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Decubitus change in the ICU: an analysis of the hemodynamic repercussions

Cambio de decúbito en la UCI: un análisis de las repercusiones hemodinâmicas

Mudança de decúbito na UTI: uma análise sobre as repercussões hemodinâmicas

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Abstract

A study that aimed to analyze and compare hemodynamic parameters before and after changing position. This is an observational, analytical, cross-sectional study with a quantitative approach, carried out in an intensive care unit. After performing a sample calculation, 27 patients were included in the research who were under continuous hemodynamic monitoring of heart rate, respiratory rate, systolic, diastolic, and mean blood pressure, as well as peripheral oxygen saturation and axillary temperature. There were no statistically significant differences (p> 0.05) in hemodynamic parameters when comparing the pre- and post-change positions. It was concluded that the patients analyzed in the sample did not present hemodynamic repercussions after the change in decubitus, praising this as a safe technique from the hemodynamic point of view and beneficial for the treatment and prevention of health problems of critical patients.

Descriptors: Patient Positioning; Hemodynamics; Critical Care; Intensive Care Units; Monitoring.

Resumén

Un estudio que tuvo como objetivo analizar y comparar parámetros hemodinámicos antes y después del cambio de posición. Se trata de un estudio observacional, analítico, transversal con abordaje cuantitativo, realizado en una unidad de cuidados intensivos. Luego de realizar un cálculo muestral, se incluyeron en la investigación 27 pacientes que se encontraban bajo monitoreo hemodinámico continuo de frecuencia cardíaca, frecuencia respiratoria, presión arterial sistólica, diastólica y media, así como saturación de oxígeno periférico y temperatura axilar. No hubo diferencias estadísticamente significativas (p> 0,05) en los parámetros hemodinámicos al comparar las posiciones antes y después del cambio. Se concluyó que los pacientes analizados en la muestra no presentaron repercusión hemodinámica tras el cambio de decúbito, alabando esta como una técnica segura desde el punto de vista hemodinámico y beneficiosa para el tratamiento y prevención de problemas de salud del paciente crítico.

Descriptores: Posicionamiento del Paciente; Hemodinámica; Cuidado Crítico; Unidades de Cuidados Intensivos; Supervisión.

Resumo

Estudo que teve como objetivo analisar e comparar os parâmetros hemodinâmicos antes e após a mudança de decúbito. Trata-se de um estudo observacional, analítico, de delineamento transversal, com abordagem quantitativa, realizado em uma unidade de terapia intensiva. Após realização de cálculo amostral foram inseridos na pesquisa 27 pacientes que estavam sob monitorização hemodinâmica contínua de frequência cardíaca, frequência respiratória, pressão arterial sistólica, diastólica e média, assim como saturação periférica de oxigênio e temperatura axilar. Não foram observadas diferenças estatisticamente significativas (p>0,05) nos parâmetros hemodinâmicos quando comparados os momentos pré e pós-mudança de decúbito. Concluiu-se que os pacientes analisados na amostra não apresentaram repercussões hemodinâmicas após a mudança de decúbito, enaltecendo esta como uma técnica segura do ponto de vista hemodinâmico e benéfica para o tratamento e a prevenção de agravamentos de saúde do paciente crítico.

Descritores: Posicionamento do Paciente; Hemodinâmica; Cuidados Críticos; Unidades de Terapia Intensiva; Monitoramento.

Introduction

The decubitus change (DC) in the ICU is a highly dependent care that aims to comfort the patient, prevent muscle disuse syndrome, aid in draining secretions from the lower airways, and optimize the ventilation / perfusion ratio pulmonary artery disease and the prevention of pressure injury formation (PI), the latter being an indicator of the quality of nursing care[1].

Aiming at such benefits, the method commonly used to perform the DC technique happens according to the functioning of a watch, which every two hours the decubitus is changed in the dorsal, right and left sides to relieve the pressure of the tissues[1].

It is known that for DC to occur, the patient's general clinical condition, the ventilatory support attached to it and their response to treatment must be evaluated and considered. Hemodynamic monitoring is an essential tool, because during DC, cardiovascular and respiratory repercussions can occur, generating possible hemodynamic instability and important compromise of the patient's health status. Repercussions such as hypotension associated with dizziness, severe dyspnea, oxygen saturation below 90% even with oxygen supplementation (O_2), significant chest pain or discomfort and fatigue are described as criteria for interrupting the decubitus change[2,3].

It is possible to find studies that demonstrate significant hemodynamic repercussions after the change of position in the ICU such as changes in heart rate (HR), mixed venous oxygen saturation (S_vO_2) and ventilatory pattern, leading to increased tissue oxygen consumption and potential damage to organic perfusion after this important care[1,4,5].

However, although an indication of probable hemodynamic instabilities during the change of position in the ICU is noticeable, this evidence comes from studies evaluating isolated and / or indirect parameters, so that, until now, we have found a shortage of evidence that associate vital data for the recognition and assessment of the critical patient's hemodynamic status in the ICU, such as HR together with systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), respiratory rate (RR), peripheral oxygen saturation (SpO_2) and temperature (T).

In this context, the study has as a guiding question: Is it possible to identify hemodynamic repercussions associated with changes in decubitus in ICU patients? The aim of this study was to analyze and compare the hemodynamic parameters of heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, respiratory rate, peripheral oxygen saturation and temperature before and after changing the position of bedridden patients in the ICU.

Methodology

Observational, analytical, cross-sectional study with a quantitative approach. The STROBE Statement checklist was used to guide the method. This study was carried out in a ten-bed ICU, in a medium-sized philanthropic hospital, located in the city of Macaé, Rio de Janeiro.

The population consisted of patients of both sexes, aged over 18 years, admitted to this ICU, with continuous hemodynamic monitoring of the parameters of HR, BP, RF, SpO_2 and T and who were submitted to the decubitus change by the nursing team. The exclusion criteria used were: Patients whose monitoring equipment did not have proof of maintenance / calibration with the INMETRO seal and Clinical Engineering of the hospital. No patients were excluded.

The sample calculation was performed by a statistician and based on the mean and standard deviation of the differences between the measurements of each variable of interest (HF, SBP, DBP, MAP, RF, SpO_2 and T), obtained before and after the change of decubitus in a pilot sample of 25 patients in this same ICU. For this calculation, a 95% confidence level was adopted for estimates and an 80% test power, thus resulting in a "n" of 27 patients. This procedure guaranteed the safety margin criterion that provided the most conservative possible sample size estimate.

This study was conducted in accordance with Resolution No. 466 of 2012 from the National Health Council / Ministry of Health and approved by the Research Ethics Committee of the Federal University of Rio de Janeiro - Campus Macaé, under number 1,747,258, in addition to of having been formally authorized by the general management and nursing coordination of the research institution.

A data collection instrument was built that made it possible to collect information on the characterization of patients (age, sex, medical diagnosis, drugs in use, technological support and severity score by the Sequential Organ Failure Assessment - SOFA) and the parameters of HR, SBP, DBP, MAP, RF, SpO_2 and T immediately before the decubitus change and after it.

SOFA is a prognostic index that quantitatively describes the degree of organ dysfunction serving as an indicator of severity. It consists of a scoring scheme from 1 to 4, where variables such as Glasgow coma scale (ECG), platelet count, oxygenation index, bilirubin and use of MAP-related vasoactive amines are used for classification, and the highest scores discharge are indicative of possible mortality6. Thus, SOFA was used in the study to categorize patients according to severity.

Data collection was carried out between October 2016 and April 2017 according to the following steps:

1. Selection and inclusion of patients with the consent form.
2. Check the functioning and calibration of the sensors of the multiparameter monitor, the proper adherence of the electrodes to the patient's chest, the verification of the ideal size of the non-invasive pressure cuff for the circumference of the upper limb and its correct position on the brachial artery, the positioning of the invasive pressure transducer, if present, on the phlebostatic axis and the verification of the pressure bag pressure gauge at 300mmHg. The temperature parameter was measured by means of a clinical or digital thermometer positioned in the axillary region (Tax).

3. Filling in the data collection instrument with the information collected before changing the position.

4. Observation of the decubitus change by the nursing team. The decubitus changes observed in the study were performed with at least 02 (two) nursing technicians, under the supervision of the nurse, respecting their respective schedules, indications, and routines. Patients were positioned in the right lateral decubitus position, left lateral decubitus and dorsal decubitus, according to the sequence of the hospital's mobilization protocol. Thus, the headboard was lowered, and the patient was guided through the mobilization with the tracing for the chosen decubitus position, being that, when it was lateral decubitus, a support was placed on the patient's back for better permanence in the required position, in addition to the cushions to reduce the pressure on bone prominences, according to the institution's routine.

5. Filling in the data collection instrument with the information collected immediately after 5 (five) minutes after the change in decubitus. The definition of the time of five minutes after the decubitus change was based on a study that defended it as the time necessary for stabilization of hemodynamic values, after alternating body positions[7].

It is important to point out that if there were any changes in the patient's hemodynamic parameters that represented a risk to the patient, the sector's health team would be promptly communicated, and thus, consequently, due assistance would be provided.

The collected data were recorded in a Microsoft Excel 2010 spreadsheet and transported to the PRISMA statistical program (Version 5.0) where they were subsequently analyzed. To compare the groups before and after decubitus change, the Student's T Test was applied for comparable samples, considering statistical significance when the probability was less than 0.05 ($p < 0.05$). It is worth noting that the normality of the sample was verified by the Shapiro-Wilk test.

Results

Twenty-seven patients submitted to changes in decubitus were observed and analyzed during the research. The patients were predominantly female (56%), aged over 65 years (63%), under invasive ventilatory support (74%), with an infusion of vasoactive amines (52%), and with a mean hospital stay of 6 days (standard deviation [SD] = 4.60). The medical diagnosis of admission of the majority was in cardiovascular conditions (44%), under surgical treatment (58%) and, regarding organ dysfunction, 74% of the patients had a SOFA score equal to or greater than 4 (Table 1).

Table 1. Regarding the characterization of the sample. Macaé, RJ, Brazil, 2017

Sample Feature	(n)%
Sex	Male (12) 44% Female (15) 56%
Age	≥ 65 years (17) 63% < 65 years (10) 37%
Length of Hospitalization	> 7 days (8) 30% ≤ 7 days (19) 70%
Conditions of hospitalization	Cardiovascular diseases (12) 44% - Clinical (7) 42% - Surgical (5) 58% Neurological diseases (1) 4% Respiratory tract diseases (5) 18% Infection (1) 4% Neoplasm (4) 15%
Use of amines	Noradrenaline (10) 37% Dobutamine (1) 4% Norepinephrine and Dobutamine (3) 11% Without amines (13) 48%
Use of Invasive Mechanical Ventilation	Yes (20) 74% No (7) 26%
SOFA Score	Score 0 (7) 26% Score ≥ 4 (20) 74%

When analyzing the variation of means related to hemodynamic parameters (HR, BP, RF, SpO_2 and T) measured before and after changing the position of patients, we obtained the following differences: SBP: 1 mmHg, DBP: 0.85 mmHg, MAP: 0.26 mmHg, HR: 2 bpm, RF: 0.07 irpm, SpO_2: 0.03% and in relation to T there was no difference (Table 2), that is, differences with small variations in all analyzed parameters.

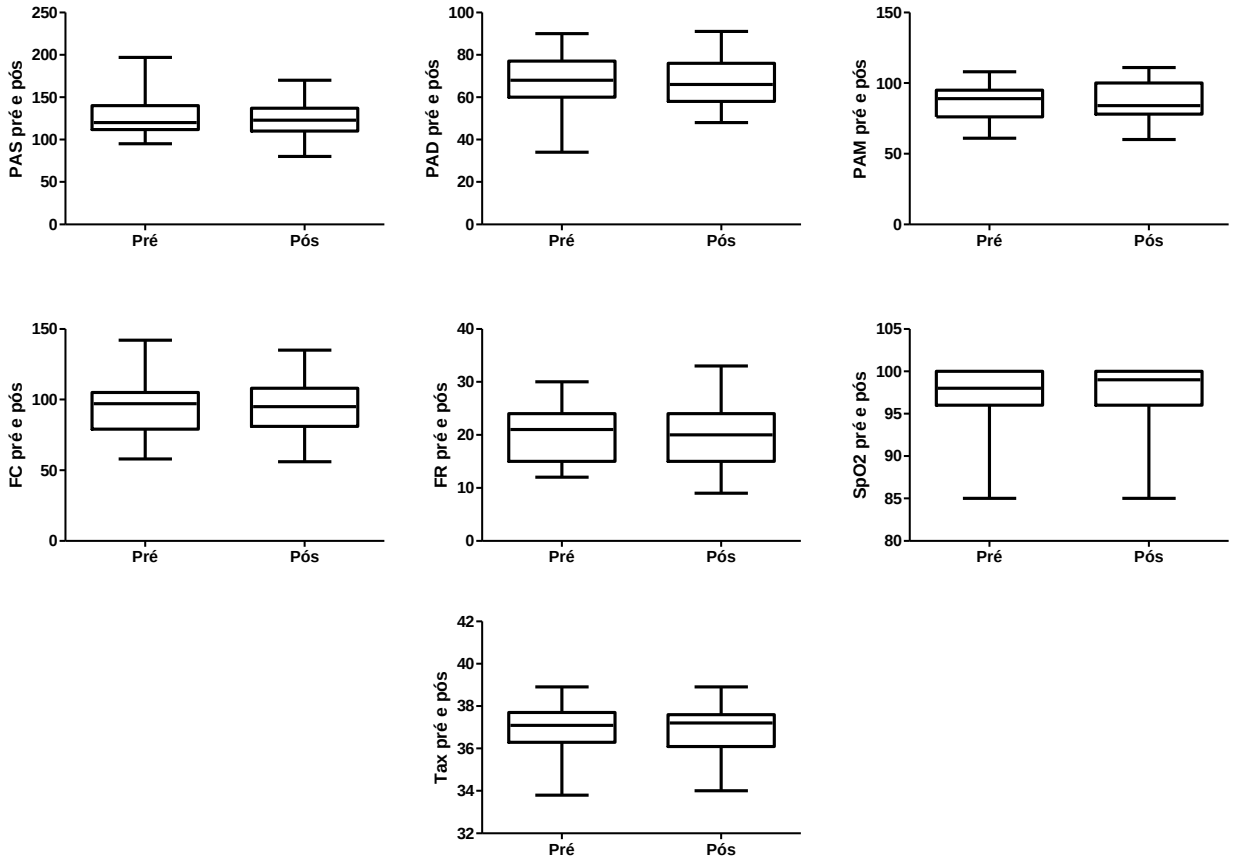
Table 2. Regarding the means and standard deviation of the variables measured before and after the change in decubitus. Macaé, RJ, Brazil, 2017

Hemodynamic parameter	Average (DP) (pre change)	Average (DP) (post change)

SBP	126,4 (22,45)	125,4 (21,94)
DBP	66,00 (13,43)	66,85 (12,22)
MAP	86,41 (13,68)	86,67 (13,53)
HR	92,74 (18,96)	94,74 (18,52)
RF	20,00 (4,76)	20,07 (5,78)
SpO_2	97,44 (3,92)	97,74 (3,32)
TAX	36,80 (1,35)	36,80 (1,25)

It is possible to observe in the Boxblot graphs below the distribution of the medians of each variable of interest measured before and after the decubitus change, demonstrating that there are no relevant graphic differences (Figure 1).

Figure 1. Boxplot comparing the variables studied before and after the decubitus change. Macaé, RJ, Brazil, 2017



In response to the doubt raised at the beginning of the present study about the change in decubitus, which may cause hemodynamic repercussions in critically ill patients, the parameters measured before and after decubitus change were analyzed and compared with each other using the Student's t test to identify statistically significant differences. According to Table 3, it is possible to observe that there was no statistically significant difference between the groups before and after decubitus change ($p > 0.05$), therefore, there is no support to affirm, in the studied sample, the presence of an association between decubitus changes and potential hemodynamic repercussions in ICU patients.

Table 3. Referring to the Student's t-test values for each measured variable. Macaé, RJ, Brazil, 2017

Variable	Test t	*p*-value
SBP	0.3376	0,7384
DBP	0.5554	0,5834
MAP	0.1394	0,8902
HR	0.7835	0,4404
RF	0.06974	0,9449
SpO_2	0.7638	0,4518
TAX	0.1182	0,9068

Furthermore, understanding the complexity and specificities of the patient coupled to VM[4], and in order to compare such results, from the studied sample, two separate groups were subsequently separated, patients coupled to VM (74%) and patients who did not require prosthesis ventilation (26%), with the same parameters described above being analyzed, and as a result there was no significant clinical and statistical variation in the pre- and post-decubitus changes (p> 0.05), corroborating the exposed result in Table 3.

Discussion

When performing the characterization of patients and comparing it with the literature, it is possible to observe similarity regarding the characterization of the sample of this research in similar studies[8,9], situations in which most patients also had diagnoses of cardiovascular order at admission, being this surgical or clinical.

It was noted that according to the application of the SOFA score, an index used to identify the degree of organ dysfunction, most patients (74%) had a score equal to or greater than 4, thus indicating that the participants were patients with a high degree of organic dysfunction. Analyzing the literature, we can see that researchers claim that higher means and scores of the SOFA score are predictors of mortality[6,10], thus emphasizing the severity of the patients analyzed.

It is important to clarify that for the purpose of calculating organic dysfunction using the SOFA score, normal bilirubin value was considered in patients, since there was an absence of such parameter in the available laboratory tests, however, it is emphasized that the addition of such parameter would not alter the characterization as to the severity of the patients, considering their pathophysiological history.

Each measured parameter (SBP, DBP, MAP, HR, RF, SpO_2 and TAX) was analyzed separately, being compared the values obtained in the two moments of collection: pre- and post-decubitus change.

Thus, when analyzing the data related to blood pressure (BP), there was no change when comparing the pre- and post-decubitus moments among the patients in the sample. In agreement with this finding, we can mention the study carried out with 21 patients with acute myocardial infarction, in which BP was measured in different positions in the bed, as well as other hemodynamic parameters such as cardiac output (CO)[8] and the researchers found that the change in BP values observed in the various positions in which the patients were placed was insignificant. In another study, carried out with a group of 12 patients also with acute myocardial infarction, the SBP parameter was compared and analyzed after the sequencing of the position changes carried out in the patients, which did not present any statistically significant changes[9], corroborating with the present study, in which the studied parameter presented a *p*-value of 0.7384, that is, greater than 0.05.

Analyzing the HR parameter, we found that the variation between the pre- and post-change groups was minimal, not being statistically or clinically significant to patients. Corroborating with the present research, a study with 12 critical patients, submitted to decubitus change, these being: Dorsal Decubitus (DD), Right Lateral Decubitus (RLD) and Left Lateral Decubitus (LLD) showed no significant difference in relation to HR[11]. In addition to this, other studies that analyzed changes in hemodynamic parameters such as BP, HR and pressure measurements in vessels and cardiac chambers in patients with acute myocardial infarction, in a sample of patients like the present study, also showed insignificant changes in HR after performed positioning changes[8,9].

However, in a study with 31 patients in an intensive care unit, which aimed to analyze hemodynamic and respiratory responses, as well as possible adverse events during mobilization, HR was increased by 10% in relation to its baseline values[12]. The difference between the data in the literature and the result pointed out in this study, may be since the mobilization of these patients in the other study was carried out differently, with a greater change in the patient's body alignment, as they passed from the dorsal position or supine to the sitting position on the bed, actively, which requires greater effort from the individual.

HR is controlled primarily by direct activity of the autonomic nervous system, through the sympathetic and parasympathetic branches on the sinus node auto-rhythm, thus, when at rest, parasympathetic activity predominates and in an opposite way, when the individual is subjected to some type of effort, there is a predominance of sympathetic activity, which can lead to an increase in chronotropism[13], information that can justify that in decubitus changes that do not require much effort on the part of the patient, HR may not change or have minimal changes.

When analyzing the RF, it was noted that this parameter did not show any significant difference when compared before and after the decubitus change, which was also seen in a study, in which most of the patients analyzed did not present any change in the RF when they were mobilized[1]. This data was also verified in another study that aimed to analyze the hemodynamic responses after the

decubitus changes and demonstrated that the RF did not change[11].

Analyzing SaO_2, the previously mentioned study also pointed out that there are no differences between the groups analyzed[11]. This, similarly, evaluated the measurement of O_2 saturation through the pulse oximeter, SpO_2, and with such measurement and subsequent analysis of the measured values, found that there was no change when compared in the two previously mentioned moments.

However, a study with the objective of verifying the behavior of the parameters related to the pulmonary mechanics of the patient under mechanical ventilation after changing the decubitus position, found changes in SpO_2 in patients undergoing such procedure[1]. However, in such research, patients were observed for up to 120 minutes after the procedure, unlike the methodological design used in the present study[1].

We can infer that the fact that most patients in the sample are coupled to invasive mechanical ventilation (72%), may have influenced the information about the non-alteration of the RF and SpO_2 parameters, since these were in assist-controlled mode with fixed values of RF, and FiO_2 values were always greater than 35%, which may have contributed to better oxygenation of the studied patients, even considering that sometimes these patients were able to do assisted cycles.

Corroborating this analysis, a study with 49 critical patients, in which 100% of these were coupled with invasive mechanical ventilation, stated that changing the position in these patients was a safe and viable practice even with physiological and structural challenges[14].

It is understood that the patient on invasive mechanical ventilation has greater complexity, making the professional care of the nurse challenging so that the quality of care is maintained, and adverse events related to this care are avoided[1].

Analyzing the temperature parameter, it was demonstrated that there were no changes in this parameter that could be related to changes in decubitus. There is a lack of evidence that correlates this variable with the change in decubitus in the patient restricted to bed. However, it is understood that heat is seen as a by-product of energy transformation during ATP synthesis and use, and that muscle activity is one of the most important factors related to the individual's thermal instability[15], therefore, considering the change in decubitus in this study a passive practice, where no effort was required from the individual, such stability can be justified during the performance of such practice.

In view of this, it was observed that the parameters measured did not show clinically and statistically significant variation when compared in the pre- and post-decubitus changes in critical patients, thus corroborating with the statement of other researchers[14], such practice can be considered safe considering the studied sample.

The clinical impairment of the patient assisted in the intensive care unit, causes some professionals to fear the possible instability in the patient's clinical condition related to the change in decubitus, and, for this reason, it is often not performed. This study demonstrated satisfactory security for its performance, with patients being able to benefit from the benefits of such practice.

Decubitus change is a technique widely used in bedridden patients, as its purposes have proved to be of great value for the maintenance, treatment, and recovery of health. Its benefits include the prevention of PI, as they relieve and redistribute the pressure on the skin, in addition to preventing the decrease of blood flow to the site[16]. In addition, they prevent the stasis of pulmonary secretions, help prevent muscle disuse and its systemic repercussions, such as constipation, thrombosis, decreased strength or resistance and orthostatic hypotension, for example[1].

Regarding PI specifically, the decubitus change is known as one of the most effective methods for its prevention, since it is an event of great contribution to the worsening health of bedridden patients, generating high costs not only for hospitals but also for family members, considering that the patient is often discharged from the hospital with the presence of such injuries, causing a delay in his recovery[17].

However, it is understood that the nurse's knowledge about the patient, his history, pathology, risk factors and responsiveness to treatment, in addition to the critical reasoning that permeates his care are indispensable for indicating such practice. In addition, it is recommended the use of continuous monitoring of the patient before, during and after the techniques for changing the position of the bed, as such surveillance guarantees the correct indication of the nurse to such practice, in addition to monitoring their clinical responses, emphasizing that these are absolute to guide decision making[1-4].

Even considering the contribution of the present study in providing support for nurses' decision-making about the best care to be performed for critical patients, especially about the hemodynamic safety of performing the decubitus change procedure, we encourage the realization of new studies in other hospital contexts relating the critical patient's physiological responses to this type of intervention to ensure the excellence of the care provided.

Conclusion

This research sought to analyze the association between decubitus changes and hemodynamic repercussions in adult ICU patients. The results showed that the hemodynamic parameters analyzed did not show a statistically significant variation when compared in the pre- and post-position changes.

It is worth considering as a limitation of the study the fact that it was carried out in a single center. Observing the variables analyzed in different teams, patient groups and institutional realities can generate different outcomes, since it is not known to what extent these factors would influence the observed result.

Thus, it was concluded that the patients analyzed did not have hemodynamic repercussions after performing this practice, thus highlighting the benefits of performing the decubitus change as a safe technique, which brings benefits

to clinical treatment and helps prevent worsening of the condition critical patient health.

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