

# Prone Position as a Care Practice of the Physical Therapists in Public Neonatal Intensive Care Units in Southern Brazil: Prone Position in NICU Southern Brazil

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## Abstract

This study aimed to identify the use of prone position, by physical therapy care, for infants hospitalized in an NICU in the Southern Region of Brazil. This is a cross-sectional study on a public NICU in the Southern Region of Brazil between December 2015 and May 2018, using standardized questionnaires for physical therapists. We included 44 NICU, totaling 104 professionals interviewed, the mean age of the interviewed was 33.5 years (SD: 7.1) and the mean experience time in the area was 7.7 years (SD: 6.9), and 77.9% reported to have specialization. According to 68.3% of the respondents, there is a protocol for the change of position in the Unit, but the prone position is not indicated in most NICUs (59.6%). Most of the respondents (65.4%) answered affirmatively, but 73.1% reported limitations in their incorporation into the Services, often related to aspects external to the newborn (lack of exclusive or full-time professionals in the NICU (75.0%) and a reduced number of professionals (33.6%)). The prone position is generally not indicated in the hospital (57.7%).

**Conclusion:** The importance of the prone position is recognized, as well as its interference concerning the NPMD of newborns. However, there was a limited alternation of positions during the newborn's hospitalization, followed by a lack of emphasis on orienting the prone position to family/caregivers. Also, a lack of exclusive or comprehensive physical therapists and the disproportion between demand and number of professionals has been observed.

**Keywords:** Body position; Early intervention; Musculoskeletal development; Physical Therapy; Prone position

**Abbreviations:** N: Number of interviewed; NPMD: Neuropsychomotor development; NICUs: Neonatal Intensive Care Units

## What is Known

- It is recommended in the literature that there should be, on average, a professional physiotherapist for every ten beds in the ICUs or fraction, in the morning, afternoon and night shift, with complete and uninterrupted assistance 24 hours a day.
- It aims at the quality of care provided to hospitalized newborns, due to the direct relationship between the interference of neonatal care and future changes in the newborn.
- The length of stay in the NICU can be associated with inadequate stimulation and positioning of the bed most of the time in the same position.
- If positioned in different positions, the newborn experiences different pressure forces on the joints and muscles, acting positively

in the development of mechanoreceptors, responsible for the coordination of movement, in order to prevent musculoskeletal deficits.

## Introduction

Given the increasing survival rate of newborns associated with a prolonged hospital stay, a direct relationship between neonatal care and newborns later evolution after hospital discharge is considered concerning risk for growth and developmental disorders [1-4]. This care is related to the use of technology, quality in neonatal care and multidisciplinary approaches, with emphasis on the importance of care based on humanization [1,5] and the integrality of care centered on family/caregivers [5-7].

Aspects of complementarity and interdependence are found in different areas [1,5] among the different professionals involved in

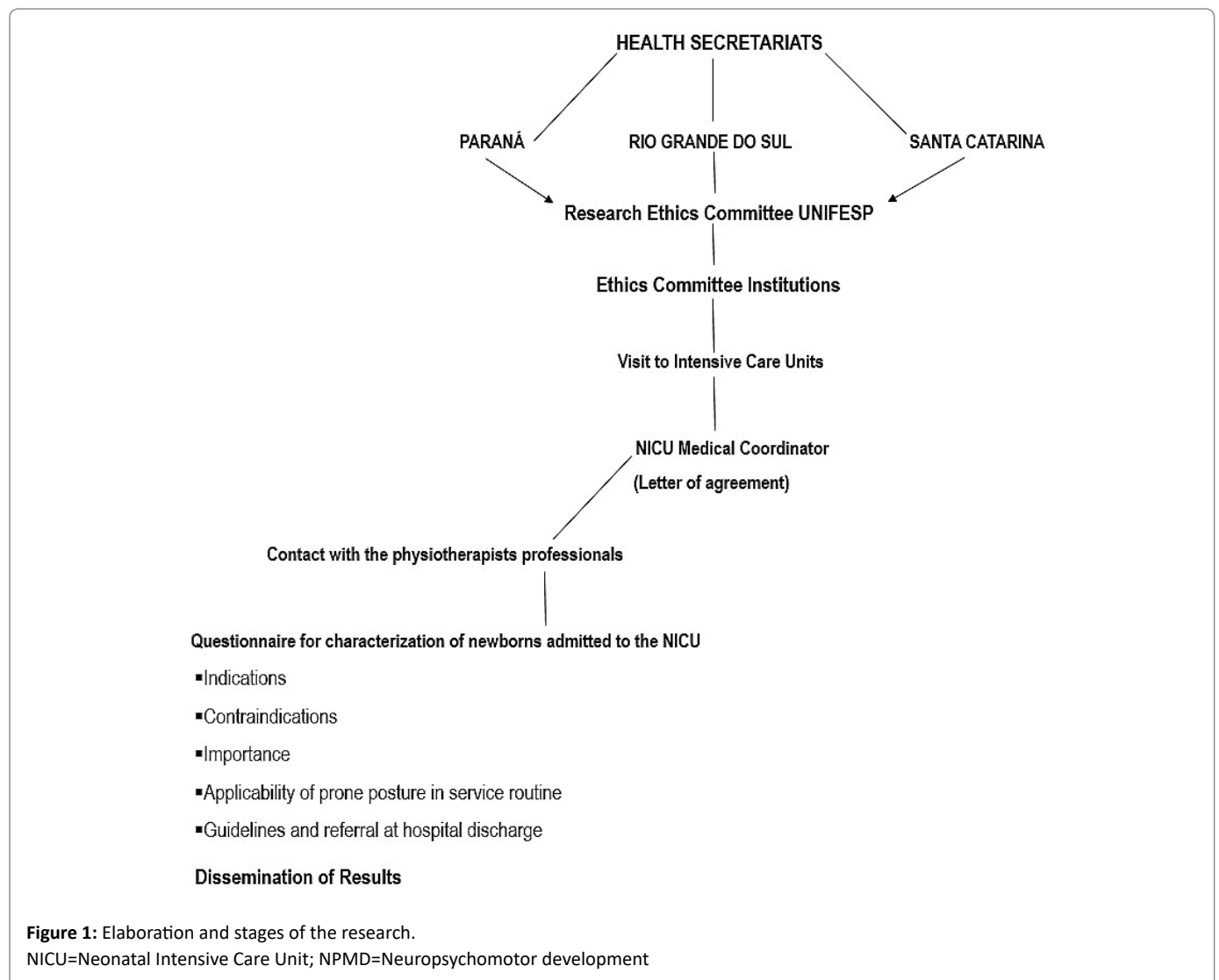
neonatal care. Regarding neuropsychomotor development (NPMD), physical therapists aim to minimize future changes resulting from the impact of neonatal intensive care units (NICUs) environment during the hospitalization period [4,8]. Therefore, they use therapeutic resources that stimulate vestibular, visual and tactile perception limited to the tolerance of the newborn, as well as care with bed functional positioning and reduction of harmful stimuli that favor inadequate motor and behavioral activity of these newborns [6,7,9,10].

Care related to functional positioning includes the prevention of dermatological lesions in areas of pressure, and ischemia, improved oxygenation, facilitation of respiratory mechanics, and the promotion of mobilization of airway secretions [5,11]. Also, positioning itself is used to promote neurobehavioral and neuromotor stability [12,13], which occurs from the alternation of newborns decubitus in NICUs [5,13].

Among the postures used for newborns, the prone posture is characterized by facilitating flexion due to the action of gravity. This posture minimizes the effects of gastroesophageal reflux to the lungs and, thus, interferes with the ability to feed orally [5,14]. When the child is on ventilatory assistance, the prone position is considered beneficial in weaning and is associated with lower risks of respiratory

complications [5,15]. A lower frequency of crying associated with the prone position is also described in the literature, as well as a decrease in stress, being associated with behavioral and physiological variables (level of pain, sleep and wakefulness, frequency of apneas) [11,16,17].

The most significant opportunity for practice in the prone position is also related to infants with better development of motor and weight-bearing capacities against gravity [14,15]. The effects of postural change on the preservation of the cutaneous integrity of newborns [12,18] and repercussions on cardiocirculatory functions are known, with less variability in heart rate associated with the prone position [17,19,20]. Positive effects of the prone position also on cardiovascular function have been demonstrated in the literature [19,21-23], related to the improvement of oxygenation [11], reduced apnea [16], improved thoracoabdominal synchrony by decreasing respiratory work, with a consequent increase in lung volume and improved oxygen saturation [17,20]. As for the prone position for anesthetized and sedated infants, a better expansion of the dorsal regions of the lung is suggested with improved oxygenation [17,20,22] followed by the statement that the prone posture is associated in a favorable way increased oxygenation in patients with acute respiratory distress syndrome (ARDS), without deleterious effects [24,25].



**Figure 1:** Elaboration and stages of the research.  
NICU=Neonatal Intensive Care Unit; NPMD=Neuropsychomotor development

The strong relationship between the prone position and the sudden death syndrome has been described in the literature [26,27], especially with premature newborns, who are at greater risk, particularly during sleep, when compared to newborns born full term [28,29]. This fact is associated with the reduction in blood pressure [28,29] and the difficulty in awakening from sleep [27,30]. Other studies [21,30,31] reveal that in the prone position, when the newborn's head is lateralized, blood flow from the internal jugular vein, vertebral artery and basilar is impaired, showing greater chances of episodes of hypotension and hypoxia.

Thus, the careful use of the prone position, based on the clinical analysis of the newborn, should be considered as a form of prevention to be adopted by the NICU team [28,29]. Thus, this study aimed to identify the use of prone position, as per physical therapy care, for newborns admitted to an NICU in southern Brazil, aiming NPMD.

## Method

### Study design and setting

This cross-sectional analytical study was conducted at public NICUs in Southern Brazil (Paraná, Rio Grande do Sul and Santa Catarina states), from December 2015 to May 2018.

According to the State Health Departments and Data SUS [32] accreditation, with periodic consultations during the data collection period, 92 public NICUs from the Southern Region of Brazil were identified, of which 19 Units were from the State of Santa Catarina, 38 from the State of Paraná and 35 from Rio Grande do Sul. Physical therapists who work in the Service routine of these Units, with one year or more of experience in the area, and who agreed and signed the Consent Form were included. Physical therapists who were in residency programs (multi-professional) were excluded.

### Operational definitions

Two reviews were prepared on the central theme under study (prone posture and neuropsychomotor development of infants; prone posture at NICUs), based on searches in the following databases: Cochrane Library, MedLine (via Virtual Health Library-HL and PubMed) and Pedro (Physiotherapy Evidence Database). Also, the term "prone position" was defined as the correct joint alignment and body symmetry, which favors motor development, promotes self-regulation and behavioral regulation; ideally, this position is described when the newborn is maintained in the physiological flexor position (shoulder, hip, and knee flexion, and lateralized head flexion) [33].

### Instruments

A questionnaire with nine multiple-choice questions and an open question was applied to identify the physical therapy care regarding the prone position in the NICUs, which was answered in person to the same researcher in all participating Units. The information collected from the questionnaire was related to the period of hospitalization in the NICU and follow-up after discharge from the newborn:

Questionnaire: indications and contraindications of the prone position regarding physical therapy assistance; newborn clinical condition or need for ventilation support (invasive and non-invasive mechanical pulmonary ventilation); importance and applicability in the routine of the Service, taking into account the difficulties of performing the prone position as a result of factors external to the newborn's clinical condition. Also, we asked about the general guidelines given to family members at hospital discharge, including the stimulation of prone position and outpatient follow-up with the physical therapist.

The variables evaluated related to health professionals were: time of experience in years and professional qualification, specialization or postgraduate (master and doctorate). Regarding the physical therapists' care concerning the prone position in the NICU, the following variables were verified: protocol of decubitus change, indication, use, applicability, importance, interference of the prone position on NPMD in neonatology. Clinical situations related to the indication of starting prone position in the NICU were: stable cardiorespiratory condition, ventilation weaning and after extubation, after sedation discontinuation, after medication discontinuation vasoactive and newborn in discharged condition of the NICU; main difficulties in achieving the prone position among NICU physical therapists: lack of full-time professionals in the Unit, reduced number of professionals, shortage of professionals on weekends and holidays, priority to cardiorespiratory interventions and lack of knowledge and management with positioning. It is emphasized that each professional could answer to more than one possibility. According to the period after hospital discharge, the variables were related to guidance provided to parents or caregivers and the recommendation of physical therapy follow-up.

### Collection procedure

The study was submitted in person to the Health Secretariat of the three states: Paraná, Santa Catarina, and Rio Grande do Sul. The study was acknowledged by the Health Secretariats and later sent to the Research Ethics Committee of the Federal University of São Paulo/UNIFESP (CAAE 49068215.4.0000.5505). Following approval by the Ethics Committee, the principal researcher contacted public institutions with NICUs, in at least five attempts, to the institutional body responsible for conducting research.

**Table 1:** Characteristics of physiotherapists working in the NICUs regarding age, the time of experience and professional qualification (N=104).

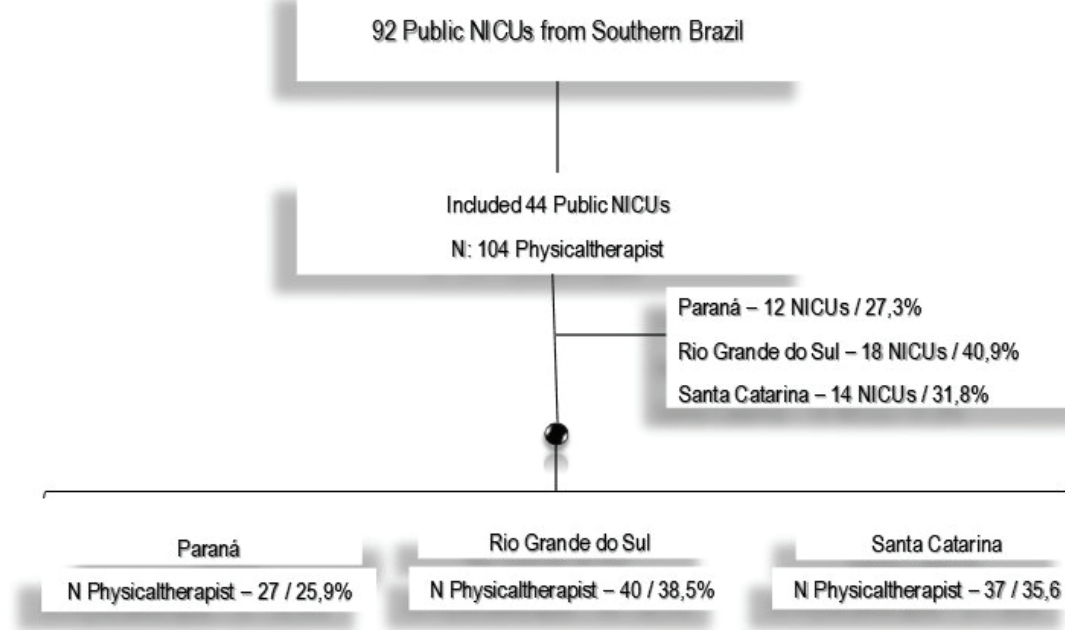
Professional qualification	Paraná	Rio Grande do Sul	Santa Catarina	Total
	N/%	N/%	N/%	N/%
Graduate	1/3.7	5/12.5	3/8.1	9/8.6
Specialization	23/85.2	32/80.0	26/70.3	81/77.9
Postgraduate	3/11.1	3/7.5	8/21.6	14/13.5
Age (years)	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Experience time (years)	36 ± 9.0	33 ± 6.0	33 ± 6.0	32 ± 7.8
	11 ± 9.0	6 ± 5.0	7 ± 6.0	7.7 ± 6.9

N=Number of interviewed; SD= Standard Deviation

**Table 2:** Clinical situations related to the indication of starting the prone position in the NICUs of Southern Brazil, according to physical therapist (N=104).

	N/%
Steady cardiorespiratory condition	62/59.6
Ventilatory weaning and after extubation	36/34.6
After 72 hours of life with continuous monitoring (minimal handling)	36/34.6
After suspension of sedation	9/8.6
Following discontinuation of vasoactive medications	7/6.7
When newborn is in NICU high condition	2/1.9

N=Number of interviewed; NICU = Neonatal Intensive Care Unit



**Figure 2:** Representation the number of Neonatal Intensive Care Unit (NICU) and interviewed professionals included in the present study. N=Number of interviewed; NICU=Neonatal Intensive Care Unit

**Table 3:** Difficulties in achieving prone position in the NICUs among physiotherapists from Southern Brazil (N=76).

	N/%
Lack of full time professionals in the unit	57/75.0
Reduced number of professionals	35/33.6
Reduced number of professionals on weekends and holidays	43/41.3
Priority to cardiorespiratory interventions	16/15.4
Lack of knowledge and management with positioning	9/0.9

N=Number of interviewed

After getting in touch with the corresponding sector, the documentation requested for the research was arranged, and the medical coordinator of each Unit was contacted. Following clearance by coordinators through a letter of agreement, and subsequent acceptance of the research by the Ethics Committees of the involved institutions, the physical therapists were personally invited, in at least at two different times, to participate in the study. If they agreed to participate in the study, the signature of the consent form was collected, followed by the application of the questionnaire. The professionals' identities were kept confidential; the preliminary and final results were made available to the medical coordinators of the participating institutions and sent to the health departments of the three states (Figure 1).

### Data analysis

Data were entered and consolidated in an Excel spreadsheet (Office Microsoft®), and presented from descriptive statistical analysis (Mean ± Standard Deviation; absolute frequency and percentages; median, Interquartile Range (IQR), minimum and maximum).

### Results

This study included 44 public NICUs from Southern Brazil (Figure 2) with the presence of a physical therapist; the other Units were excluded because of the lack of authorization from the coordinators (41 Units) or the non-adherence of the physical therapist to the research (seven Units). A total of 104 physical therapists interviewed, with average experience time in the neonatology area of 7.7 years and 77.9% reported having specialization (Table 1).

Most respondents (68.3%) stated that there is a protocol for decubitus change in the Unit where they work, however, in most NICUs included in this study, prone position is not indicated (59.6%). The prone position concerning NPMD was considered necessary by almost all respondents (99%), as most professionals considered this position beneficial and applicable in neonatology (97.1%).

Regarding the beginning of the prone position in the NICUs, the clinical situations cited by the interviewed physical therapists are described in table 2. It is emphasized that each professional could answer more than one alternative to indicate this position.

We observed that 73.1% of the participants in this study stated that there were limitations in the incorporation of the prone position into the service in which they work. These limitations were mainly related to aspects external to the clinical condition of newborns, for example, the lack of full-time physical therapist in the sector or the reduced number of professionals in this area, especially on weekends and holidays, leading them to prioritize cardiorespiratory interventions, compared to interventions related to the NPMD stimulation (Table 3). It is noteworthy that each professional could answer more than one alternative to indicate the difficulties to perform this position.



Regarding the interference of the prone position in the NPMD of newborn in NICUs, most respondents (65.4%) answered affirmatively; however, at discharge, the position of newborns in prone status is not usually mentioned (57.7%) in the guidance given to parents or caregivers, although physical therapist follow-up after discharge is recommended by most respondents (64.4%).

## Discussion

Regarding the professionals evaluated, the prone position is considered necessary, and there is evidence of its benefits in neonatology, as well as later in the NPMD of newborns. However, factors external to the clinical condition of newborns were determinant in the use of prone position by the physical therapy professionals in these Units. Among the factors mentioned, the main aspects mentioned were the lack of exclusive or full-time professionals and the reduced number of professionals in the Units evaluated.

The second Ordinance of the Ministry of Health N° 3.432 in force since August 8, 1998, the National Health Surveillance Agency [33] and, more recently, Resolution 1909/2015, mention that there should be, on average, one professional physical therapist for every ten ICU beds or fraction, in the morning, afternoon and evening shifts, with full, uninterrupted 24-hour assistance available [3,34]. The follow-up by physical therapist of the newborn in need of intensive care was implemented and regulated by Ordinance N.3.432/SM/GM of August 12, 1983, which is considered essential in the rehabilitation and prevention of critically-ill patients [5,35], aiming at reducing neonatal morbidity, shorter hospital stays, and lower hospital costs [7,8].

The role of care performed by the physical therapist varies according to the indication (cardiorespiratory or motor) [7,36], and the physical therapy team may have different levels of specialization and continuing education [5,37]. In this study, regardless of the geographical area, the level of education was similar among professionals, and most have specialization. However, aspects related to professional training (specialization in the area of neonatology or time of experience in the area) are not mandatory for the physical therapist working in the NICU. The lack of exclusivity and integrality of the professional physiotherapist in the NICU, which consequently translates into a reduced number of hours of assistance provided, especially during holidays and weekends. A trained team in the area of expertise is required [1,3,4] aiming at the quality of care provided to hospitalized newborns [1,5], due to the direct relationship between the interference of neonatal care and future changes in the newborn [1,5,38].

The length of stay in the NICU [11,13] may involve inadequate stimulation and bed positioning most of the time in the same position [39-42]. The indication of a prone position in the NICU is mainly related to the clinical condition of the newborn [43,44]. According to the respondents, the most cited factors determining the prone position were the presence of the stable cardiorespiratory condition and ventilation support. On the other hand, aspects such as the team's lack of collaboration, either due to insecurity or resistance concerning this position, can be considered factors of interference in the decubitus alternation routine in the NICUs surveyed. When positioned in different positions, the newborns experience different pressure forces in the joints and muscles, acting positively in the development of mechanoreceptors, responsible for the coordination of movement, in order to prevent musculoskeletal deficits [27,40-43].

Since the correct postural alignment of the newborn is essential, the first months of life are marked by the initial acquisition of postural control in lying positions [40-42], and prone position is positively associated with typical motor development [1,41,42]. It is crucial to

encourage positioning change from birth [40,42,45]. Also, the lack of guidance on other positions makes parents maintain their newborn in the supine position most of the time after hospital discharge [45]. Newborn follow-up was shown to be indicated after discharge from the NICU. However, for most professionals interviewed, the prone position was not included in the routine in the orientations provided at hospital discharge. The limited practice of alternating position during the hospitalization of the newborn, as well as the lower emphasis of prone position during orientations to family/caregivers, provide less practice of this position at home.

It is important to provide information on how to stimulate the newborn after hospital discharge to experience the environment, with the opportunity to explore it, as well as guidance to family members to continue multisensory stimulation protocols [13,46]. Also, from the NPMD viewpoint, experience in one position may interfere with the sequence and mechanism of motor milestones [41,42]. However, in this study, we often observed that the physical therapist care in the NICUs was hampered by the lack of professionals in the Service (professionals who are not exclusive to the NICU and the reduced number of professionals to supply the service's demand).

Limitations of this study are its cross-sectional design, the non-participation of all physical therapists working in each service, as well as the exclusion of the NICUs due to the non-authorization of the coordinators or non-adherence by the professionals; the study is characterized by being a self-report of the results obtained, and, therefore, there may be a bias of social desirability; the questionnaire applied was developed by the researcher, not based on guidelines and/or validated, as well as no pre-test and/or pilot study.

## Conclusions

According to the 104 physical therapist professionals from the Southern Region of Brazil included in this study, the importance of the prone position is recognized, as well as its interference concerning the NPMD of newborns. However, there was a limited alternation of positions during the newborn's hospitalization, followed by a lack of emphasis on orienting the prone position to family/caregivers. In addition, there was often a lack of an exclusive or full-time physical therapist in the NICUs, as well as a disproportion between demand and number of professionals in care, especially on holidays and weekends.

## Conflict of Interest

The authors declare that they have no conflict of interest.

## Funding

There is no funding source.

## Ethical Approval

The study was submitted to the Research Ethics Committee of the Federal University of São Paulo/UNIFESP (CAAE 49068215.4.0000.5505).

## Informed Consent

Informed consent was obtained from all individual participants included in the study.

## Author's Contribution

MM: Conceptualized and designed the study, carried out the collection and analysis of data analyses, drafted the initial manuscript and approved the final manuscript as submitted.

CJ and FISS: Carried out the analysis of data analyses, reviewed the manuscript, and approved the final manuscript as submitted.

MWLS: Designed the data collection instruments, and coordinated and supervised data collection, critically reviewed the manuscript, and approved the final manuscript as submitted.

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