Nursing intervention to prevent delirium in critically ill adults

Intervenção de enfermagem para prevenir o delirium em adultos gravemente enfermos

Intervención de enfermería para prevenir el delirio en adultos críticamente enfermos

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ABSTRACT

Objective: To determine the effectiveness of a nursing intervention for delirium prevention in critically ill patients. **Method:** A quasi-experimental study was conducted with a non-equivalent control group and with evaluation before and after the intervention. 157 Patients were part of the intervention group and 134 of the control group. Patients were followed-up until they were discharged from the ICU or died. The incidence of delirium in both groups was compared. Additionally, the effect measures were adjusted for the propensity score. **Results:** The incidence and incidence rate of delirium in the control group were 20.1% and 33.1 per 1000 person-days (CI 95% 22.7 to 48.3) and in the intervention group was 0.6% and 0.64 per 1000 person-days (CI 95% 0.22 to 11.09), respectively. The crude Hazard Ratio was 0.06 (CI 95% 0,008 to 0,45) and adjusted 0.07 (CI 95% 0,009 to 0,60). The number needed to be treated was six. **Conclusion:** Low incidence of delirium in critically ill patients intervened demonstrated the effectiveness of interventions. The average intervention time was 4 days with a 15-minutes dedication for each patient.

DESCRIPTORS

Delirium; Critical Care Nursing; Controlled Before-After Studies.

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INTRODUCTION

Acute confusion or delirium is considered one of the most frequent syndromes in intensive care units (ICU); it constitutes a neurobehavioral disorder, underdiagnosed and therefore, undertreated, but potentially reversible and preventable[1].

Delirium is considered as an alteration of the consciousness, diminution of the ability to pay attention to the environment, reduction of the ability to focus, maintain or direct the attention. It comes with changes in cognitive functions that are not explained by previous or current dementia; its duration is variable and tends to fluctuate during the course of the day[2]. The patient does not always have this reversibility characteristic because in many cases assistance is offered late[3]. Early identification of the signs described is important to plan timely interventions involving the healthcare team, the patient, and their family[4].

Daily observation of the patient is, first of all, the way to detect changes in the behavior of critically ill patients. Delirium is classified according to the psychomotor agitation, that is, the level of agitation in three clinical subtypes, being the hyperactive delirium[3,5] less frequent compared to hypoactive delirium which is often overlooked, being this the most common form that leads to the highest risk of mortality. Finally, mixed delirium is a combination of hyperactive and hypoactive delirium where a person can fluctuate between signs and symptoms of both[3].

There are theories about the physiopathology of delirium that point towards neurotransmission, inflammation and stress factors in the brain[3]. Predisposing factors and precipitating factors have been identified for a patient to present delirium; the former are those that make the individual more susceptible to presenting confessional syndrome, namely, advanced age, male gender and previous dementia. The precipitating factors are those that trigger delirium and are modifiable such as the introduction or withdrawal of drugs, sleep disturbances, environmental factors, diseases and surgeries[6]. Any or the sum of these factors can trigger delirium, which constitutes a focus of attention of health personnel, especially nurses who are key in the recognition and prevention of predisposing factors[7-8].

Epidemiological data on the prevalence and incidence of delirium show diverse results. A meta-analysis analyzing 42 studies reports delirium in 5,280 of 16,595 for a prevalence of 31.8%; prevalence ranged between 11% and 91% in the different studies included[9]. What is worrying is that delirium is associated with a longer hospital stay, higher mortality rates, poorer functional outcomes, greater long-term cognitive dysfunction and higher rates of institutionalization, and despite this, health services have largely ignored its existence[9-11]. There are several methods for diagnosis, from simple, practical and quick methods to the most complex forms. One of these is the Confusion Assessment Method for Intensive Care Unit (CAM-ICU)[12], where delirium is present with at least two points and it is necessary for the patient to present a higher Richmond Agitation-Sedation Scale (RASS) score than -3[12].

Currently, there is a tool that allows calculating the risk of development of delirium: the PRE-DELIRIC model[13-14]. It was designed in 2013 based on the risk factors described in a systemic review. This model includes ten risk factors defined objectively and clearly within 24 hours of admission to the ICU[9]. The PRE-DELIRIC model has been internationally validated[5], but its true predictive value may vary from one ICU to another. For this reason, a validation into Spanish was performed which determined the discriminatory capacity of the PRE-DELIRIC prediction model, with an area under the ROC curve of 85.4% with 95% confidence intervals from 77.6% to 93.3%, which defines it as effective, capable of successfully predicting and classifying the outcome of delirium or no delirium in approximately 8-9 out of 10 patients[8]. This classification of patients into risk groups allows the efficient initiation of preventive measures[5].

Scientific evidence shows greater contributions in non-pharmacological interventions focused on preventing delirium in surgical patients[15], which have turned out to be cost-effective. These protocols are based on activities to control certain risk factors and have demonstrated their effectiveness in the sense of diminishing the incidence and duration of this clinical condition. In addition, critical care nurses are ideal to participate in the design, implementation and follow-up of these interventions, which can explain the high adherence rates to delirium prevention protocols[16]. It is clear that an adequate treatment includes a simultaneous approach of precipitating and predisposing factors, in this sense, it is supported that the non-pharmacological approach should be used in all individuals while medicaments should be reserved for the most serious cases[17].

Prevention requires a special emphasis as nursing contributes to identifying patients at risk, communication support and patient care guidance, early mobilization, environmental stimulation, pain management, family involvement and cognitive interventions traditionally used in diseases such as Alzheimer, dementia, acute stroke and traumatic brain injury[10,18]. However, there are recognized limitations in relation to early and standardized team participation previously trained in multicomponent interventions for delirium[19].

In short, prevention is the most effective and economic measure to address delirium in its initial phase and nursing contributes largely to this work. This is why a delirium prevention protocol was designed based on the available literature and on the experience of the research team in this line of research, for which the objective of this work to determine the effectiveness of a nursing intervention for delirium prevention in critically ill patients in intensive care units of Bucaramanga - Colombia.

METHOD

STUDY TYPE

A quantitative, prospective, quasi-experimental study was conducted with a non-equivalent control group and evaluation before and after the intervention[20] for delirium prevention in critically ill patients.

POPULATION

Patients who met the following inclusion criteria were selected: being over 18 years of age, being within the first 24 hours of stay after admission to the ICU, meeting the intensive care unit criteria defined by the research group (patient with vasoactive support, with invasive or non-invasive mechanical ventilation and invasive monitoring) and patient without delirium. And none of the following exclusion criteria: patients with a result on the RASS -4 and -5, subjects with cognitive impairment or previous mental illness, with a history of delirium or in which the measurement of delirium could be affected by their basic condition and with a history of alcoholism.

For the calculation of the sample size, the formula specific for experimental studies was used[21]. Thus, the sample size was 291, assuming $\alpha = 0.05$, $\beta = 0.1$ and $\delta^*min = 0.25$. Patients were admitted to the intensive care units of two fourth-level hospitals of eastern Colombia between October 2015 and October 2016.

DATA COLLECTION

Once the participants were selected and written informed consent forms were filled in, the participants were allocated to the intervention group or control group according to whether they accepted the intervention or not. They were monitored until they were discharged from the ICU or died, and finally, principal outcomes and incidence of delirium in both groups were compared.

The research team was trained in the application of scales used and the implementation of the intervention and follow-up. In addition, all healthcare team members took a Good Clinical Practice course before collecting the data.

In this way, the participants of the protocolized nursing intervention group received daily strategies based on two components (Chart 1) at the same time during their stay in the ICU. The data was collected in the ICU, the evaluators who carried out the daily follow-up at the same time and the person who analyzed the information did not know which group the patient belonged to.

The instruments for collecting the information were the following:

The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) scale, where the Richmond Agitation-Sedation Scale assessment was previously applied. The application of the scale was not continued with a score between -4 and -5[12]. To diagnose delirium, the presence of two major criteria is required (acute or fluctuating onset and inattention) and at least one of the minor criteria (disorganized thinking and altered level of consciousness). Regarding the inattention criterion, it was evaluated through the auditory and visual examination respectively. For both exams, inattention was considered to be present when the score was less than eight in any of the two exams.

The PRE-DELIRIC model was then applied in its version validated into Spanish[8], which examines the following factors: age, acute physiology and chronic health evaluation score (APACHE II), coma, urgent admission to the ICU, cause of admission, infection, use of sedatives, use of morphine in three dosage groups, serum urea and metabolic acidosis.

DATA ANALYSIS AND PROCESSING

Subsequently, a database was created in EPIDATA 3.1. All the records were double-typed and validated in the VALIDATE subprogram. STATA 14 software was used for the analysis of information. For qualitative variables, proportions and averages were calculated for the quantitative variables, accompanied by their confidence intervals. In addition, the X^2 test was used to evaluate the existence of statistically significant differences among the groups. The cumulative incidences and hazards were calculated, the latter following the Kaplan Meier method.

The propensity score was based on a logit model. The average treatment effect on the treated (ATT) was estimated with propensity score matching using the nearest neighbor matching method. Also, the Number Needed to Treat (NNT) was calculated based on the ATT[22]. Finally, the relative risk and hazard ratio crude and adjusted for propensity score were calculated by Cox and Poisson regressions with robust variance[23].

ETHICAL ASPECTS

Regarding ethical considerations, the research followed the guidelines established in the Colombian Resolution 8430 of 1994. According to said resolution, the research is classified as minimum risk type as some variables were evaluated through a physical examination of patients without invasive procedures and non-pharmacological measures were implemented in the intervention group. Therefore, written informed consent was obtained from patients or their family caregivers who have been previously authorized in their health and medical records if a patient was unable to grant it. The research was approved by the health sciences research committee of the University of Santander.

RESULTS

Chart 1 – Description of the multicomponent nursing intervention and standard care in the control group.

EXPERIMENTAL GROUP	To perform the intervention, a quiet and private environment was provided by closing the entry device in the cubicle (doors, curtains), providing privacy. The intervention was daily performed from admission to discharge from the ICU by two previously trained nurses; the intervention lasted approximately 15 minutes. The activities carried out are described below: COGNITIVE STIMULATION - Spatial and temporal orientation: Daily greetings, call the patient by their name, daily information of space, place and the reason for admission. A conversation was initiated actively listening about current and past events or news to interest and stimulate the person while guiding on time, place, person, and family. Cognitively stimulation activities: word search games, crosswords. Duration: Five minutes every day. - Visual and auditory stimulation: direct visual contact, frequent use of contact, the use of vision and hearing devices (glasses, hearing aids), active listening to the patient being allowed to express their concerns and answer questions were promoted. During contact with the patient, they spoke slowly, medium tone of voice, use of short and clear phrases. Concrete and specific communication was maintained. Photographs, letters and magazine drawings or made by family members were shown. Nurses asked for the list of personal items that the patient would like to have during their hospital stay to obtain them such as glasses, hearing aids, dentures, family photos, religious objects, etc. Use of relationship games, for example, indicate in a list the objects that go in the fridge. Duration: Five minutes every day. FAMILY SUPPORT The involvement of family and caregivers in self-care and patient reorientation was encouraged. Education about delirium and its complications. The accompaniment and approach of the patient to a relative or person of his confidence were facilitated, as long as possible. Duration: Five minutes every day during visiting time.	**Daily monitoring of the application of CAM ICU -RASS:** Every day the intervention was performed and the CAM ICU scale was applied to verify the effect of the intervention (delirium development or not). If the patient worsened his state of health or his level of sedation and did not allow the intervention, the subject continued to follow up to the improvement of the conditions to continue delirium prevention activities. A maximum time of 8 days was established to stop patient intervention if their medical condition did not improve or there were changes in the Rass scale to allow the application of the CAM-ICU scale. The research team did not change or titrate sedation levels of the study patients.
CONTROL GROUP	The usual care consisted of standard hospital care (Orientation, reduction of environmental stimuli: noise, lighting) provided by general physicians, medical specialists, nurses and support staff. The members of the intervention team did not provide services in patients assigned to usual care (Control Group). However, the same group of physicians and medical specialists, nurses and support staff and resident doctors will provide usual care in both study groups.	**Daily monitoring of the application of CAM ICU -RASS:** Every day the intervention was performed and the CAM ICU scale was applied to verify the effect of the intervention (delirium development or not). If the patient worsened his state of health or his level of sedation and did not allow the intervention, the subject continued to follow up to the improvement of the conditions to continue delirium prevention activities. A maximum time of 8 days was established to stop patient intervention if their medical condition did not improve or there were changes in the Rass scale to allow the application of the CAM-ICU scale

The sample consisted of 291 critically ill patients distributed as follows: 134 patients in the control group and 157 in the intervention group. Figure 1 shows the information on the involvement of participants, adapted from CONSORT 2010[24].

Table 1 describes the sociodemographic and clinical characteristics and the PRE-DELIRIC score of participants in both control and intervention groups. There are statistically significant differences in the distribution of the following variables between the groups: the control group has a greater proportion of men (p-value <0.01) from the emergency department (p-value 0.03), medical diagnosis and surgical group (p-value <0.01) with use of sedatives (p-value 0.02), mechanical ventilation (p-value <0.01), hospital stay > 5 days (p-value <0.01) and coma patients (p-value 0.03).

On the other hand, the intervention group has a higher proportion of patients with APACHE II score > 14 (p-value <0.01). No statistically significant differences were found for the risk of delirium in the control group (26.2%) and the intervention group (31.2%), according to the PRE-DELIRIC scale.

Regarding the cumulative incidence of delirium, 27 patients in the control group were found to developed delirium (20.1%) and one patient in the intervention group (0.6%), p-value of <0.01. Regarding the type of delirium, 18 of the 27 cases (66.7%) in the control group and the only case of the intervention group corresponded to hypoactive type delirium. In addition, the average number of days of stay in the ICU was 6.1 in the control group and 4.1 in the intervention group, p-value of <0.01.
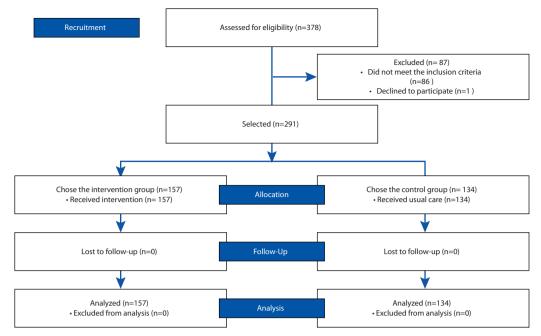
Figure 1 – Flow diagram of the recruitment of critically ill patients.

Table 1 – Description of critically ill patients in control and intervention groups.

Category	Control group		Intervention group		P-value
	N	%	N	%	
Gender					
Female	49	36.6	80	51.0	0.01
Male	85	63.4	77	49.0	
Years of age ≥ 60	81	60.4	100	63.7	0.6
Origin					
External	23	17.2	43	27.4	
Emergency Department	42	31.3	41	26.1	0.03
Surgery	18	13.4	9	5.7	
Hospitalization	51	38.1	64	40.8	
Diagnostic group					
Medical	68	50.7	134	85.9	
Surgery	48	35.8	10	6.4	<0.01
Trauma	3	2.2	8	5.1	
Neurology/neurosurgery	15	11.2	4	2.6	
Urgent admission	18	13.4	11	7.0	0.07
Morphine use	30	22.4	31	19.7	0.86
Use of sedatives	34	25.4	23	14.7	0.02
Infection	62	46.3	71	45.2	0.86
Metabolic acidosis	27	20.1	38	24.2	0.41
Mechanical ventilation	58	43.3	17	10.8	<0.01
APACHE II Score >14	88	65.7	127	80.9	<0.01
Hospital stay ≥5 days	75	56.0	50	31.8	<0.01
Coma	11	8.2	2	1.3	0.03
PREDELIRIC > 50	32	26.2	49	31.2	0.4

Considering the time at individual risk, the incidence rate of delirium in the control group was 33.13 per 1000 person-days with a 95% confidence interval from 22.7 to 48.3 and 0.64 per 1000 person-days with a 95% confidence interval from 0.22 to 11.09 in the intervention group. In the control group, after 15 days of stay in the intensive care unit, the delirium risk is 50% as shown in Figure 2. The proportionality test score was 0.99.

In addition, the propensity score was based on a logit model that included gender, diagnostic group, mechanical ventilation, and APACHE II score variables. Common support was created to eliminate 5% from the top and bottom of the control group. The ATT estimation with the nearest neighbor matching method was -0.166, and six blocks were created with satisfactory balance property. The NNT was six, that is, it is necessary to perform the delirium prevention intervention in six critical patients to prevent one from developing delirium while they are in the ICU compared to those who receive the usual attention (control).
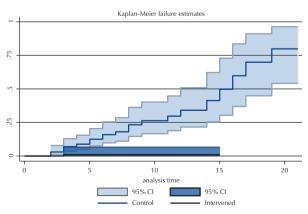

Figure 2 – Cumulative hazard of delirium in critically ill patients in the control and intervention groups.

Additionally, the crude Hazard Ratio was 0.06 with a 95% confidence interval from 0.008 to 0.45 and adjusted for the propensity score was 0.07 with 95% CI from 0.009 to 0.60, p-value <0.01. Furthermore, relative risks, both crude and adjusted, were calculated and shown in Table 2.

Table 2 – Measures of the intervention effects for the prevention of delirium in critically ill patients in the control and intervention groups.

	Hazard Ratio	Confidence interval	p-value	Relative Risk	Confidence interval	p-value
Crude	0.06	0.008 to 0.45	<0.01	0.03	0.004 to 0.23	<0.01
Adjusted*	0.07	0.009 to 0.60	<0.01	0.05	0.006 to 0.41	<0.01

* Adjusted for the propensity score

DISCUSSION

Delirium may have serious negative consequences in ICU patients. An emerging evidence framework suggests the usefulness of multimodal programs for delirium prevention that include non-pharmacological interventions and multidisciplinary team approaches.

Through the analysis of results, it is verified that nursing interventions applied in this study to prevent delirium in the ICU demonstrated to be efficient, despite the presence of precipitating and predisposing factors of patients in the intervention group. This is compatible with the meta-analysis performed with 4267 patients that showed that delirium probabilities were 53% lower in the intervention group compared to the control group (OR, 0.47, 95% CI, 0.38-0.58)[18]. Seven studies with multicomponent interventions significantly reduced incident delirium (relative risk (RR) 0.73, 95% CI 0.63-0.85)[25]. In this study, the cumulative incidence of delirium in the intervention group only corresponded to 0.6%. In a study conducted in Spain, researchers also obtained delirium prevention data above 94% in patients, despite their medical background and delirium-triggering risk factors[26].

As for intervention components, nurses are usually the first group to notice changes in patients' mental state, for which they should be properly trained in delirium symptoms and scale management. In addition, nurses should be trained in preventive healthcare. After the cognitive intervention, a significant reduction in delirium incidence, duration, occurrence and development was found in four studies[19]. Despite these improvements, early cognitive intervention for delirium prevention and management is a relatively new research topic. The importance of involving family in the nursing process is recognized as a right and duty of healthcare professionals in humanized care[19].

Another variable susceptible to change is hospital stay duration. Seven studies with multicomponent non-pharmacological delirium interventions reduced the length of stay by –1.26 (95% CI, –1.84 to –0.69) days[27]. In this research, an average of two-day hospital stay in the ICU was decreased in favor of the intervention group, which may have a positive impact on reducing infections in intensive care units, in particular ventilator-associated pneumonia, considering that 10.8% of the intervened patients previously had this condition[28].

In addition, the evidence and results calculated from the number of patients requiring treatment show that five patients should be intervened to prevent the appearance of delirium in patients. Therefore, the early participation of multidisciplinary personnel in identifying and addressing the risk factors of delirium in the intensive care setting is the key element of a successful program for the prevention of delirium[29]. This is because, unfortunately, when delirium has already developed, multicomponent interventions do not show any impact on delirium duration or severity[29].

Finally, in relation to the results compared with those of the control group, there is a statistically significant difference between gender, origin, diagnostic group, use of sedatives, Apache II score and hospital stay variables. The above indicates group heterogeneity, which may be considered as bias when evaluating the effectiveness of nursing interventions. Therefore, the analysis of the average treatment effect on treated patients was carried out using the nearest neighbor matching method, calculating the propensity score including the variables that had a differential behavior among the groups but did not change after the intervention. Also, multivariate Cox and Poisson regression models with robust variance were conducted to adjust for propensity score as it reduces the effects of confounding[30]. However, unmeasured variables, sample size and many variables for propensity score estimates may affect results. Despite these limitations, it is possible to demonstrate the effectiveness of nursing interventions to reduce delirium in ICU patients.

The research group recommends nurses in intensive care units to carry out actions aimed to guide patients, cognitive stimulation and family support. Barriers such as difficulty in detecting this event in intubated patients and poor training of healthcare staff for using the abovementioned scales make assessments difficult. There is also not enough time to complete them, which can hinder the identification of event risk and the implementation of timely and effective actions. In addition, the team will continue developing this line of research with interventions following the controlled clinical trial (CCT) methodology to ensure group homogeneity through randomization.

CONCLUSION

Delirium in critically ill patients is associated with longer hospital stays, mortality and long-term cognitive

dysfunction. This study concludes that although the groups showed significant differences, the multiple analysis shows that the intervention decreases the probability of developing delirium; the number of critically ill patients requiring treatment was six. The impact of delirium incidence was demonstrated after an intervention of 0.6% compared to 20.1% in the control group and two-day hospital stay in favor of the intervention group. The average intervention time was 4 days with a 15-minute dedication for each patient per day. Therefore, the implementation of these nursing interventions is highly recommended, considering their effectiveness. In summary, further research in this field is very much encouraged through controlled clinical trials.

RESUMO

Objetivo: Determinar a eficácia de uma intervenção de enfermagem para prevenção do delirium em pacientes críticos. **Método:** Foi realizado um estudo quasi-experimental com grupo controle não equivalente e com avaliação antes e após a intervenção. 157 pacientes faziam parte do grupo intervenção e 134 do grupo controle. Os pacientes foram acompanhados até a alta da UTI ou óbito. A incidência de delirium em ambos os grupos foi comparada. Além disso, as medidas de efeito foram ajustadas para o escore de propensão. **Resultados:** A incidência e a taxa de incidência de delirium no grupo controle foram de 20,1% e 33,1 por 1000 pessoas-dia (IC 95% 22,7 a 48,3) e no grupo de intervenção foi de 0,6% e 0,64 por 1000 pessoas-dia (IC 95% 0,22 a 11,09), respectivamente. O Hazard Ratio bruto foi de 0,06 (IC 95% 0,008 a 0,45) e ajustado de 0,07 (IC 95% 0,009 a 0,60). O número que precisava ser tratado era seis. **Conclusão:** A baixa incidência de delirium em pacientes gravemente enfermos com intervenção demonstrou a eficácia das intervenções. O tempo médio de intervenção foi de 4 dias com dedicação de 15 minutos para cada paciente.

DESCRITORES

Delírio; Enfermagem de Cuidados Críticos; Estudos Controlados Antes e Depois.

RESUMEN

Objetivo: Determinar la efectividad de una intervención de enfermería para la prevención del delirio en pacientes críticos. **Método:** Se realizó un estudio cuasiexperimental con un grupo control no equivalente y con evaluación antes y después de la intervención. 157 pacientes eran parte del grupo de intervención y 134 del grupo de control. Los pacientes fueron seguidos hasta que fueron dados de alta de la UCI o fallecieron. Se comparó la incidencia de delirio en ambos grupos. Además, las medidas del efecto se ajustaron por el puntaje de propensión. **Resultados:** La incidencia y la tasa de incidencia de delirio en el grupo de control fue de 20,1% y 33,1 por 1000 personas-días (IC 95% 22,7 a 48,3) y en el grupo de intervención fue de 0,6% y 0,64 por 1000 personas-días (IC 95% 0,22 a 11,09), respectivamente. El cociente de riesgo bruto fue de 0,06 (IC 95% 0,008 a 0,45) y ajustado 0,07 (IC 95% 0,009 a 0,60). El número necesario a tratar era seis. **Conclusión:** La baja incidencia de delirio en pacientes críticos intervenidos demostró la efectividad de las intervenciones. El tiempo medio de intervención fue de 4 días con una dedicación de 15 minutos para cada paciente.

DESCRIPTORES

Delirio; Enfermería de Cuidados Críticos; Estudios Controlados Antes y Después.

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