Original Article

TEXTO & CONTEXTO ENFERMAGEM
TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

PREVALENCE AND FACTORS ASSOCIATED WITH CHRONIC CRITICAL DISEASE IN HOSPITALIZED FOR TRAUMA IN INTENSIVE CARE

Maicon Henrique Lentsck[1]
Matheus da Cunha Paris[1]
Carine Teles Sangaleti[1]
Bruno Bordin Pelazza[1]
Leticia Gramazio Soares[1]
Tatiane Baratieri[1]
Erica de Brito Pitilin[2]
Ricardo Castanho Moreira[3]

[1]Universidade Estadual do Centro Oeste, Departamento de Enfermagem. Guarapuava, Paraná, Brasil.
[2]Universidade Federal da Fronteira Sul, Setor de Enfermagem. Chapecó, Santa Catarina, Brasil.
[3]Universidade Estadual do Norte do Paraná, Setor de Enfermagem. Campus Luiz Menehgel, Bandeirantes, Paraná, Brasil.

ABSTRACT

Objective: to identify the prevalence of chronic critical disease and associated factors in patients hospitalized for trauma in the Intensive Care Unit.
Method: case-control study, with data from medical records of adults hospitalized for trauma in an Intensive Care Unit, between 2013 and 2019. Data were collected from the patient admission book, the electroni cmedical records and the records of the Hospital Infection Control Service. The dependent variable was the occurrence of chronic critical disease, and the independent variables were related to sociodemographic characteristics, comorbidities, trauma, pre-hospital care, prognostic indices, procedures and complications. Multiple logistic regression analysis was performed, which estimated the Ods Ratio (OR) and respective confidence intervals (CI).
Results: chronic critical disease occurred in 150 patients (24.2%), of the 619 patients studied. The factors associated with CCD were organic dysfunction (OR=1.09) and gastrointestinal complications (OR=2.71). Patients with chronic critical disease, in addition to proseeding for surgical procedures, developed organic dysfunctions in different systems, presenting high scores in prognostic indexes, i.e., a worse prognosis, in addition to developing complications.
Conclusion: the identification of gastrointestinal complications and the increase in organic dysfunction as factors associated with chronic critical patients become useful to compose the clinical profile of patients and to plan intensive care for the traumatized patients, thus contributing to the prevention and management of these patients by nurses.

DESCRIPTORS: Acute illness. Chronic disease. Trauma. Intensive care unit. Critical care. Epidemiology.

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PREVALÊNCIA E FATORES ASSOCIADOS À DOENÇA CRÍTICA CRÔNICA EM HOSPITALIZADOS POR TRAUMA EM TERAPIA INTENSIVA

RESUMO

Objetivo: identificar a prevalência de doença crítica crônica e fatores associados em pacientes hospitalizados por trauma em Unidade de Terapia Intensiva.
Método: estudo de caso-controle, com dados de prontuários de adultos hospitalizados por trauma em uma Unidade de Terapia Intensiva, entre 2013 e 2019. Os dados foram coletados do livro de admissão de pacientes, do prontuário eletrônico e das fichas do Serviço de Controle de Infecção Hospitalar. A variável dependente foi a ocorrência de doença crítica crônica e as variáveis independentes relacionavam-se às características sociodemográficas, comorbidades, trauma, atendimento pré-hospitalar, índices prognósticos, procedimentos e complicações. Realizou-se análise de regressão logística múltipla, que estimou o *Ods Ratio* (OR) e respectivos intervalos de confiança (IC).
Resultados: a doença crítica crônica ocorreu em 150 pacientes (24,2%), dos 619 estudados. Os fatores associados à DCC foram disfunção orgânica (OR=1,09) e complicações gastrointestinais (OR=2,71). Os pacientes com doença crítica crônica, além de demandarem por procedimentos cirúrgicos, desenvolveram disfunções orgânicas em diferentes sistemas, apresentando altas pontuações nos índices de prognósticos, ou seja, um pior prognóstico, além de desenvolverem complicações.
Conclusão: a identificação das complicações gastrointestinais e o aumento da disfunção orgânica como fatores associados ao paciente crítico crônico tornam-se úteis para compor perfil clínico de pacientes e para planejar a assistência intensiva ao traumatizado, contribuindo, assim, para a prevenção e o manejo desses pacientes pelo enfermeiro.

DESCRITORES: Doença aguda. Doença crônica. Trauma. Unidade de terapia intensiva. Cuidados críticos. Epidemiologia.

PREVALENCIA Y FACTORES ASOCIADOS A ENFERMEDAD CRÓNICA CRÍTICA EN HOSPITALIZADOS POR TRAUMA EN CUIDADOS INTENSIVOS

RESUMEN

Objetivo: identificar la prevalencia de enfermedad crítica crónica y factores asociados en pacientes hospitalizados por trauma en la Unidad de Cuidados Intensivos.
Método: estudio de casos y controles, con datos de las historias clínicas de adultos internados por trauma en una Unidad de Cuidados Intensivos, entre 2013 y 2019. Los datos fueron recolectados del libro de ingreso de pacientes, la historia clínica electrónica y los formularios del Servicio de Control de Infecciones Hospitalarias. . La variable dependiente fue la ocurrencia de enfermedad crítica crónica, y las variables independientes se relacionaron con características sociodemográficas, comorbilidades, traumatismos, atención prehospitalaria, índices pronósticos, procedimientos y complicaciones. Se realizó análisis de regresión logística múltiple, que estimó el Ods Ratio (OR) y los respectivos intervalos de confianza (IC).
Resultados: la enfermedad crítica crónica se presentó en 150 pacientes (24,2%), de los 619 estudiados. Los factores asociados a CC fueron disfunción orgánica (OR=1,09) y complicaciones gastrointestinales (OR=2,71). Los pacientes con enfermedad crítica crónica, además de requerir procedimientos quirúrgicos, desarrollaron disfunciones de órganos en diferentes sistemas, presentando puntuaciones altas en los índices pronósticos, o sea, peor pronóstico, además de desarrollar complicaciones.
Conclusión: La identificación de las complicaciones gastrointestinales y el aumento de la disfunción orgánica como factores asociados a los pacientes críticos crónicos se vuelven útiles para componer el perfil clínico de los pacientes y planificar la terapia intensiva para pacientes traumatizados, contribuyendo así a la prevención y manejo de estas condiciones. pacientes por la enfermera.

DESCRIPTORES: Enfermedad aguda. Enfermedad crónica. Trauma. Unidad de terapia intensiva. Cuidado crítico. Epidemiología.

INTRODUCTION

Trauma is the leading cause of death and disability in people under 25 years of age[1]. In the United States of America (USA), a study analyzed hospitalizations for injuries in all trauma centers and showed that intensive treatment was required in 33.8% of hospitalizations, causing an incidence of 3.3 hospitalizations in adults in intensive care units (ICU) per 1,000 inhabitants[2].

In Brazil, although there are few studies on the subject, a study conducted in Cascavel-PR showed that trauma was responsible for 32.6% of ICU admissions, the most common cause being traffic accidents (60.4%)[3]. Another study, which analyzed 18 years of ICU trauma hospitalizations in the Unified Health System (SUS), showed that, on average, there was a 3.6% increase in hospitalization rates. However, hospital mortality due to trauma in the ICU declined, on average, 1.7% per year[4]. Thus, there is undoubtedly a situation of perennial chronicity among traumatized patients hospitalized in the ICU.

It is noteworthy that the chronicity mentioned was conceptually highlighted by some researchers in the late 1980s. At the time, the term chronic critically ill patient was created in order to describe patients who survive an initial episode of critical illness, but who remain dependent on intensive care for prolonged periods or even for the rest of their lives[5]. These are patients who survive the acute phase of critical illness and stay much longer in the ICU, developing a much more chronic phase[6].

The occurrence of CCD is a reality in ICUs, with studies demonstrating a prevalence of 14%[7] and 18.5%[8] in traumatized patients hospitalized in the intensive care sectors. Generally, these patients are severely injured, present high severity of trauma, with a mean Injury Severety Score (ISS) of 32.1 and the Acute Physiology And Chronic Health Evaluation (APACHE II) of 22.8[8], considered high.

In the USA, a study with critically ill patients showed that 7.6% of patients were classified as CCD, presenting hospital mortality of 30.9% and an estimated hospital cost of US$26 billion[9]. In Brazil, there is no consensus to define CCD, making it difficult to be identified in intensive patients, in addition, there is still little research on the subject, with incipient or even absent data.

Considering the epidemiology of trauma, the impact of CHD on the health system, the recognition of the need for investigation for the prupose of care planning and the gap in the clinical characteristics of chronic critically ill patients, the aim of this study was to identify the prevalence of chronic critical disease and associated factors in patients hospitalized for trauma in the ICU.

METHOD

The case-control study method was chosen for this research, delimited to a general ICU of a tertiary hospital in the Midwest region of Paraná, located in the municipality of Guarapuava, headquarters of the 5th Regional Health Department of the State Health Secretariat (SESA) and conducted according to the recommendations of the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol for this type of study.

The study population consisted of adult patients who suffered trauma. For the sample calculation, we considered a 14% percentage occurrence of CCD[7], a confidence level of 95% and a margin of error of 3%. A percentage for losses of 15% was predicted. 605 participants were calculated as the required amount for the sample. In the period included in this study, 976 patients were admitted to the department. Inclusion criteria were: to be over 18 years of age, admitted to the ICU in the period between January 1, 2013 and December 31, 2019 and also exclusion criteria, which were: hospitalizations related to procedures not related to trauma (259), with incomplete records (37) and trauma related to burns and intoxications (61), in order to homogenize the sample, since it is specific traumas which require differentiated intensive care. Thus, the sample consisted of 619 participants.

Data were collected from the ICU admission book. Subsequently, the documental analysis of the seven-year retrospective series and the selected medical records was performed through the electronic medical records and records from the Hospital Infection Control Service (HICS). In addition, the physical records were also accessed.

To classify the occurrence of CCD in the study, criteria established and used by Medicare and Medicaid in the USA were used, which consider eight days of ICU stay based on one or more of the following conditions: use of mechanical ventilation (MV) for at least three consecutive days, tracheostomy (TQT), Cerebrovascular Accident (CVA), Traumatic Brain Injury (TBI), sepsis or severe injury[10], this variable being considered as dependent. The determinants for their development in the ICU were organized into groups of characteristics: a) sociodemographic (sex and age); b) comorbidity; c) trauma (severity, most affected body region, type of trauma, multiple trauma and external cause); d) information collected and procedures performed at the APH (breath ethyl, advanced respiratory and circulatory support, acute respiratory failure, altered pupils and blood pressure, and use of vasoactive drugs); e) prognostic indices (APACHE II, Simplified Acute Physiology Score (SAPS II), Logistic Organ Dysfunction System (LODS) and Sequential Organ Failure Assessment (SOFA); e) ICU procedures (surgeries, biological substances, packed red blood cells in the first 24 hours, total parenteral nutrition, vasoactive drugs and mechanical ventilation); f) complications in the ICU (respiratory, cardiac, gastrointestinal, hematological, infectious, renal, musculoskeletal, neurological, vascular and psychiatric). comorbidity was defined by the Charlson Comorbidity Index (CCI). The procedures of pre-hospital care (PHC) were defined as: advanced respiratory support, orotracheal intubation (IOT), transtracheal percutaneous ventilation (TPV), puncture and/or chest drainage; advanced circulatory support, venous access, infusion of crystalline solution for volume replacement (greater than or less 1000 ml) and administered drugs. The ISS was used trauma severity, which is calculated by the Abbreviated Injury Scale (AIS). The prognostic and organic dysfunction indexes APACHE II, SAPS II, LODS and SOFA were calculated using the worst parameters identified in the first 24 hours through the *Société Française d'Anesthésie et de Réanimation website*. To classify complications, a consensus list of experts was considered, considering 25 complications that can be used to assess the quality of care for acute adult trauma[11].

The variables that required classifications were performed by researchers through a double collection. Subsequently, the results were compared to identify inconsistencies and subsequent analysis by a third researcher. This procedure was performed considering that the medical records were a source of extensive and sometimes unclear information, requiring thorough reading of all its elements.

The data were analyzed descriptively with central and dispersion measures, such as mean, standard and median deviation, and also by means of relative (%) and absolute (n) frequencies. The presentation of the frequency of CCD was in a punctual and estimated measure, with a confidence interval of 95%.

To compare categorical variables, pearson's chi-square or Fischer's exact test (for expected values lower than 5) was performed. In order to compare the numerical variables between two groups, the student´s t or Mann-Whitney tests were performed. The $p \leq 0.05$ value was considered significant in each of the tests.

Multiple analysis was performed using logistic regression models using the stepwise forward model, which estimated the Ods Ratio (OR) and respective confidence intervals (CI). Variables with $p<0.20$ in the univariate analysis were included in the model and the variables that remained significant ($p<0.05$) or adjusted the model were maintained in the final model. The adequacy of the final models was verified from the devianc and Hosmer-Lemeshow tests, the colinearity of the variables was tested with the variance inflation factor (VIF) and the statistical analyses performed with version 12 of the Stata software.

This study was approved by the Ethics Committee in research with human beings, and was exempt from requiring Informed Consent Form (TCLE) as it is a retrospective study of documentary analysis.

RESULTS

During the study period, 619 traumatized patients were hospitalized in the ICU and, of these, 150 (24.2% - 95% CI: 20.8; 27.7) developed CCD, with an average stay of 17 days, maximum of 72 days and minimum of 8 (eight) days. Sociodemographic characteristics show that 85.3% were men, with a mean age of 39.82 years ±19.27. A higher mean Charlson Comorbidity Index (CCI) was noted in those with CCD (0.46), in addition to a greater injury severity (ISS) (17.82 ±8.99) compared to those without CCD (17.59 ± 8.93). Traffic accidents stood out as the main external causes (56.7%), the majority (82.7%) suffered multiple injuries and the predominant type of injury was blunt trauma (83.3%) (Table 1).

For patients with CCD in intensive care, those who required 2 (two) or more surgeries (43.3%) stand out. The prognostic and organ dysfunction indices, measured in the first 24 hours of admission, were always higher in individuals with CCD APACHE II 13.98 ±7.30; SAPS II 35.22±17.13; LODS 5.56 ±3.60; SOFA 5.02 ±3.70 and an average of 2.58 ±1.18 compromised organ systems. In addition, in relation to organic dysfunctions, more than 50% of the patients had hepatic, neurological, renal and pulmonary dysfunction. Regarding the need for life support procedures, 70% of these patients required mechanical ventilation, and 52.7% needed to infuse biological substances. A significant association was identified between CCD and the variables renal dysfunction and mechanical ventilation, as well as the SOFA means and number of compromised systems showed a significant difference between the groups with and without CCD (Table 2).

Table 1 - Prevalence of Chronic Critical Disease and sociodemographic characteristics of trauma and pre-hospital care of traumatized patients hospitalized in ICU, according to their classification. Guarapuava, PR, Brazil, 2022. (n=619)

Variables	Chronic Critical Disease				
	Total	Yes		No	
	n	n	%	n	%
Total	619	150	23.2	469	76.8
Sex					
Male	94	22	14.7	72	15.4
Female	525	128	85.3	397	84.6
Breath ethyl / Drugs					
No	533	126	84.0	407	86.8
Yes	86	24	16.0	62	13.2
Cause					
Physical aggression	155	35	23.3	120	25.6
Traffic accidents	349	85	56.7	264	56.3
Falls	101	28	18.7	73	15.6
Other causes	14	2	1.3	12	2.6
Type of trauma					
Bruised	509	125	83.3	384	81.9
Penetrating	110	25	16.7	85	18.1

Table 1 - Cont.

Variables	Chronic Critical Disease				
	Total	Yes		No	
	n	n	%	n	%
Polytrauma					
No	91	26	17.3	65	13.9
Yes	528	124	82.7	404	86.1
Most affected regions					
Extremities	79	22	14.7	57	12.2
Head and neck	341	70	46.7	271	57.8
Abdomen	75	20	13.3	55	11.7
Face	27	8	5.3	19	4.1
Thorax	97	30	20.0	67	14.3
Advanced respiratory support					
No	165	36	24.0	129	27.5
Yes	454	114	76.0	340	72.5
Advanced circulatory support					
No	191	43	28.7	148	31.6
Yes	428	107	71.3	321	68.4
Acute respiratory failure					
No	221	45	30.0	176	37.5
Yes	398	105	70.0	293	62.5
Altered pupils					
No	464	111	74.0	353	75.4
Yes	154	39	26.0	115	24.6
SAP*< 90mmHg					
No	444	106	70.7	338	72.1
Yes	175	44	29.3	131	27.9
Vasotive drugs					
No	598	143	95.3	455	97.0
Yes	21	7	4.7	14	3.0

Continuous variables	Chronic Critical Disease			
	Yes		No	
	Average	SD†	Average	SD†
Age	39.82	19.27	37,.44	17.53
CCI‡	0.46	1.38	0.36	1.18
ISS§	17.82	8.99	17.59	8.93

*SBP: Systolic Blood Pressure; †SD: Standard Deviation; ‡CCI: Charlson Comorbidity Index; §*Injury Severity Score*.

Table 2 - Characteristics of intensive care of traumatized patients hospitalized in intensive care, according to Chronic Critical Illness. Univariate analysis performed according to Pearson's Chi-Square *or* fischer exact, Student t or Mann-Whitney tests. Guarapuava, PR, Brazil, 2022. (n=619)

Variables	Chronic Critical Disease				
	Total	Yes		No	
	n	n	%	n	%
Surgery					
1	127	38	25.3	89	19.0
2 and more	274	65	43.3	209	44.6
No	218	47	31.3	171	36.5
Cardiac dysfunction					
No	480	115	76.7	365	77.8
Yes	139	35	23.3	104	22.2
Hematological dysfunction					
No	612	148	98.7	465	98.9
Yes	7	2	1.3	5	1.1
Liver dysfunction					
No	280	68	45.3	212	45.2
Yes	339	82	54.7	257	54.8
Neurological dysfunction					
No	216	46	30.7	170	36.2
Yes	403	104	69.3	299	63.8
Renal dysfunction*					
No	331	69	46.0	262	55.9
Yes	288	81	54.0	207	44.1
Pulmonary dysfunction					
No	327	71	47.3	256	54.6
Yes	292	79	52.7	213	45.4
Vasotive drugs					
No	415	91	60.7	324	69.1
Yes	204	59	39.3	145	30.9
Mechanical ventilation*					
No	229	45	30.0	184	39.2
Yes	390	105	70.0	285	60.8
Total parenteral nutrition					
No	596	142	94.7	454	96.8
Yes	23	8	5.3	15	3.2

Table 2 - Cont.

Variables	Chronic Critical Disease				
	Total	Yes		No	
	n	n	%	n	%
Biological substances					
No	325	71	47.3	254	54.2
Yes	294	79	52.7	215	45.8
Red blood cell concentrate					
No	449	103	68.7	346	73.8
Yes	170	47	31.3	123	26.2

Continuous variables	Chronic Critical Disease			
	Yes		No	
	Average	SD†	Average	SD†
APACHE II‡	13.98	7.30	12.86	8.05
SAPS II§	35.22	17.13	32.15	18.59
LODS||	5.56	3.60	4.87	3.67
SOFA*¶	5.02	3.70	4.25	3.51
Compromised systems*	2.58	1.18	2.30	1.27

* Significant relationship between variables – p value < 0.05; †SD: Standard Deviation; ‡APACHE: Acute Physiology And Chronic Health; §SAPS: Simplified Acute Physiology Score; ||LODS: Logistic Organ Dysfunction System; ¶SOFA: Sequential Organ Failure Assessment.

Regarding the complications developed during the ICU stay, even though the majority were not, some complications presented considerably high values in patients with CCD, with respiratory (37.3%), hematological (22.7%) and psychiatric (23.3%) complications being more frequent. A significant association was identified between CCD and the variables respiratory and gastrointestinal complications (Table 3).

The factors associated with the development of CCD for this population were analyzed in Table 4. The univariate model highlights the variables included for analysis in the final model (p<0.20), remaining significant: mean number of compromised organic systems (*p*= 0.019), SOFA mean (*p*=0.022), renal dysfunction (*p*=0.036), use of mechanical ventilation (*p*=0.042), gastrointestinal complications (*p*=0.007) and respiratory complications (*p* =0.049). The variables maintained in the multiple model associated with CCD, independently of the others, were organ dysfunction, showing that, with each increase of one point in the SOFA index (p=0.032), the chance of CCD OR 1.09 increases by 9% (CI=1.00;1.11) and gastrointestinal complications (p=0.012) with OR 2.71 (CI=1.24;5.94) (Table 4).

Table 3 - Complications in traumatized patients hospitalized in ICU, according to Chronic Critical Disease. Univariate analysis performed according to Pearson's Chi-Square or Fischer's exact, *Student's t or Mann-Whitney's test.* Guarapuava, PR, Brazil, 2021. (n=619)

Variables	Chronic Critical Disease				
	Total	Yes		No	
	n	n	%	n	%
Respiratory complications*					
No	428	94	62.7	334	71.2
Yes	191	45	37.3	135	28.8
Cardiac complications					
No	517	115	81.3	395	84.2
Yes	102	35	18.7	74	15.8
Gastrointestinal complications*					
No	591	137	91.3	454	96.8
Yes	28	13	8.7	15	3.2
Hematological complications					
No	494	116	77.3	378	80.6
Yes	125	34	22.7	91	19.4
Infectious complications					
No	558	133	88.7	425	90.6
Yes	61	17	11.9	44	9.4
Surgical complications					
No	584	143	95.3	441	94.0
Yes	35	7	4.7	28	6.0
Musculoskeletal complications					
No	552	137	91.3	415	88.5
Yes	67	13	8.7	54	11.5
Neurological complications					
No	614	149	99.3	465	99.1
Yes	5	1	0.7	4	0.9
Vascular complications					
No	614	148	98.7	466	99.4
Yes	5	2	1.3	3	0.6
Psychiatric complications					
No	445	115	76.7	330	70.4
Yes	174	35	23.3	139	29.6

*Significant relationship between variables - $p<0.05$.

Table 4 - Logistic regression models, according to stepwise foward, for Chronic Critical Disease in traumatized ICU patients. Guarapuava, PR, Brazil, 2021. (n=619)

Characteristics	Univariate model			Multiple model		
	OR*	IC†	*p* value	OR aj‡	IC†	*p* value
Demographic						
Age	1.00	0.99-1.01	0.159	1.00	0.99-1.01	0.151
Trauma						
Severe head trauma	0.66	0.38-1.16	0.158	1.08	0.68-1.72	0.727
Intensive treatment						
Surgeries (2 and more)	1.55	0.94-2.55	0.083	1.37	0.86-2.28	0.220
APACHE II§	1.01	0.99-1.04	0.133	0.99	0.95-1.02	0.647
SAPS II||	1.00	0.99-1.01	0.075	0.99	0.98-1.01	0.882
SOFA¶	1.06	1.00-1.11	0.022	1.05	1.00-1.11	**0.032**
LODS**	1.04	0.99-1.09	0.088	0.99	0.92-1.07	0.945
Nº systems committed	1.19	1.02-1.38	0.019	1.09	0.89-1.33	0.391
Renal dysfunction	1.48	1.02-2.14	0.036	1.36	0.93-1.98	0.112
Mechanical ventilation	1.50	1.01-2.23	0.042	1.20	0.74-1.96	0.441
Vasotive drugs	1.44	0.98-2.12	0.057	1.11	0.69-1.77	0.655
Pulmonary dysfunction	1.33	0.92-1.93	0.122	0.93	0.56-1.54	0.787
Biological substances	1.31	0.90-1.90	0.146	1.02	0.67-1.57	0.893
Complications						
Psychiatric	0.72	0.47-1.10	0.136	0.74	0.48-1.14	0.175
Gastrointestinal	2.87	1.33-6.18	0.007	2.71	1.24-5.94	**0.012**
Respiratory	1.47	1.00-2.16	0.049	1.32	0.88-1.97	0.169

*OR: Odds Ratio; †CI: Confidence interval; ‡ OR aj: Adjusted Odds Ratio; §APACHE II: Acute Physiology And Chronic Health; ||SAPS II: Simplified acute physiology score ¶SOFA: Sequential Organ Failure Assessment.; **LODS: Logistic Organ Dysfunction System.

DISCUSSION

CCD occurred in 150 patients out of 619 studied, i.e., 24.2% of the sample, with an estimated occurrence of 20.8% to 27.7% of the adult traumatized population in ICUs in Brazil. Most of these individuals were hospitalized for blunt trauma, which is the most prevalent type of trauma in car accidents, as demonstrated in other studies[8–9].

CCD affects about 10% of general ICU patients annually[12]. In the Brazilian reality, a study in Rio Grande do Sul with general intensive patients showed that 11.2% of these developed CCD[13], while in traumatized patients it reached 14% to 18.5%[8–9]. The data found in this study presented a prevalence of 24.2%, considered the highest prevalence. This may be directly related to the demand for surgical procedures and organic dysfunctions in different systems, presenting high scores in prognostic indices, in addition to developing complications. Furthermore, in the multiple analysis, gastrointestinal complications and the highest SOFA score remained as independent associated factors for the development of CCD.

The literature mentions that the decrease in hospital mortality due to trauma shows that survivors remain dependent on intensive care for a long period and, after discharge, with sequelae, psychological and cognitive alterations[11–12].

The mean ICU stay is justified by the severity of patients, who require long-term intensive care, as found in this study, in which the length of stay was 17 and eight days, a result that is in agreement with the findings available in the literature, which demonstrate a high mean length of stay in the ICU[12,14–15].

Although mortality from critical illness has fallen over decades, the number of patients with long-term functional disabilities has increased, patients with CCD are being discharged from ICUs, thus causing impairments in quality of life, significant health costs[616], and family overload. In addition, they become dependent on care, requiring preparation for discharge from this unit and the hospital, as well as for returning home, which requires articulation of care and support networks at the primary level of the latter, in order to avoid a continuous cycle of complications and readmissions[17].

As for the characteristics of patients admitted to the ICU with CCD, the literature shows a predominance of males[18–19]. This predominance is even greater when observed among trauma patients[9], which is explained by the risk behavior used in traffic and abusive use of alcohol and drugs by a significant portion of the population[20]. This may determine an increased incidence of CCD in patients with blunt trauma and the severely injured[9].

Although there is not much research on patients with CCD that explored the dysfunctions and complications addressed in this study, some authors found similar results. These are critically ill patients who require supportive therapies, such as vasoactive drugs and MV and, therefore, are considered complex cases that present a high risk of complications, a greater predominance of pulmonary and renal dysfunction, in addition to complications such as pneumonia in its different types: nosocomial[8], associated with MV, aspirative and others[21–22].

According to the profile identified in this study and the fact that it was carried out with trauma patients hospitalized in an ICU, one can conjecture with the severity score verified in the trauma, as it causes greater organic dysfunctions and severe injuries in patients[8–9].

The highest average score for prognostic indices and organ dysfunction in patients with CCD compared to those who did not develop it is also found in the literature, a fact that shows a poor prognosis associated with the failure of numerous systems, with a high risk of mortality and complications, given the pathophysiology involved, as they are fragile and complex patients, who requir complex care, medications, interventions and a multiprofessional therapeutic approach from an interdisciplinary perspective[8–9,18,22]. However, it should be noted that knowledge about CCD is still incipient and its pathophysiology is not well explained. That is, although advances add new information, their complexity does not lend itself to a linear clinical path[12].

Regarding the pathophysiology of CCD, the literature shows that, when the patient progresses to this condition, there is an attenuation of the activation of the neuroendocrine axis, causing hormonal changes. There is pituitary suppression, probably due to hypothalamic suppression, hypercortisolemia, increase in dopamine and cytokines[12]. Furthermore, in CCD, there is a decrease in growth hormone due to hypothalamic dysfunction[23]. In trauma, one of the main characteristics is hypercortioslemia and a decrease in thyroid hormones[24–25] and, as CCD evolves, a slow reduction in cortisol levels is observed, in addition to the maintenance of the decrease in thyroid hormones[13]. Also, in trauma, an inflammatory-immune response to the injury is triggered, causing immunosuppression, chronic inflammation and catabolism, which generates greater tissue damage and organic dysfunction[24].

Despite some studies that found that a higher SOFA score was not a risk factor for the development of CCD[2,21], the present study found the opposite result. A higher SOFA score was found to be a factor associated with the development of CcD, as chronic critically ill patients have numerous organ dysfunctions, persistent inflammation and have a failure in the body's homeostatic regulation[9] and risk factors for the development of CCD[9,12].

Therefore, specific approaches are needed to prevent organ dysfunction and CCD, such as control of inflammatory markers (such as CRP and Erythrocyte Sedimentation Rate) and direct action in combating inflammation and the catabolic response to trauma (providing early enteral or parenteral nutrition and use of antioxidants), glycemic control, and care to avoid healthcare-associated infections (HAI). In addition, the control of cortisol and thyroid hormone levels should be performed frequently in trauma patients and intervene whenever the exams are altered, with the aim of suppressing this persistent inflammatory response and the consequent organic dysfunction[13,23–26].

Nevertheless, there are no proven therapies to prevent CCD[6], *such as bundles* of preventive measures commonly adopted in the ICU, given the complicated and persistent dynamics of the disease and relationship with the type of trauma and previous physiological conditions of the patient. Thus, interprofessional action is recommended.

Knowing that the infection leads to sepsis and organic dysfunctions, some precautions are highlighted, such as hand hygiene, control of aseptic techniques, disinfection of equipment and infusers, blood count control, routine swab collection and blood culture, among others to prevent Health Care Related Infections (HCRI). Nutritional therapy, to meet the energy demands of trauma-induced catabolism, is also important; early mobilization of the patient in bed, to improve the inflammatory imbalance and preserve muscle cells; use of vasoactive drugs and/or volume replacement, to avoid organic hypoperfusion, in addition to care in the management and prevention of sepsis, with appropriate antibiotic therapy for cases with antibiogram[13,23,26].

In view of the relationship found in this study between greater organ dysfunction and the development of CCD, knowledge of the pathophysiology of CCD, the care necessary for the prevention and management of both organ dysfunction and CCD, highlights the importance of multidisciplinary care in ICU[6]. An expanded clinical look at these individuals is required, especially because they are traumatized patients, as trauma triggers a series of organic changes aimed at reducing hospitalization time and the occurrence of complications, such as the gastrointestinal complications that this study demonstrated in association with the CCD development.

Gastrointestinal complications in patients with CCD, in this study, are mainly due to abdominal trauma and surgeries in which the patients were submitted. This type of complication is little explored in the literature, but a study conducted in two level 1 trauma centers in the USA did not find statistical significance in colitis as a factor associated with CCD[9], unlike the present study, in which these complications remained associated. Therefore, prevention and early approach are necessary and would prevent further harm to the patient.

The prevention of complications from abdominal trauma starts from the PHC and in the management in the hospital environment. In blunt abdominal trauma, injuries can be overlooked, as it is not something visible, which requires imaging and physical examination workup, which, together with knowledge about the kinematics of the trauma, could predict serious injuries. Therefore, possible structural and pathophysiological changes in these patients cannot be neglected, as they can lead to hemorrhagic shock, organ dysfunction and death. On the other hand, penetrating trauma can cause irritation to destruction of local and adjacent tissues or cause even a systemic infection[27–28].

It is believed that gastrointestinal complications are the drivers for multiple organ dysfunction, due to the unicellular epithelial layer present in the gastrointestinal tract (GIT), the specific immunology and the environment with the presence of microorganisms[28]. These three constituents are essential to maintain the body's homeostasis, however, a state of shock or trauma can cause a disruption in the intestinal barrier, resulting in the migration of microorganisms from the GI tract to other systems[28]. Thus, a relationship is identified between organ dysfunction and gastrointestinal complications, which remain as variables associated with CCD independently of the others.

In addition, the direct mechanism of traumatic injury, increased intra-abdominal pressure and compartment syndrome may alter organ perfusion, causing dysfunction and organ failure. Therefore, knowledge of the mechanism of injury, physical examination, diagnostic tests, control of intra-abdominal pressure and early decompression or exploratory interventions can prevent the appearance of numerous gastrointestinal complications[29].

In this sense, understanding and classifying organ dysfunction in trauma patients becomes predominate, as well as considering the association with CCD. Therefore, SOFA or other ICU usability indices such as APACHE II, LODS, SAPS II and Multiple Organ Disfunction Score (MODS) should be considered in the assessment of critically ill patients. These scales can be explored in other studies and used in clinical practice to predict organ dysfunction, severity and prognosis, as well as determine CCD prevention strategies. Therefore, the literature supports that advanced practice nurses should take clinical leadership in the implementation of programs that screen patients at risk of developing CCD and implement preventive care strategies[12].

Therefore, the contribution of this study to the qualification of nursing care is highlighted, since the professional practice is constantly aimed at these patients and care at the bedside. Its contribution is highlighted both for the improvement of the nursing prescription for the traumatized patient, with essential care, whether in the care, as in the early recognition and in the suspicion of the development of CCD, but also in the knowledge of the epidemiological profile and the factors associated with CCD. This study is limited due to the fact that it was performed in only one ICU and in a retrospective manner.

CONCLUSION

It is noted that the highest SOFA score and gastrointestinal complications are independent associated factors for the development of CCD. In this sense, patients with CCD are severe and complex and in order to deal with the it is necessary to know the pathophysiology, epidemiology, complications and associated risk factors. Therefore, this study is unprecedented and will contribute to health professionals, especially nurses, in terms of improving their knowledge and practive both in the prevention and in the management of these patients. As a pioneer, it can contribute to the prospection of other studies, with more patients and other ICUs, or that address some specific characteristics, such as the dosage of inflammatory markers and the control of inflammation for the prevention of CCD, since persistent inflammation is extremely linked to pathophysiology.

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NOTES

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CONTRIBUTION OF AUTHORITY

Study design: Paris MC, Lentsck MH.
Data collection: Paris MC, Lentsck MH.
Data analysis and interpretation: Paris MC, Lentsck MH, Sangaleti CT, Pelazza BB.
Discussion of results: Paris MC, Lentsck MH, Sangaleti CT, Pelazza BB.
Writing and/or critical review of the content: Paris MC, Lentsck MH, Sangaleti CT, Pelazza BB, Soares LG, Baratieri T, Pitilin EB. Moreira RC.
Review and final approval of the final version: Paris MC, Lentsck MH, Sangaleti CT, Pelazza BB, Soares LG, Baratieri T, Pitilin EB, Moreira RC.

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CONFLICT OF INTEREST

There is no conflict of interest.

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CORRESPONDING AUTHOR

Matheus da Cunha Paris
matheusparis91@gmail.com