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Cost assessment of the pharmacotherapy applied to patients affected by COVID-19 on invasive mechanical ventilation in a general hospital

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Abstract

Objective: To evaluate the profile of patients affected by COVID-19 who required invasive mechanical ventilation in relation to the prescription of anesthetics, neuromuscular blockers, sedatives, antimicrobials and anti-inflammatory drugs in a general hospital in Rio de Janeiro. The impact of the pandemic on the consumption and price variation of these drugs was also evaluated. **Methods:** A retrospective study in the form of a case series in which the inclusion criteria were patients admitted to the intensive care unit between May and July 2020 with a diagnosis of COVID-19, positive PCR laboratory test results, and subjected to invasive mechanical ventilation. Exclusion criterion was: patients under 18 years old. The drugs of interest were defined through a review of the literature produced in 2020; the analyses were carried out in 5 phases: data collection carried out by the research pharmacists in prescriptions and in the consumption reports of the system used in the institution; identification of unit prices of drugs of interest; calculation of the overall cost of drug therapy for patients; calculation of cost in relation to drugs of interest; comparison of data referring to the interest group with data on complete therapy and identification of medications with greater financial prominence; identification of price variation in public purchases of medicines with the greatest financial prominence. **Results:** Eighteen patients were selected with a total cost of pharmacological treatment of US\$ 49,602.24, with a mean of US\$ 2,755.68 ± US\$ 2,425.31 per patient. Consumption of different therapeutic classes was observed: the most consumed items were enoxaparin, norepinephrine, meropenem, midazolam and rocuronium. These 6 drugs accounted for 43.3% of the total pharmacotherapy cost and it can be seen that their prices increased by up to 1,664.7%. **Conclusions:** High consumption with the valuation of the observed items directly implied the high cost of the therapy for these selected patients and the increased risk of drug shortages for the treatment, with reflections on the quality of care provided and on patient safety.

Key words: pharmacoeconomics; coronavirus infections; mechanical ventilation; drug costs; pharmaceutical services.

Avalia o do custo da farmacoterapia aplicada em pacientes acometidos por COVID-19 em ventila o mec nica invasiva em um hospital geral

Resumo

Objetivo: Avaliar o perfil de pacientes acometidos pelo COVID-19 que necessitaram de ventila o mec nica invasiva em rela o   prescri o de anest sicos gerais, bloqueadores neuromusculares, sedativos, antimicrobianos e anti-inflamat rios em um hospital geral do Rio de Janeiro. O impacto da pandemia sobre o consumo e a varia o dos pre os desses medicamentos tamb m foi avaliado. **M todos:** Estudo retrospectivo na forma de s rie de casos em que os crit rios de inclus o foram: pacientes internados na unidade de terapia intensiva hospitalar entre maio e julho de 2020 com diagn stico de COVID-19, por meio de teste laboratorial de PCR positivo, submetidos   ventila o mec nica invasiva. Os crit rios de exclus o foram: pacientes menores de 18 anos. Os medicamentos de interesse foram definidos atrav s de revis o da literatura produzida em 2020, as an lises foram realizadas em 5 fases: coleta de dados realizada pelos farmac uticos pesquisadores na prescri o m dica e nos relat rios de consumo do sistema informatizado utilizado na institui o; identifica o dos pre os unit rios dos medicamentos de interesse; c lculo de custo global da terapia medicamentosa dos pacientes; c lculo do custo em rela o aos medicamentos de interesses; compara o dos dados referentes ao grupo de interesse com os dados da terapia completa e identifica o dos medicamentos de maior destaque financeiro; identifica o de varia o no pre o praticado em aquisi es p blicas dos medicamentos de maior destaque financeiro. **Resultados:** Foram selecionados 18 pacientes com um custo de tratamento farmacol gico totalizado em US\$ 49.602,24, sendo uma m dia de US\$ 2.755,68 ± US\$ 2.425,31 por paciente. Observou-se o consumo de diferentes classes terap uticas, os itens mais consumidos foram enoxaparina, noradrenalina, meropenem, midazolam e rocur nio. Esses 6 medicamentos representaram 43,3% do custo total da farmacoterapia e pode-se observar o aumento de seus pre os em at  1664,7%. **Conclus es:** O alto consumo com a valoriza o dos itens observados implicou diretamente no alto custo da terapia para tais pacientes selecionados e o aumento de risco de desabastecimento de medicamentos para o tratamento, com reflexos na qualidade da assist ncia prestada e na seguran a do paciente.

Palavras-chave: farmacoeconomia; infec es por coronavirus; ventila o mec nica; custos de medicamentos; assist ncia farmac utica.



Introduction

According to the World Health Organization, as of September 2021, there were more than 233 million confirmed cases of COVID-19 and nearly 4.8 million deaths caused by the SARS-CoV-2 infection worldwide. In Brazil, more than 21 million cases and more than 596,000 deaths were confirmed in the same period.¹

Since the first confirmed cases, hypoxia and COVID-19-related acute respiratory syndrome have triggered a rapid increase in admissions to intensive care units and centers. In this scenario, different treatment strategies are used, such as positioning the patient in the prone position; nebulization with nitric oxide and prostacyclin; and use of invasive (IMV) and non-invasive (NIMV) mechanical ventilation.²⁻⁴

When observing patients who meet requirements for orotracheal intubation, one of the several methods used in the treatment of COVID-19, we analyzed that, to maintain oxygen saturation above 94% and a breathing frequency of at least 24 bpm, they present some specific needs such as supplemental oxygen through a nasal oxygen catheter with an additional 5 L/minute; NIMV with an inspired oxygen fraction greater than 50%; pulse pressure with delta greater than 10 cmH₂O or positive end-expiratory pressure greater than 10 cmH₂O. Patients who cannot adapt to the non-invasive ventilation equipment are also eligible for this procedure.⁵

In order to maintain the life of a patient on invasive ventilatory support, the drug therapy applied is fundamental. Even if they do not play any direct role in the fight against infection by the virus, the effect of the drugs are important in maintaining vital signs and controlling symptoms. The medications applied in patients affected by COVID-19 stand out predominantly in the care chain, especially for those undergoing intensive treatments.⁵

The COVID-19 pandemic threatens the entire global chain of supplies, especially that related to the health products and medications.^{6,7}

Since its inception, interruptions in the supply chain and reduction in the stocks of strategic supplies and medical equipment have worried health institutions' managers, regardless of the available financial resources.^{7,8}

This study aims at evaluating the use profile of certain classes of medications, such as: general anesthetics, neuromuscular blockers (NMBs), additives, antimicrobials, vasopressors, anti-inflammatory and anticoagulants, by patients affected by COVID-19 subjected to IMV in a general hospital from Rio de Janeiro, in addition to describing the impacts of the pandemic on the consumption and prices of these drugs in 2020.

Methods

An observational, exploratory and retrospective study with a quantitative approach in the format of a case series was carried out in a Pharmacy Service of a general, tertiary and large public hospital in the state of Rio de Janeiro. To analyze the pharmacotherapy cost for patients affected by COVID-19 admitted to intensive care units and subjected to IMV, data mining and analysis took place between December 2020 and January 2021. The inclusion criteria for the patients were as follows: patients admitted to the hospital between May and July 2020 in intensive care units, with positive PCR laboratory test results for the presence of the SARS-COV-2 virus, and undergoing IMV. The exclusion criterion was age below 18 years old. Selection of the patients took place as described in the following flowchart (Figure 1):

The list of drugs of interest was obtained from a review of the scientific literature available in the CAPES Journals portal, focused on full scientific articles published in 2020 aimed at the treatment and support of patients with COVID-19 with the "covid 19", "treatment" and "management" descriptors in Portuguese and English, as well as in manuals and protocols published by the Ministry of Health and medical entities.

Consequently, the medications addressed in the materials consulted that were included in the unit's standardization comprised the group of interest. In this study, medications aimed at the treatment of comorbidities presented by the patients, such as diabetes, cancer or other pathologies not directly related to COVID-19, were not evaluated.

From the selection of patients and the list of drugs of interest, the consumption of medications per patient during their hospitalization period was evaluated, in order to analyze the cost of the drug treatment used. This stage of the study was divided into 5 phases (Figure 1).

It is noteworthy that values related to equipment, hospital supplies or labor of the health professionals are not included and that all values from the original manuscript were converted to the equivalent in US dollars and its quotation in 2021. An electronic form prepared in Microsoft® Excel 2010 was used for the quantitative analysis of the data.

This study was approved by the Committee of Ethics in Research with Human Beings of the Federal Hospital of Civil Servants, through CAAE 38199220.4.0000.5252.

Results

A total of 21 patients who met the inclusion criteria were identified. Three of them were excluded for meeting one of the exclusion criteria, generating a final sample comprised by 18 patients, 8 female and 10 male (Table 1). The drugs selected for monitoring, according to the Chemical Therapeutic Anatomic classification (ATC), were as follows: ascorbic acid (A11GA01); amoxicillin (J01CA04); amoxicillin with clavulanate (J01CR02); ampicillin (J01CA01); ampicillin with sulbactam (J01CR01); atracurium (M03AC04); azithromycin (J01FA10); betamethasone (H02AB01); cefepime (J01DE01); ceftazidime (J01DD02); ceftriaxone (J01DD04); cisatracurium (M02AC11); clarithromycin (J01FA09); dexamethasone (H02AB02); dexmedetomidine (N05CM18); dextroketamine (N01AX03); dopamine (C01CA04); enoxaparin (B01AB05); etomidate (N01AX07); fentanyl (N01AH01); flumazenil (V03AB25); heparin (B01AB01); hydrocortisone (H02B09); imipenem (J01DH51); levofloxacin (J01MA12); lidocaine (N01BB02); linezolid (J01XX08); meropenem (J01DH02); methylprednisolone (H02AB04); midazolam (N05CD08); norepinephrine (C01CA03); oseltamivir (J05AH02); pancuronium (M03AC01); piperacillin with tazobactam (J01CR05); prednisone (H02AB07); propofol (N01AX10); rocuronium (M03AC09); sugammadex (V03AB35); succinylcholine (M03AB01); vancomycin (J01XA01); and vecuronium (M03AC03).¹⁰⁻²¹

All the pharmaceutical presentations of the standardized medications in the unit were evaluated. The drugs were organized in groups, according to the unit's Pharmacotherapy Guide, namely: adrenergic and vasopressor agents; anticoagulants; anti-inflammatory drugs; antibiotics; anesthetics, NMBs and sedatives.²⁰



Among the 41 drugs in the 74 different presentations selected for analysis, the patients only used 32 medications in 44 presentations. The total cost of these patients' pharmacological treatment, obtained through the reports extracted from HOSPUB, was

US\$ 49,602.24. The mean consumption cost per patient was US\$ 2,755.68 ± US\$ 2,425.31, in a mean hospitalization time of 23 ± 19.7 days. The mean daily expenditure on medications was US\$ 119.81 per patient.

Figure 1. Study flowchart

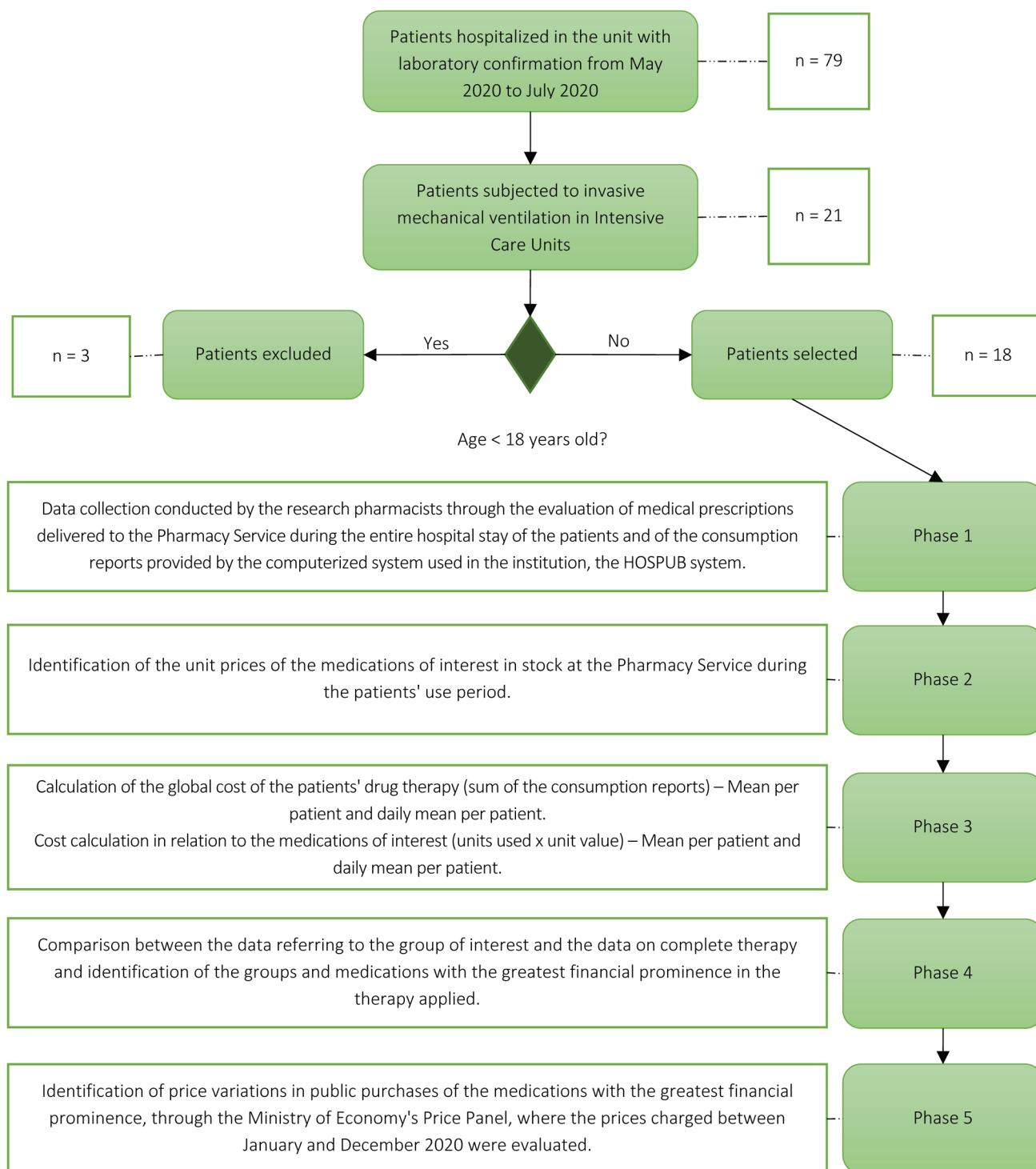


Table 1. Profile of the patients selected for the study

Patient	Gender	Age (years old)	Hospitalization time (days)	Number of days and cost of the medications														Total cost per patient
				M		M1		Md		Rc		Ne		Ep		O		
				days	US\$	days	US\$	days	US\$	days	US\$	days	US\$	days	US\$	days	US\$	
1	F	31	11	-	-	-	-	2	159.12	-	-	2	39.57	1	6.28	11	95.08	300.05
2	M	67	18	6	72.44	3	38.92	2	201.00	7	897.20	5	98.93	-	-	18	573.95	1,882.44
3	M	71	80	-	-	22	726.47	2	100.50	1	144.52	3	75.19	36	483.65	80	927.21	2,457.54
4	M	56	22	-	-	-	-	8	488.13	-	-	7	300.08	5	31.41	22	154.19	973.81
5	M	76	13	-	-	-	-	6	427.12	3	797.85	6	395.71	4	25.12	13	244.62	1,890.42
6	M	49	15	-	-	-	-	7	301.49	8	1,035.70	6	118.71	-	-	15	387.36	1,843.26
7	M	51	44	9	90.55	4	58.38	3	314.06	1	144.52	7	340.31	10	94.22	44	765.52	1,807.56
8	F	63	50	-	-	8	188.10	5	201.00	-	-	7	182.03	17	106.78	50	338.83	1,016.74
9	F	87	20	-	-	-	-	10	502.49	-	-	10	455.07	1-	62.81	20	610.30	1,630.67
10	M	79	51	11	119.53	11	291.88	8	502.49	-	-	17	724.15	26	238.68	51	831.93	2,708.66
11	F	69	5	5	76.06	-	-	4	301.49	5	505.81	5	296.78	2	12.56	5	261.37	1,454.07
12	M	90	8	8	57.95	-	-	-	-	-	-	1	19.78	1	6.28	8	100.03	184.04
13	M	69	11	4	76.06	-	-	5	125.62	4	505.81	7	379.88	-	-	11	732.47	1,819.84
14	F	71	12	-	-	6	214.05	1	100.50	-	-	3	138.50	1	6.28	12	149.12	608.45
15	F	55	17	6	72.44	-	-	4	326.62	8	1,270.54	12	308.65	-	-	17	2600.21	4,578.46
16	M	66	15	-	-	-	-	3	125.62	1	24.09	5	360.10	10	62.81	15	305.85	878.47
17	F	68	15	9	369.46	-	-	8	473.18	1	6.02	8	439.24	3	18.84	15	362.92	1,669.66
18	F	66	14	11	478.12	-	-	10	732.80	1	144.52	10	621.27	-	-	14	332.05	2,308.76

M: meropenem 500 mg, M1: meropenem 1 g, Md: midazolam 5 mg/mL, Rc: rocuronium 10 mg/mL, Ne: norepinephrine 2 mg/mL; Ep: enoxaparin 40 mg/0.4 mL; O: others.

The total value of consumption of the drugs of interest presented a mean of US\$ 30,012.91, US\$ 1,667.38 ± US\$ 1,015.44 per patient, corresponding to 65.12% of the total consumption observed in the HOSPUB's reports. The mean daily expenditure on the medications selected was US\$ 72.50 per patient.

Therefore, we conclude the following: financially, the group of NMBs, sedatives and anesthetics accounted for most of the cost of the drug therapies applied to the 18 patients. In relation to the drugs of interest, this group represented 53.64% of the cost, or US\$ 16,009.98 of the total. Rocuronium, midazolam, dextroketa mine and fentanyl stood out, which accounted for 18.25% (US\$ 5,476.58), 17.04% (US\$ 5,383.23), 7.96% (US\$ 2,390.82) and 6.90% (US\$ 2,069.96), respectively, of the cost related to the group.

Compared to the overall costs of the treatments, taken from HOSPUB, the group corresponds to 34.9% of the expenses related to medications, standing out when compared to other therapeutic groups.

Among the patients, 17 used midazolam, which is the most used sedative drug, both in terms of prevalence among the patients and in terms of use volume. A mean of 75.0 ± 44.9 10 mL ampoules of midazolam maleate at 5 mg/mL were used per patient. A mean midazolam dose of 32.5 ± 11.6 mg/h is estimated per patient.

Rocuronium was used by 11 patients, making it the most prevalent NMBs. A mean of 80.6 ± 68.6 5 mL vials of rocuronium bromide at 10 mg/mL were used per patient. An estimated mean dose of 34.9 ± 20.8 mg/h of rocuronium per patient is estimated.

Despite being used on a smaller scale, dextroketa mine gained space from a financial point of view, due to its high added value. Only 5 patients made use of the drug, with a total consumption of 86 ampoules-vials (10 mL- 50 mg/mL), with a mean of 17.2 ± 17.3 ampoules-vials per patient. However, despite this mean value, only one patient made use of 74 ampoules-vials during his treatment day.

In the group of adrenergic and vasopressor drugs, only the use of norepinephrine was identified in the patients. This drug represented an expense of US\$ 5,293.95, corresponding to 17.64% of the total value observed among the medications selected, and a mean of 73.0 ± 49.7 ampoules per patient. An estimated mean dose of 3.5 ± 1.5 mg/h of norepinephrine bitartrate per patient is estimated.

The anticoagulants class accounted for 6.9% of the total consumption of medications. Enoxaparin 40 mg, used by 12 of the 18 patients, was the most consumed drug, totaling US\$ 1,155.73, representing 3.8% of the total expenditure on medications and 56.0% of the expenditure within the anticoagulants class. There was a mean consumption of 15 ± 19.2 syringes per patient during the period assessed.

Anti-inflammatory drugs were the medications that least impacted on the financial resources, nearly 1.07% among the items evaluated, representing slightly more than US\$ 320.26. Hydrocortisone 100 mg obtained the highest consumption among the drugs of the class, being prescribed to 6 individuals, with a mean of 11.6 ± 7.1 ampoules-vials per patient.

Methylprednisolone 500 mg was responsible for the highest expenditure among the medications of the class (US\$ 232.23). Prescribed for 7 patients and with a mean of 6.2 ± 4.4 vials per patient, methylprednisolone has a unit price considerably higher than hydrocortisone.

In relation to the antibiotics, meropenem was used by 12 patients, being the most prescribed antibiotic, followed by azithromycin (11), ceftriaxone (9), vancomycin (7) and oseltamivir (5).

The antibiotics that represented the greatest expense to the pharmacy were the following: meropenem, responsible for 9.76% of the expenses assessed (US\$ 2,930.41); piperacillin with tazobactam (1.78%- US\$ 535.49); linezolid (1.70%- US\$ 509.19); azithromycin (1.28%- US\$ 383.10); and vancomycin (0.82%- US\$ 247.90).



A mean of 31 ± 28.2 vials of meropenem 1 g and 21 ± 36.8 vials of meropenem 500 mg were used per patient. For azithromycin, the mean was 5 ± 5.5 500 mg vials per treatment.

We arrive at some conclusions given the above. The items with the highest overall consumption and the highest prevalence among the patients were as follows: enoxaparin 40 mg/0.4 mL, norepinephrine 2 mg/mL - 4 mL, meropenem 500 mg, meropenem 1 g, midazolam 5 mg/mL - 10 mL, and rocuronium 10 mg/mL - 5 mL.

The fraction corresponding to the most relevant medications from the budgetary perspective against the total cost of the treatment provided to the patients selected can be seen in Figure 2. These six medications together correspond to 40.8% of the total cost of the pharmacotherapy applied to the patients affected by COVID-19 subjected to IMV (US\$ 20,239.91).

In the midst of the pandemic, many medications suffered changes in their prices due to variation in the demand. Among the groups of sedatives, anesthetics and NMBs it was not different, according to the evaluation carried out using the Ministry of Economy's Price Panel.⁹

Among the consumption highlights, the standardized presentation at the hospital of midazolam maleate (5 mg/mL - 10 mL) presented an important financial value.

In January 2020, the mean cost of the medication was US\$ 1.28 per ampoule. In August, its mean price reached US\$ 6.09, ending the year with a mean price of US\$ 4.60 per ampoule in December. In relation to its peak, recorded in August, the price increase was 375.5% when compared to the price in January 2020.

The standardized presentation of rocuronium bromide (10 mg/mL in 5 mL), in January 2020, had a mean cost of US\$ 6.30. In October, its mean price reached US\$ 10.34, and ended the year with a mean price of US\$ 7.73. When comparing the prices in January and October 2020, there was a 64.1% increase in the price charged.

Dextroketa mine hydrochloride, in the form of 50 mg/mL in 10 mL, recorded a mean price of US\$ 26.32 in January. In September 2020, the price rose to US\$ 33.29, and it recorded a mean price of US\$ 30.10 in December. Comparing January and September prices, there was a 26.5% increase in the price charged.

An increase in the demand for norepinephrine hemitartrate (2 mg/mL in 4 mL) was also observed, an item that cost US\$ 0.71 in January 2020, reaching US\$12.56 in October, a 1,664,7% increase.

The anticoagulants' price also rose. In the case of enoxaparin 40 mg, its mean price was US\$ 5.15 before the pandemic. In December 2020, its mean price underwent a 79.7% variation, rising to US\$ 9.25. Sodium heparin 25,000 UI, with a prior price of US\$ 1.88 in January, reached US\$ 20.02 in December 2020, with a 1,062.2% variation.

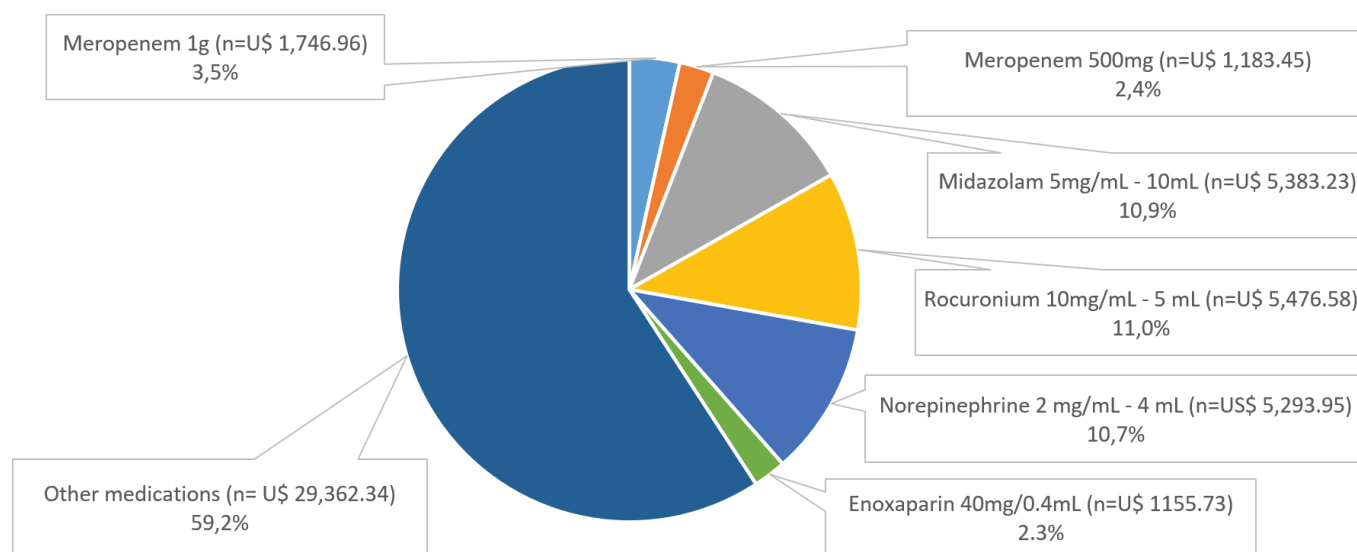
Although it was not a widely used medication, hydrocortisone also went through a rising process regarding its cost, around US\$ 0.84 in early 2020, and US\$ 2.42 in December, a 188.5% variation.

According to the Price Panel, all the antibiotics experienced price fluctuations during the pandemic. In January 2020, the mean cost of azithromycin was US\$ 20.87. In October, it reached US\$ 41.25, and its mean price in December was US\$ 26.08; a 99.6% increase when comparing January and October.

Meropenem 1 g had a mean cost of US\$ 9.61 in November 2020, while in January 2020, its price was US\$ 7.28 and ended the year at US\$ 8.82, which configures a variation of up to 32.0%.

Piperacillin combined with tazobactam (4 g/500 mg) was no different: in January 2020, its price was US\$ 6.01, rising to US\$ 10.65 in March. At the end of 2020, it reached US\$ 8.03. When compared to January, there was a 77.2% variation in March.

Figure 2. Medications with the highest financial relevance.



Discussion

Management of sedation and analgesia to alleviate anxiety and pain and ease IVM is one of the main points in the treatment of critically-ill patients. One of the greatest challenges in the care of patients infected with SARS-CoV-2 is maintenance of good analgesia and sedation, especially given the prolonged time on IMV in some cases.^{19,22}

High consumption of drugs in the sedative, anesthetic and NMB group was expected, given the characteristics of the disease and its complications, especially in the study group, consisting of patients subjected to IMV.^{19,22}

The high demand for the use of norepinephrine by these patients is justified by the fact that the drug in question is the first choice in the recovery of hemodynamic parameters. It is noteworthy that this was the only medication used by all the patients evaluated, which reinforces not only the preferred clinical course of action but also the high incidence of hemodynamic changes related to COVID-19.^{18,19}

It is noteworthy that the hemostatic changes presented during the SARS-CoV-2 infection are caused by several pathogenic mechanisms, many of them still scarcely understood. Consequently, the monitoring of parameters related to this increase in coagulation is essential in the prevention of severe consequences. Although the recommendation for the use of anticoagulants is individualized, in general, unfractionated or low molecular weight heparins are indicated.^{19,24-27}

Use of these anticoagulant agents in most of the patients observed in the way it was done was already expected in view of the already recommended consumption of this medication by medical societies and other reference bodies: the point of greatest attention is the valuation of the items belonging to this class, with significant increases in prices observed in the Price Panel, which could put the patients' treatments at risk.^{19,24-27}

In any type of infection, caution must be implemented when using anti-inflammatory drugs, mainly when dealing with glucocorticoids. On the other hand, the patient's general state of hyperinflammation can cause other more serious consequences, making the use of these drugs subjected to individualized assessment.^{3,27,28}

According to Martin et al. (2020), bacterial co-infection with COVID-19 was only reported in 2% to 8% of the patients affected by the disease. However, the rate corresponding to the prescription of antibiotics varies from 57% to 95% in the hospitalized individuals among the study patients. Unfortunately, there are still few data in the literature that elucidate the role of antibiotics in the treatment of COVID-19 and which shed light on what the outcomes presented by the patients after their use are.^{10,28}

The daily expenditure on medications per patient in the ICU found in this study is close to the values found by S . In 2015, he estimated the cost of medications used per patient in the ICU at approximately US\$ 90.16 a day and US\$ 2,704.65 a month.³⁰

The values found are also in agreement with the cost of the drug treatment conducted in a field hospital from Piaul. The daily cost of medications used in the protocol for the treatment of COVID-19 patients varied from US\$ 65.20 to US\$ 97.44.³¹

Aiming to calculate the mean daily costs (direct and indirect) of patients in the ICU with COVID-19, Planisa estimated the cost/day

at US\$ 1,026.75. Another study, which evaluated patients with COVID-19 in the ICUs of 7 hospitals, estimated the mean daily cost of the treatment at US\$ 248.97.^{31,32,33}

In 2020, the vaccines for the prevention of COVID-19 were not yet available to the Brazilian population. When comparing the mean expenditure of the Unified Health System (*Sistema  nico de Sa de*, SUS) for critically-ill COVID-19 patients (US\$ 2,755.68) and with two-dose vaccination of an individual (Butantan: US\$ 48.74; Pfizer: US\$ 46,48), there is an approximate difference of US\$ 2,708.07.^{34,35}

Vaccination against COVID-19 promotes prevention and aids the SUS public coffers. This gross calculation, which does not include the direct and indirect cost of hospitalization and vaccination, provides a simplified view of the impact of vaccination on public health.^{34,35}

The sudden increase in the consumption of the most used medications and with greater financial impact related to the support and care of the patients selected, according to the unit's consumption record, is associated with the difficulty by the national industrial sector to meet this demand and the difficulties importing products and inputs observed in the pandemic culminated in rising prices.^{9,36,37,38}

Thus, the importance of structuring and promoting a drug production network in the Brazilian territory was highlighted, with the objective of supplying the internal market, which is strong and less dependent on the world's economy and politics.^{9,36,37,38}

Conclusion

Most of the medications used by the patients were aimed at preventing opportunistic infections, maintaining homeostasis, induction and maintenance of intubation, and life support.

In a different scenario, where an effective treatment has yet to be discovered, it is important to ensure that the medications most used to maintain patients' lives continue to be financially and physically accessible. Thus, identifying the medications with the greatest demand and financial impact during the pandemic and calculating their mean consumption at times of high bed occupancy, helps pharmaceutical managers to acquire the appropriate quantity, in line with the new need that emerges in the hospital environment.

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Collaborators

WCPS, RGPS, MCMPS and APA: comprehensive content; WCPS, RGPS, MCMPS and APA: conception and planning of the research project; WCPS, RGPS and MCMPS: data acquisition; WCPS, RGPS and MCMPS: data analysis and interpretation; WCPS, RGPS, MCMPS and APA: writing and critical review; WCPS, RGPS, MCMPS and APA: ensuring accuracy and integrity of any and all parts of the paper.



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Conflito de Interesses

The authors declare that there is no conflict of interest in relation to this article.

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