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DELIRIUM IN INTENSIVE CARE UNITS: PREDICTIVE MODEL AND ABCDEF BUNDLE

DELIRIUM EM UNIDADE DE CUIDADOS INTENSIVOS: MODELO PREDITIVO E *BUNDLE* ABCDEF

DELIRIUM EN UNIDAD DE CUIDADOS INTENSIVOS: MODELO PREDICTIVO Y *BUNDLE* ABCDEF

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ABSTRACT

Objective: Decrease delirium's prevalence ratio in patients hospitalized in an intensive care unit of the south region of Portugal.

Methods: A descriptive study was developed in an intensive care unit of the south region of Portugal, during the final internship of a Masters degree in Nursing. A flowchart for preventing delirium in the patients hospitalized in this intensive care unit was made. This was applied, by the nurse, to 19 patients intentionally selected. Delirium monitoring was done using the confusion assessment method for intensive care units.

Results: Delirium's prevalence ratio was of 26.3%, lower than previous years. Patients with delirium, were mechanically ventilated for more days and had a prolonged stay. Out of the 9 patients with high risk of developing delirium, only 3 presented the disturbance, thanks to the implementation of a non pharmacological treatment.

Conclusions: The flowchart created can be used, profitably, in a patients group in an intensive care unit of the south region of Portugal. This tool allows a systematic approach of patients, reducing the delirium's prevalence ratio, which increases patient's safety in the daily practice.

Keywords: Bundle; Delirium; Intensive Care Unit; Nursing; Predictive Model.

RESUMO

Objetivo: Reduzir a taxa de prevalência de *delirium* nos doentes internados numa unidade de cuidados intensivos da Região Sul de Portugal.

Métodos: Desenvolveu-se um estudo descritivo numa unidade de cuidados intensivos da Região Sul de Portugal, durante o Estágio Final do Mestrado em Enfermagem. Construiu-se um fluxograma para prevenção do *delirium* nos doentes internados na referida unidade. Este foi aplicado, pelo enfermeiro, a 19 doentes selecionados de forma intencional. A monitorização do *delirium* foi feita através do método de avaliação da confusão mental para unidades de cuidados intensivos.

Resultados: A taxa de prevalência de *delirium* foi de 26.3%, inferior aos anos anteriores. Os doentes com *delirium*, apresentaram mais dias de ventilação mecânica e de internamento. A implementação de medidas não-farmacológicas, fez com que, dos 9 doentes com alto risco de desenvolver *delirium*, apenas 3 apresentassem a perturbação.

Conclusões: O fluxograma construído pode ser utilizado, proveitosamente, num grupo de doentes internados numa unidade de cuidados intensivos da Região Sul de Portugal. Este

permite fazer uma abordagem sistematizada dos doentes, conseguindo-se reduzir a taxa de prevalência de *delirium*, o que constitui um valor adicional à segurança do doente na prática diária.

Descritores: *Bundle; Delirium*; Enfermagem; Modelo Preditivo; Unidade de Cuidados Intensivos.

RESUMEN

Objetivo: Reducir la prevalência de *delirium* en los pacientes hospitalizados en una unidad de cuidados intensivos en la región sur de Portugal.

Métodos: Se ha desarrollado un estudio descriptivo en una unidad de cuidados intensivos de la región sur de Portugal, mientras ocurría una práctica de final de maestria en enfermería. Se ha creado un diagrama de flujo para la prevención del *delirium* en los pacientes hospitalizados en la misma unidad. Este diagrama de flujo fué aplicado por el enfermero a 19 pacientes seleccionados de forma intencional. La monitorización del *delirium* se hizo a través del método de evaluación de la confusión mental para las unidades de cuidados intensivos.

Resultados: La prevalencia del *delirium* fue de 26.3%, inferior a los años anteriores. Los pacientes con *delirium* tuvieron más días de ventilación mecánica y hospitalización. La aplicación de medidas no farmacológicas ha hecho que, de los 9 pacientes en alto riesgo de desarrollar *delirium*, solamente 3 tuviesen el trastorno mental referido.

Conclusiones: El diagrama de flujo desarrollado puede utilizarse, con beneficios, en un grupo de pacientes hospitalizados en una unidad de cuidados intensivos en la región sur de Portugal. Esto permite hacer un abordaje sistematizado de los pacientes, logrando reducir la prevalencia de *delirium*, lo que constituye un valor adicional a la seguridad del paciente en la práctica diaria.

Palabras clave: *Bundle*; *Delirium*; Enfermería; Modelo Predictivo; Unidad de Cuidados Intensivos.

INTRODUCTION

Delirium is characterized by disturbance of attention, consciousness and cognition, and its prevalence in patients admitted to intensive care units (ICU) can reach 87%[1]. The presence of delirium leads to an increase length of hospital stay, duration of mechanical ventilation, costs, mortality and long-term cognitive and functional impairment[2,3]. Given all this, it is crucial to prevent the development of delirium.

Identifying patients at high risk of developing delirium may facilitate prevention of this disorder. In this sense, predictive models of delirium emerged, which became an asset for daily practice[4]. PRE-DELIRIC (PREdiction of DELIRium for Intensive Care patients) was the first delirium prediction model created for intensive care. This model was validated in 2012 and reliably predicts the development of delirium during hospitalization using 10 predictors [age, diagnostic group, urgent admission, morphine administration, infection, coma, sedation, urea, metabolic acidosis, APACHE-II (Acute Physiology and Chronic Health Evaluation-II)] evaluable 24 hours after patient admission[4]. If the PRE-DELIRIC is ≥ 50%, the patient is at high risk of developing delirium[4]. This model is limited by the fact that it requires predictors obtained during the first 24 hours of ICU stay[5]. A relevant number of patients may develop delirium during this period and preventive measures should ideally be applied as early as possible[5]. Thus, in 2015 , the second predictive model of delirium for intensive care, the E-PRE-DELIRIC (Early PREdiction of DELIRium for Intensive Care patients) is validated, consisting of nine predictors (age, history of cognitive impairment, history of alcohol abuse, diagnostic group, urgent admission, mean blood pressure, corticosteroid administration, respiratory failure, urea) assessed at the time of admission to the ICU. A patient with an E-PRE-DELIRIC ≥ 35% is at high risk of developing delirium[5].

In order to understand which of the two models makes a more correct prediction of patients who develop delirium during hospitalization, the DECISION study (DElirium prediCtIon in the intenSIve care unit: head to head comparisON of two delirium prediction models) appears. The results of this study were announced in 2017, where the PRE-DELIRIC emerges as the most reliable model[6].

When identifying high-risk patients, PRE-DELIRIC contributes to a better management of resources, as we only focused on these patients, and to the early implementation of preventive measures, in which the nurse has a fundamental intervention[4].

In 2013, the guidelines for the management of pain, agitation and delirium were updated[7]. In order to comply with what is recommended in these guidelines, the ABCDEF bundle was created (A – pain assessment, prevention and management; B – spontaneous awakening and breathing training; C – choice of sedation and analgesia; D – assessment, prevention and management of delirium; E – early mobilization; F – family involvement)[8]. Scientific evidence strongly recommends the use of this bundle in the prevention and management of delirium as it enables a complete approach to the patient, a better use of resources, better pain control, an improvement in the hospital survival rate, a decrease in the delirium prevalence rate and a decrease in the number of days of mechanical ventilation[8-11].

Within the scope of letter "D" of the aforementioned bundle, the Mental Confusion Assessment Method for Intensive Care Units (MCA-ICU) is the recommended tool for the evaluation of delirium, because within the existing ones for this purpose, it is the one that presents greater sensitivity and specificity[12]. In the area of prevention, the non-pharmacological approach has been consistently demonstrated as the most effective strategy in hospitalized patients[13]. In this context, early mobilization, adequate hydration, improved sleep, orientation in time and space, therapeutic activities for cognitive stimulation and visual and auditory optimization, if necessary[13].

The identification of patients at high risk of developing delirium and the consequent implementation of non-pharmacological preventive measures is within the guidelines of Meleis' Theory of Transitions, since the human being, due to illness, cannot experience balance in the interaction with the environment, reflecting this aspect in the inability to adapt and to take care of oneself[14]. It is on this incapacity that the nurse develops interventions adjusted to each patient and respective family to promote healthy responses to the transition[15]. So, this middle-range theory guides nursing practice, allowing nurses to have a deeper understanding of the transition process and to adopt strategies to face the situation being experienced[15]. This transition may or may not be desired, and result or not of a personal choice[14], being able to establish a connection with the development of delirium in the patient hospitalized in intensive care.

In 2015, in an ICU in the southern region of Portugal, 42.9% of patients developed delirium during hospitalization. This value decreased to 38.1% in 2016, in the same period of time. This, according to the activity report of the aforementioned ICU. Given this reality, the main objective is to reduce the prevalence rate of this disorder in patients hospitalized in the aforementioned ICU.

METHODS

A descriptive study was developed, in which the subject studied was the reduction of the prevalence rate of delirium through the implementation of a predictive model and preventive measures, in patients hospitalized in an ICU in the southern region of Portugal. It was conducted after approval by the Ethics Committee of the institution where the research was carried out (process number 1852) and authorization by the Board of Directors of the same institution. This was a study conducted within the standards required by the Declaration of Helsinki.

Existing statistical data were consulted regarding the percentage of patients with delirium in the last two years. A work tool was created in the form of a flowchart, which allows the identification of patients at high risk of developing delirium, to whom non-pharmacological preventive measures are applied (Figure 1↗).

For patients admitted between November 1 and December 22, 2017, the constructed flowchart was implemented [calculation of PRE-DELIRIC (Appendix 1) – identification of patients at high risk of developing delirium – implementation of the ABCDEF bundle, with emphasis on the letter "D", where delirium was monitored and non-pharmacological preventive measures were applied]. Only the letter "D" of the ABCDEF bundle was addressed, as it allows a direct approach to the disturbance under study. This process was ensured by a nurse trained in the different tools used. The data collected during this process were placed in a previously constructed table (Table 1↗).

As exclusion criteria, a length of stay < 24 hours, a score < -3 on the Richmond Agitation and Sedation Scale (RASS) maintained throughout the hospital stay and the previous existence of cognitive alterations, the same criteria that had been used to obtain the results in the last two years. As a result, 19 patients were part of the sample (Figure 2↗).

The assessment of delirium was performed using the CAM-ICU, and a positive assessment during hospitalization is sufficient to consider delirium present.

Variables such as gender, number of days of mechanical ventilation and hospitalization, survival or not in the ICU and APACHE-II value were also collected (Table 1↗).

The collected data were analyzed using Microsoft Excel.

RESULTS

In a total sample of 32 patients admitted to the ICU between November 1 and December 22, 2017, 13 met the exclusion criteria. Thus, 19 patients were included for analysis (Figure 2↗), whose data and demographic and clinical characteristics are shown in Table 1↗ and 2↗.

42.1% of study patients were male. The most frequent reason for exclusion was a hospital stay of less than 24 hours, followed by a RASS score < -3 maintained throughout the entire hospital stay, with a total percentage of excluded individuals of 40.6%.

Most patients had a PRE-DELIRIC between 30% and 40%. Of the 9 patients with PRE--DELIRIC ≥ 50%, 3 developed the disorder under study, while in 6 of the cases this was not the case.

Of the patients included, 5 had delirium, which corresponds to 26.3% of the population under analysis. Of these, 3 had been identified as patients at high risk of developing delirium (PRE-DELIRIC ≥ 50%), while 2 had a PRE-DELIRIC < 50%.

In the study sample, patients had an average of 3.8 days of mechanical ventilation and 5.6 days of hospitalization. The mean APACHE-II value was 20.3 and the mortality rate was 15.8%. The 5 patients who developed delirium had more days of mechanical ventilation and hospitalization. Of these 5 patients, 3 had an APACHE-II value higher than the mean of the study sample and one of them died.

The implementation of non-pharmacological measures within the scope of the letter "D" of the ABCDEF bundle, by the nurse, meant that, of the 9 patients at high risk of developing delirium, only 3 presented this disorder, showing effectiveness in 66.7% of the cases. With this intervention, the prevalence rate of delirium reduced compared to the same period of time in previous years (11.8% compared to 2016 and 16.6% compared to 2015), as shown in Graph 1↗.

DISCUSSION

Delirium is an acute brain disorder that can affect from 22% to about 80% of patients admitted to intensive care[1,16]. In the present study, the prevalence rate of this disorder was 26.3%, within the described range, although considerably below the possible values to be achieved.

It is recommended that the first step to predict the prevalence rate of delirium is the use of a predictive model[5,17]. In this context, PRE-DELIRIC shows a reliable prediction and its use allows the stratification of patients according to the their risk of developing this disorder, and only those at high risk are treated[4,17]. This allows nurses to implement preventive measures immediately and, consequently, to improve the prognosis of these patients[4,5,17]. These advantages make that the daily use of PRE-DELIRIC in intensive care practice is advised[4]. In the present study, only 3 of the 9 patients with PRE-DELIRIC ≥ 50% developed delirium, revealing a lower correct prediction level than previous studies[17,18]. Despite this, it should be noted that for these patients at high risk of developing delirium, preventive measures were implemented in order to prevent this from happening, which may explain these results.

The incorporation of evidence from the guidelines for the management of pain, agitation and delirium in the ABCDEF bundle has shown to have positive effects, as this systematization in the approach to critically ill patients has had results such as a reduction in the delirium rate and the mortality rate[9-11].

Although in this study, only the letter "D" of that bundle was implemented, the results were also positive. The implementation of non-pharmacological preventive measures meant that 6 of the patients at high risk of developing delirium did not present this disorder. There are previous studies, with results that are in agreement with these findings[9,11,13].

As seen, the use of the ABCDEF bundle in intensive care contributes to the improvement of the results obtained, even if it is not implemented in its entirety. Therefore, nurses have an active intervention in this aspect, as they have the autonomy to act in some areas that constitute the bundle, such as monitoring delirium with the CAM-ICU and implementing non-pharmacological preventive measures.

Delirium is an undervalued mental state in the ICU but it has serious consequences, so there needs to be a structured approach to these patients[18]. In this study, a flowchart was created to prevent the development of delirium in patients hospitalized in the ICU and, consequently, reduce its prevalence rate. The objective was achieved, which allows us to

affirm that a work instrument with clinical relevance was built. It focuses on two significant aspects, the PRE-DELIRIC model (prediction) and the ABCDEF bundle, with special emphasis on the letter "D" (prevention). Taking into account the importance described above about these two elements, it is considered that the creation of the flowchart constitutes an important fact in the construction of knowledge. This is part of the commitment to the quality of health care, which has placed new and challenging goals for nurses in the development of the nursing discipline and profession, in order to achieve an adequate response to existing needs[19].

This study had two significant limitations. First, the short period of time it was run was reflected in the sample size. The fact that the number of patients included for analysis was reduced, conditions the generalization of the conclusions obtained. Second, the use of the work tools involved in the built flowchart (PRE-DELIRIC, CAM-ICU and ABCDEF bundle) implies a professional trained in their use[5,20], which meant that all assessments and interventions were in charge of a single nurse, since there were no more elements with experience in the matter. This aspect also meant that the implementation of the letter "D" of the ABCDEF bundle was not ensured daily as recommended[5].

Future studies are suggested to assess the impact of using the PRE-DELIRIC model and the full use of the ABCDEF bundle on the prevalence rate of delirium in ICU patients, since data in this area are still scarce.

CONCLUSIONS

The flowchart constructed can be used in a group of patients hospitalized in an ICU in the southern region of Portugal. It made it possible to identify patients at high risk of developing delirium, to whom non-pharmacological preventive measures were applied, leading to a reduction in the prevalence rate of this mental disorder. Thus, it can be said that the objective initially defined was successfully achieved. Taking into account the results obtained with the application of the flowchart created, it is considered that this constitutes an additional value for patient safety in daily practice and for improving the quality of care provided.

This study shows that it is important to use a predictive model of delirium in intensive care, which, associated with early prevention, brings benefits to clinical practice. Thus, the PRE-DELIRIC model and the ABCDEF bundle seem to be elements to be incorporated into the daily approach to critically ill patients.

The instrument created allows nurses to make a systematic approach to patients, in terms of preventing delirium in the ICU. This intervention has the theoretical support of Meleis' Theory of Transitions, which, in addition to enabling the understanding of the transition through which the individual goes through a disease process, allows the nurse to develop skills to care in this context.

In terms of future strategies, as a way of improvement, it is intended to train the remaining nursing professionals so that they can be involved in this project, putting it into practice more easily and frequently. It is intended to implement the ABCDEF bundle as a whole, with the involvement of the medical team, in order to enhance the results obtained. The introduction of preventive pharmacological measures is planned, with drugs whose benefit has already been scientifically proven. It is recognized the need to implement the flowchart created over a longer period of time, achieving a more significant sample, so that the results obtained can be extrapolated and more reliable.

Authors' contributions

RP: Design and coordination of the study, collection, storage and analysis of data, review and discussion of results.

RP, JM e MCM: Study design, review and discussion of results.

RP, MCM, HG: Study design and coordination, data analysis, review and discussion of results.

All authors read and agreed with the published version of the manuscript.

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Confidentiality of Data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

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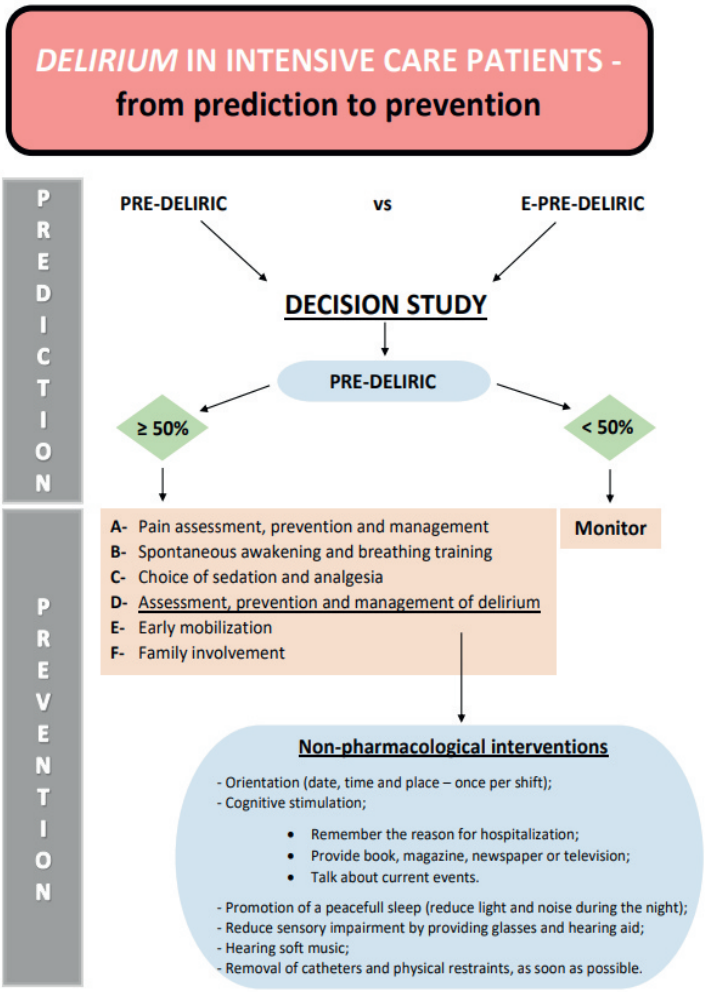


Figure 1 – Flowchart for the prevention of delirium in the patient in the intensive care unit.[↖]

Table 1 – Data from patients included in the study.[5,6,7]

Gender	Mechanical ventilation days	Days of admission to the ICU	Survival in the ICU	APACHE-II	PRE-DELIRIC (%)	Delirium
F	10	13	Yes	23	54	Present
F	4	5	Yes	27	66	Absent
F	0	2	Yes	18	38	Absent
M	4	6	Yes	13	40	Present
F	0	2	Yes	11	25	Absent
F	15	15	No	18	44	Absent
M	1	2	Yes	19	51	Absent
F	0	3	Yes	17	39	Absent
F	3	10	Yes	34	72	Absent
M	0	2	Yes	24	56	Absent
M	1	3	Yes	16	74	Absent
F	1	4	Yes	17	45	Absent
M	5	7	Yes	23	68	Present
F	1	2	Yes	22	21	Absent
M	7	7	No	19	40	Present
F	3	4	Yes	31	61	Present
M	10	10	No	18	39	Absent
M	6	8	Yes	13	28	Absent
F	1	2	Yes	23	60	Absent

M= male; F= female.

Table 2 – Demographic and clinical characteristics of patients included in the study.[5]

Variable	
Sex, n (%)	
Male	8 (42.1)
Female	11 (57.9)
APACHE-II Punctuation, average (min/max)	20.3 (11/34)
PRE-DELIRIC ≥ 50%, n (%)	9 (47.4)
Delirium present, n (%)	5 (26.3)

min= minimum; max= maximum.

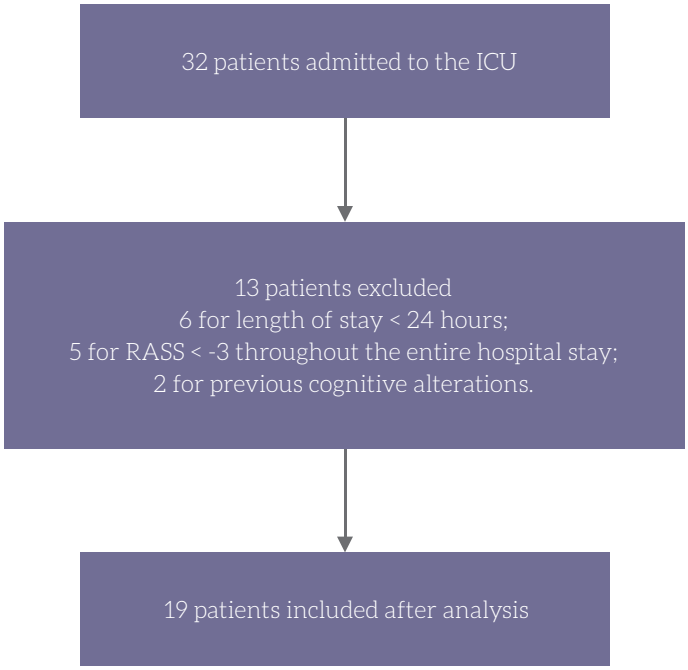
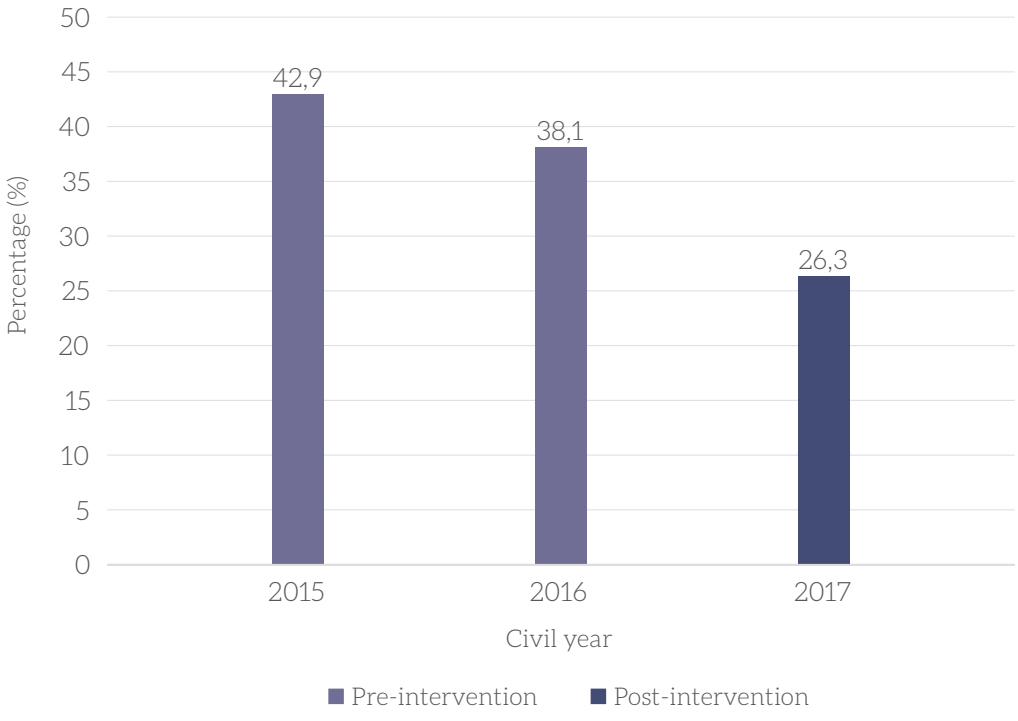


Figure 2 – Flowchart of patients included in the study.[22]



Graph 1 – Prevalence of delirium in patients admitted to the ICU.[1]