasses at the nursing station); (2) number of professionals present per category, considering the number of beds occupied in the unit for the subsequent calculation of whether or not the minimum number required by the health regulations (one physician, one physiotherapist and one nurse per 10 beds, a nurse technician for every two beds and a day-care physician during the morning and afternoon shifts); (3) the use or not of any adornment items (rings, bracelets, watches or fake nails) on the hands/wrists of the professionals; (4) the type of care procedure performed by the professional with the patient, the use of PPE by the professional during the procedure, the type of precaution indicated on the patient's bedside identification record for the procedure the patient was submitted to; (5) whether or not the type of precaution indicated on the patient's bedside identification record is applied to the precautionary patient registration chart of the Healthcare-Associated Infection Control Committee (HAICC) of the hospital present at the unit's nursing station; (6) adequacy or not of PPE used by the professional for the care procedure based on the risk observed by the investigator during the procedure and the comparison with a standardized table by HAICC which records which PPE are indicated for use according to the performed procedure and the type of precautions to which the patient is subjected.

The study did not evaluate the technique used by professionals to place or remove PPE. The observation sessions lasted from 30 to 60 minutes and were performed in the morning, afternoon and evening periods.

The research was developed in four sequential stages: (1) approach by the research team with the field and application of the ICF in September 2015; (2) application of the questionnaire to characterize the professionals participating in the study in September 2015; (3) observer training in another hospital unit (Semi-intensive Unit); and (4) ICU audits between October and December 2015.

Data analysis and processing

The data collected were released in the Epi Info program, version 3.5.1, and later the files were transported for analysis in the Excel application of the Microsoft company, version 7. Absolute frequencies of responses were calculated and analyzed. The Chi-square test (χ^2) of independence was applied when pertinent, and the Yates correction (1934) was necessary in some situations. The descriptive level (or p-value) was subsequently presented.

Ethical aspects

The research was approved by the Ethics Committee in Research with Human Subjects linked to the Faculty of Health Sciences of the Universidade de Brasilia, opinion no. 1.188.047/2015, in accordance with recommendations of Resolution 466/2012 of the National Health Council. All participants signed the Informed Consent Form (ICF).

RESULTS

A total of 52 professionals working in the direct care of patients hospitalized in the ICU of the hospital participated in the study, represented by 55.77% nursing technicians (n = 29), 19.23% nurses (n = 10), 17.30% physicians (n = 9) and 7.70% physiotherapists (n = 4). Three were on leave and did not participate in the study.

Regarding the characteristics of professionals in relation to gender, 79.31% (n = 23) of the nursing technicians were female, while the distribution of both genders was equal to 50% among nurses (n = 5) and physiotherapists (n = 2), and 55.56% (n = 5) of the medical category were male. More than half of the professionals (55.77%, n = 29) were between the ages of 30 and 40, and 59.62% (n = 31) of them reported working up to 40 hours a week. Regarding the duration in the profession, it was found that the majority (n = 17) among nursing technicians and physiotherapists had 6 to 10 years, all physicians had over 11 years of experience, while the performance among nurses was distributed among all the analyzed ranges (from 0 to 21 or more years).

Regarding training on the use of PPE and types of precautions in service in the year prior to the survey, the following data were respectively obtained: 86.20% (n = 25) and 93.10% (n = 27) of the nursing technicians performed the training, 70% (n = 7) and 70% (n = 7) of the nurses, 75% (n = 3) and 75% (n = 3) of the

physiotherapists, and 33.33% (n = 3) and 22.22% (n = 2) of the physicians.

The PPE supply was evaluated in 36 observation sessions from 10/05/2015 to 12/16/2015 during the three work shifts. It was identified that there was a shortage of aprons and gloves in the first 15 minutes of an observation session during the beginning of the night shift. Still regarding the aprons, some were found hanging near the patients' bed, which suggests that they had been used and were being stored to be used again for care of the same patients.

Regarding the lack of masks (recorded in two observation sessions), it is important to note that there was no total lack of this PPE in the unit, because in the same sessions where there were no masks available for use in the unit's storage sites, there were also records of professional procedures using a mask. This suggests that the professionals used the same mask throughout the work shift.

The use of hand adornments among the ICU health team was high in all professional categories. No professional wore adornments on their hands in only 11.11% (n = 4) of the sessions.

Regarding the number of personnel per professional category considering the number of beds occupied per shift during the observation sessions, it was identified that the number of professionals present was lower than required according to national health regulations in a session (2.78%) for a physiotherapist; while the presence of daily physicians was not identified in the morning and afternoon periods during the data collection period. However, larger numbers of professionals than needed were identified in the majority of the sessions, distributed as: nurses in 13 sessions (36.11%), physiotherapists in 12 sessions (33.33%), and nursing technicians in 32 sessions (88.88%).

In the 36 audit sessions, there were 445 opportunities to observe care procedures involving the use of PPE, and 89.21% (n = 397) of these procedures occurred in patients who were in contact precautions. If evaluated individually, more than half of these audits were unnecessary. Of the 45 patients, 43 were placed on contact precautions for suspicion or confirmation of colonization by multiresistant bacteria, and no patients were identified in precautions for droplets or aerosols. According to criteria established by the institution and according to the monitoring records of patients admitted to the HAICC ICU, 27 patients should have received the indication and been submitted to contact precautions during the period. This inaccuracy resulted in the submission of 35.55% (n = 16) of patients to unnecessary admission contact precautions.

The Chi-square test of independence was applied to evaluate the use of PPE when indicated and not indicated and among professionals per shift. It was necessary to apply the Yates correction to perform this test in the work shifts because the table contained cells with values less than five. The mean adherence rate to the use of PPE when indicated was 72.72%. In analyzing the correct or incorrect use rate of the four kinds of PPE together by procedures distributed by professional category and by shift, the rates ranged from 29.79% to 50.19%. The average rate when there was no indication to use PPE and the professionals did not use it was 68.01%. The results are presented in Tables 1 and 2.

Table 1 – Chi-square test of independence of PPE use among types of PPE, professionals and work shifts in the teaching hospital ICU – Brasília, Federal District, Brazil, 2015.

Variables	No. of procedures	No. of PPE uses	Adhesion rate to PPE use (%)	Chi-square test	*P*-value
PPE – Indicated					
Gloves	432	410	94.91	226.07	<0.0001
Apron	292	267	91.43		
Mask	155	124	80.00		
Safety glasses	57	14	24.56		
Professional					
Nurse	68	33	48.53	6.84	0.0772
Physiotherapist	47	14	29.79		
Physician	69	31	44.93		
Nursing Technician	261	131	50.19		
Shift					
Morning	149	67	44.97	0.36	0.8345
Afternoon	133	64	48.12		
Night	163	78	47.85		

Note: (N=52)

Table 2 – Chi-square test of independence of the non-use of PPE between types of PPE, professionals and work shifts in the teaching hospital ICU – Brasília, Federal District, Brazil, 2015.

Variables	No. of procedures	No. of non-use of PPE	Rate of non-use of PPE (%)	Chi-square test	*P*-value
PPE – Not indicated					
Gloves	13	4	30.77	175.69	<0.0001
Apron	153	134	87.58		
Mask	290	167	57.58		
Safety glasses	388	373	96.13		

Note: (N=52)

For the individualized analysis of each procedure regarding the correct uses found for each of the four types of PPE, the representations of the correct percentages of PPE use by procedures are grouped in Figure 1. A radar type chart was used to gather the correctness percentages of the four PPE evaluated in 12 types of observed procedures into one same figure. In this type of chart, the colored line in blue represents the PPE certainty rate that is identified by the name at the tip of the quadrilateral.

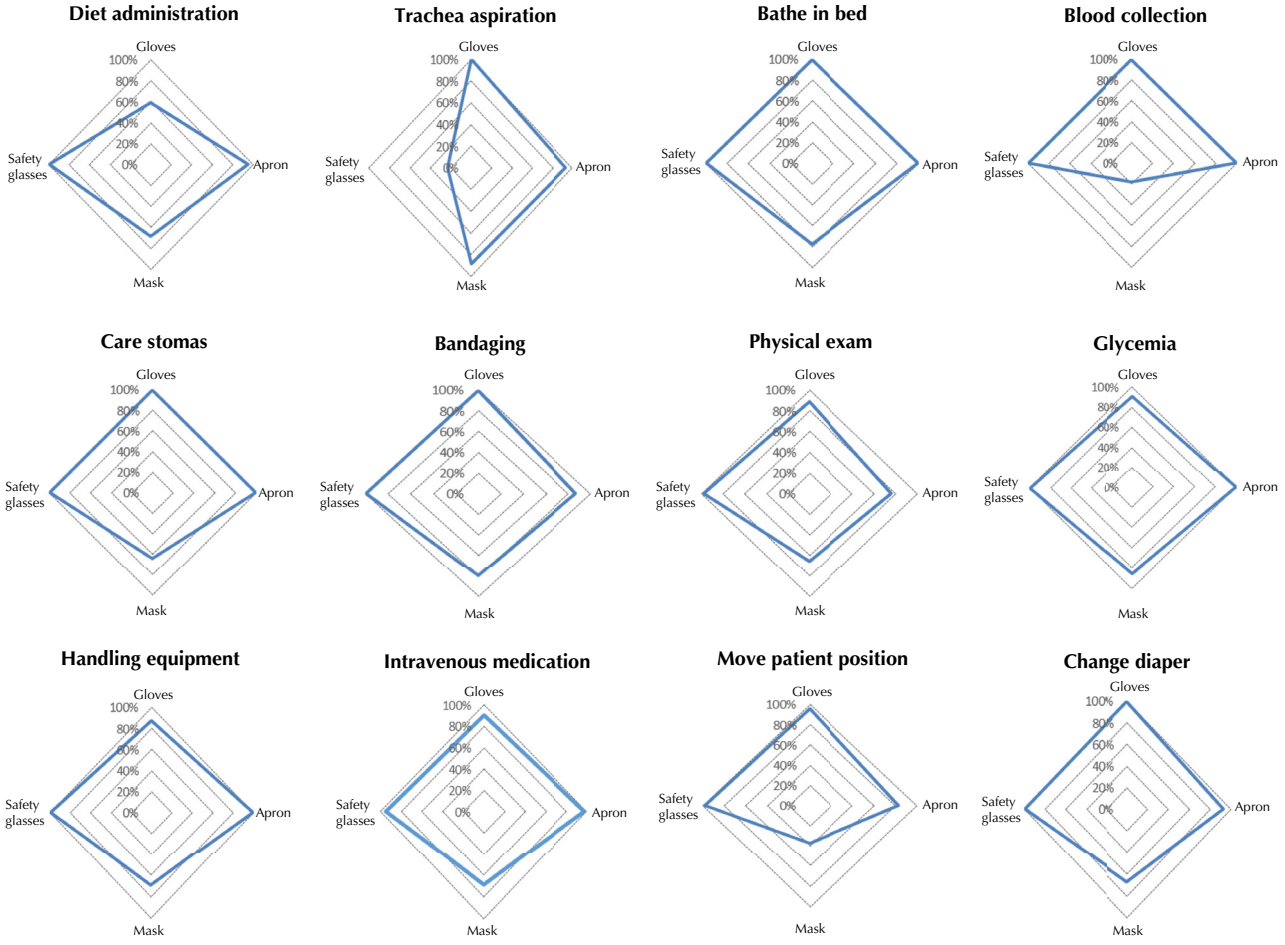

Figure 1 – Correct use percentage of PPE in care procedures performed by professionals in direct patient care in the adult ICU of the teaching hospital – Brasília, Federal District, Brazil, 2015.

DISCUSSION

Regarding the characteristics of the health professionals participating in this study in relation to the gender variable, a predominance of female participants was only found among nursing technicians. Feminization of the health workforce has occurred since the 1970s, ratifying other studies in Brazilian ICUs, however, differing from other research in relation to nurses and physiotherapists, in which the majority is predominantly female[14-16].

Regarding the age group, the majority of professionals were between 30 and 40 years of age, and more than 80% were between 30 and 50 years old, which suggests they are experienced people. These findings are in agreement with those of other studies done in Brazilian ICUs[14-16].

The majority of the participants stated that they had been working for more than 5 years in the profession; a result that was relatively equivalent to that of another national study[15] and different from two other studies[14,16], which identified teams with shorter working time in Brazilian ICUs. It was also sought to verify a possible situation of multiple employment bonds or overwork, which may be the cause for fatigue, constituting risk factors that predispose to the occurrence of slips, lapses of memory or mistakes which can directly influence the implementation of good care practices. It was identified that the majority of the team worked in only one employment relationship, mainly the nursing technicians, since 79% affirmed to work up to 40 hours weekly.

In-service training with regular periodicity is an important tool to maintain good adherence to precautions[6,8,17]. A validated questionnaire aimed at Brazilian nurses to measure knowledge of standard precautionary measures may be useful in this regard[18]. Most professionals in the ICU scenario of this study reported having received in-service training on the use of PPE (apron, gloves, mask and safety glasses) and types of precautions (standard and isolation) in the year prior to the study, except for physicians. These findings corroborate other ICU surveys in which most nursing professionals claim to have received training, while physicians did not receive training on such topics[19-21].

Although it occurred at a low frequency and for a short period, the lack of PPE for care activities is a negative point. This situation triggered many complaints from the health team. In addition to compromising the professional's safety, the lack of PPE also increases the risk of cross-transmission of microorganisms between patients, which affects quality and safety of care.

For the personnel of the care teams, the main inadequacy identified was the lack of daily/routine physician. The lack of adequate numbers and qualifications is one of the main limiting aspects for adherence to good practices and care protocols[14,22]. Among the other professional categories, a number greater than the minimum necessary was identified, taking the resolutions of the National Sanitary Surveillance Agency as reference. However, the distribution of professionals between shifts and work days was not proportional to the number of beds occupied, which led to a deficit in physiotherapists in an observation session. A redistribution of professionals in the work shifts should be done prioritizing the need of the service to avoid work overload and a consequent reduction in adherence to precautions.

Placing patients in contact precautions during the study period was frequent without their being in compliance with the criteria established by the hospital's HAICC. Given this, it can be seen that the team has difficulties in applying the established criteria, they do not know or they refuse to follow them. In addition, unnecessary use of PPE was identified, especially gloves.

The adhesion rate to using gloves and aprons was high, greater than 91%, possibly because most patients were in contact precaution. The glasses were the most overlooked PPE. They were only used 24.56% of the time when indicated, mainly in the endotracheal aspiration procedures. When jointly analyzing the adherence percentage to the four PPE indicated in a specific procedure according to the precaution to which the patient was submitted, the adjustment mean was very low, only 46.97%. For example, adhesion to using gloves, apron and mask in the tracheal aspiration procedures was greater than 90%, while it was less than 5% for using glasses. This difference resulted in the discrepancy between the high adherence rate to the use of PPE when evaluated individually, and the low percentage of PPE use when the answers regarding the four were analyzed together by the procedure type to which the patient was being submitted. It is emphasized that the mask and glasses were the PPE which contributed the most; the mask for having been used unnecessarily in various procedures, and the glasses because they were not used in procedures such as tracheal aspiration.

Adherence to the use of PPE in standardized precautions and special precautions is also extremely variable. Longer experience in the profession can negatively contribute to the adhesion. Low adherence to glasses and mask in risky situations was also found in a study that evaluated standard precautions in 30 hospitals in 19 cities in Turkey[10]. A research evaluating compliance with hand hygiene and the use of PPE showed that skin irritation or hand pain from the use of gloves are also factors which negatively influence adherence to precautionary practices[14].

Review studies show evidence of several factors which interfere in adherence to standard precautions, such as individual, work-related and organizational[23-25]. Qualitative research with nursing professionals identified that the factors which hinder adherence to the standard precautions were emergency situations, the non-availability of PPE, their storage in locations far from the point of care, overwork and the consequent lack of time to put them on, providing care for children, more experienced professionals (bosses, physicians or teachers) who do not adequately carry out the precautions and can influence other professionals, greater professional experience and skills, among others. As contributing factors, susceptibility and vulnerability to diseases, adult patient care, previous occupational exposure, posters and workplace reminders alerting them to practices, continuing professional education, precautions demanded by the bosses, and others[22].

A randomized clinical trial identified important issues to be addressed in HAICC policies on contact precautions. The study identified that as the percentage of patients undergoing contact precautions increased at the unit, there was a steep decline in compliance with precautionary practices such as hand hygiene and correct PPE use. With about 40% of patients hospitalized for unit contact precautions, noticeable declines were noted in the adherence of professionals to precautions[26].

In Brazil, researchers evaluated colonization pressure as a risk factor for colonization by carbapenem-resistant *Pseudomonas aeruginosa* and multidrug-resistant *Acinetobacter* spp. in ICU. Two interventions were implemented, i.e. education and introduction of alcohol preparation for hand hygiene. As a result, colonization pressure increased due to the increase in patients already colonized upon admission. The authors concluded that when this pressure reaches critical levels, efforts aimed primarily at hand hygiene may not be sufficient to prevent transmission[27].

Despite all the discussions in the literature, several studies have presented successful results in reducing pathogen transmission with increased adherence to recommended precaution practices[4-5].

Audits of work processes with direct observations have advantages and disadvantages, as discussed in international and national literature by different authors and institutions[9,11-14,17,19-20]. The main limitation or known disadvantage of the audit method for hand hygiene adherence and PPE use in direct observation is the Hawthorne effect, constituting a possible limitation of this study, since the other disadvantages pointed out in the literature which are presented for audits through direct observations were overcome in this research by the adopted method which avoided the selection bias of the shift and used a standardized and uniform method. Thus, this study achieved its goal by evaluating the infrastructure and standardized and specific precaution practices of health professionals in the audited ICU.

CONCLUSION

When evaluating the human resources structure and the availability of PPE from the ICU of the DF teaching hospital, it was identified that the set of information gathered on the characteristics of the multiprofessional team is positively in favor of better performance in adherence to good practices of precautions. However, a lack of daily physicians and inadequacies in the daily distribution of the number of professionals were identified. In addition, the PPE was in irregular supply.

The audit adopted in this study focused on operationalizing actions, which identified that most of the patients were submitted to specific contact precautions upon admission to the ICU, 35% of which were unnecessary. The use of PPE for care procedures was evaluated individually and showed high adherence to the use of gloves, aprons and masks, and very low adherence to the use of safety glasses, in addition to the unnecessary use of masks occurring.

The Hawthorne effect, which is the change in attitude/behavior of professionals when they know they are being observed, may have interfered in obtaining information and may be the main limitation of this study, despite the care taken to reduce the impact of this effect. The reduced number of procedures observed when stratified by type of procedure also does not allow transferring this information to other institutions. The scarcity of audit studies on compliance with precautionary practices also limits discussion of the data.

Nevertheless, the obtained results demonstrate the importance of adherence audits to standard precautions which are specific, periodic and systematically performed in critical care settings, as well as in other care units, as they show the behavioral scenario and practices which determine indicators of the involved processes and results, being fundamental for managing the care quality, with the purpose of improving the organizational and team performance.

RESUMO

Objetivo: Avaliar a estrutura e a adesão às medidas de precauções-padrão e específicas dos profissionais de saúde em Unidade de Terapia Intensiva de hospital de ensino, no Distrito Federal. **Método:** Estudo descritivo, transversal e prospectivo. Utilizou-se de questionário estruturado mediante observações que registraram as práticas dos profissionais com Equipamentos de Proteção Individual e indicações de precauções. Foi aplicado o teste Qui-quadrado, e calculado o *p-valor*. **Resultados:** Participaram do estudo 52 profissionais, e foram observados 445 procedimentos assistenciais em 36 sessões de auditoria. A média da taxa de adesão ao uso de equipamentos foi de 72,72%, sendo 94,91% às luvas, 91,43% ao avental, 80% à máscara e 24,56% aos óculos de proteção. Quando não havia indicação e não foi utilizado o Equipamento de Proteção Individual, a média da taxa foi de 68,01%, sendo 30,77% em relação às luvas, 87,58% ao avental, 57,58% à máscara, e 96,13% aos óculos. As precauções de contato foram indicadas desnecessariamente em 35% dos pacientes. **Conclusão:** Verificou-se boa adesão ao uso de luvas, avental e máscara, baixa adesão ao uso de óculos de proteção e uso desnecessário de máscaras e precauções de contato admissionais.

DESCRITORES

Controle de Infecções; Unidades de Terapia Intensiva; Pessoal de Saúde; Precauções Universais; Prática Profissional; Segurança do Paciente.

RESUMEN

Objetivo: Evaluar la estructura y la adhesión a las medidas de precauciones estándar y específicas de los profesionales sanitarios en Unidad de Cuidados Intensivos de hospital de enseñanza, en el Distrito Federal. **Método:** Estudio descriptivo, transversal y prospectivo. Se utilizó un cuestionario estructurado mediante observaciones que registraron las prácticas de los profesionales con Equipos de Protección Individual e indicaciones de precauciones. Se aplicó la prueba de Chi cuadrado y se calculó el p-valor. **Resultados:** Participaron en

el estudio 52 profesionales y se observaron 445 procedimientos asistenciales en 36 sesiones de auditoría. El promedio de la tasa de adhesión al uso de equipos fue del 72,72%, siendo el 94,91% a los guantes, el 91,43% al delantal, el 80% a la mascarilla y el 24,56% a los anteojos de protección. Cuando no había indicación y no fue utilizado el Equipo de Protección Individual, el promedio de la tasa fue del 68,01%, siendo el 30,77% con relación a los guantes, el 87,58% al delantal, el 57,58% a la mascarilla y el 96,13% a los anteojos. Las precauciones de contacto fueron indicadas innecesariamente al 35% de los pacientes. **Conclusión:** Se verificó buena adhesión al uso de guantes, delantal y mascarilla, baja adhesión al uso de anteojos de protección y uso innecesario de mascarillas y precauciones de contacto de ingreso.

DESCRIPTORES

Control de Infecciones; Unidades de Cuidados Intensivos; Personal de Salud; Precauciones Universales; Práctica Profesional; Seguridad del Paciente.

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