CENTRO UNIVERSITÁRIO UNINOVAFAPI
BACHARELADO EM MEDICINA

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TELEMEDICINA TRANSFORMANDO O CUIDADO DO AVC NO PIAUÍ: Uma Análise Abrangente do Primeiro Ano de uma Iniciativa Estadual

TERESINA
2024

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Trabalho de Conclusão de Curso apresentado ao curso de Bacharelado em Medicina do Centro Universitário UNINOVAFAPI como requisito para obtenção do título de Médico(a).

Orientador: Dr. Irapuá Ferreira Ricarte

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SUMÁRIO

Telemedicine Transforming Stroke Care in Piauí: A Comprehensive Analysis of a State-Wide Initiative's First Year"

Abstract

Background: Stroke is the leading cause of death in Brazil as of 2022, with significant disparities in care accessibility, particularly in socioeconomically disadvantaged regions like Piauí. This state, one of the poorest in Brazil, had not previously recorded the use of thrombolytic treatment in public hospitals before the launch of a pioneering stroke care program.

Objective: This study assesses the impact of a telemedicine-based stroke care initiative launched in Piauí. It aims to bridge the gap in stroke care by facilitating prompt thrombolytic treatment and enhancing patient outcomes.

Methods: We conducted a retrospective analysis of 868 patients treated from October 2022 to September 2023 under the state-wide stroke care program, which includes 6 Stroke Treatment Centers distributed around the state. Utilizing data from the JOIN telemedicine platform, the analysis focused on patient demographics, stroke types, treatment timelines, and outcomes.

Results: The cohort included 868 patients, with a mean age of 67.2 years; 55.5% were male. Hypertension and dyslipidemia were the most prevalent conditions. The average onset-to-door time was 3.28 hours, door-to-CT time was 23 minutes, and door-to-needle time averaged 67.08 minutes. Thrombolysis was administered to 15.6% of all stroke cases, with 31.8% among those with ischemic strokes. Notably, these patients hailed from 100 cities, emphasizing the wide reach of the program across Piauí.

Conclusion: The introduction of a telemedicine-based stroke care program in Piauí has significantly enhanced access to essential stroke treatments, demonstrating its effectiveness in overcoming healthcare disparities. The initiative's success underscores the potential of telemedicine as a scalable model for improving stroke care in regions with limited healthcare resources. Future efforts will focus on reducing treatment times and expanding stroke care infrastructure to ensure comprehensive patient care.

Keywords: Stroke care, Telemedicine, Thrombolysis, Healthcare disparities, Piauí, Brazil**.**

INTRODUCTION

Stroke has risen to become Brazil's leading cause of death as of 2022, with its survivors often facing severe physical and cognitive challenges that significantly reduce their quality of life and present a substantial economic burden[1]. The healthcare system in Brazil exhibits a stark disparity in the availability of stroke care, with affluent regions having access to advanced reperfusion therapies. In contrast, public hospitals, the primary healthcare providers for the majority, often do not have access to essential thrombolytic treatments and standardized care protocols[2]. This gap is most acutely felt in Piauí, one of the poorest states in Northeast Brazil, and a region marked by pronounced socioeconomic challenges.

Data from PROADESS (Project for the Evaluation of the Health System's Performance) places Piauí at the epicenter of a critical health crisis, with the highest cerebrovascular disease mortality rate in Brazil at 70.2 deaths per 100,000 inhabitants, significantly exceeding the national average of 44.9. This alarming rate highlights the imperative need for a comprehensive stroke treatment program launched statewide in 2022[3], aimed at confronting these severe health challenges. Central to this program is the telestroke initiative, utilizing telemedicine to connect patients in remote areas with stroke specialists. This innovative strategy is expected to reduce treatment delays and improve patient outcomes, serving as a crucial solution in Piauí, which suffers from a pronounced shortage of neurologists in rural areas and holds the country's highest stroke mortality rate. Telemedicine stands as a critical solution to navigate the challenges of geographical and resource limitations, accelerating diagnosis and the delivery of care and enabling specialists in major healthcare centers to extend their support to the regions most affected[4]–[7].

Our study aims to conduct a descriptive analysis of patients suspected of stroke who received telemedicine-based care in Piauí during the first year of the program's implementation. We seek to assess the impact of telemedicine on improving stroke care in the region and to provide a comprehensive overview of the telestroke initiative's operational framework. Significantly, this program's implementation in Piauí represents a crucial step towards reducing healthcare disparities in stroke care, as no thrombolytic treatments were previously recorded in the state's public healthcare facilities. This initiative promises to transform the approach to stroke treatment in regions burdened

by limited healthcare resources, setting a precedent for similar healthcare environments.

METHODS

This retrospective study evaluates the inaugural year of the state-wide integrated stroke care program in Piauí, Brazil, initiated in October 2022. The program's core objective is to deliver prompt thrombolytic treatment within the 4.5-hour window following a stroke, optimizing patient outcomes by reducing door-to-needle times and associated morbidity and mortality.

Study Protocol

This study encompassed all patients treated under the Piauí state stroke care pathway from October 2022 to September 2023. A retrospective analysis of patient records was conducted to collect demographic and clinical information. Data collected included demographics, stroke risk factors, stroke subtypes based on computed tomography (CT) (ischemic or hemorrhagic stroke) and transient ischemic attack [TIA], patient disposition during hospital admission (intensive care unit, stroke unit, regular ward or emergency room), frequency of treatment with thrombolysis or thrombectomy. The analysis included evaluating stroke risk factors and characteristics of the stroke (including stroke type and baseline National Institutes of Health Stroke Scale [NIHSS] scores), and details regarding the timing and approaches of acute management (such as time of hospital arrival, door-to-CT times, door-to-needle times, and the type of recanalization therapy administered).

The subtypes of stroke were defined using universally accepted criteria: ischemic stroke and intracerebral hemorrhage based on clinical and neuroimaging findings (CT or magnetic resonance imaging [MRI])[8]. TIA was defined as a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia without acute infarction, with symptoms usually lasting < 24 hours[9][10]. Risk factors were considered if described on the patient’s chart.

Data Collection

Patient data was sourced from the JOIN telemedicine platform and used to manage patients with suspected stroke. This platform maintains a comprehensive epidemiological and clinical data archive for patients treated within the Piauí stroke care program. Data retrieval was conducted remotely via the JOIN application, adhering to strict confidentiality standards through robust anonymization protocols inherent to the system.

Regionalization and Facility Deployment

The initiative to enhance stroke treatment in Piauí, Brazil, commenced in October 2022, with five Stroke Treatment Centers opened at regional hospitals in Floriano, Parnaíba, Picos, Piripiri, and São Raimundo Nonato. This initiative expanded in June 2023 when another center was inaugurated in Teresina, the state's capital (*figure 01*). Guided by the Ministry of Health's Ordinance 800, the selection of these centers was based on criteria emphasizing the availability of essential human and material resources. Initially, the five centers lacked specialized stroke units but offered thrombolytic treatment. The Teresina Center is distinguished by having both a stroke unit and the capability for mechanical thrombectomy. Plans are underway to establish five more centers to form an 11-center thrombolysis network across Piauí's macro-regions, all equipped for continuous tele-stroke support.

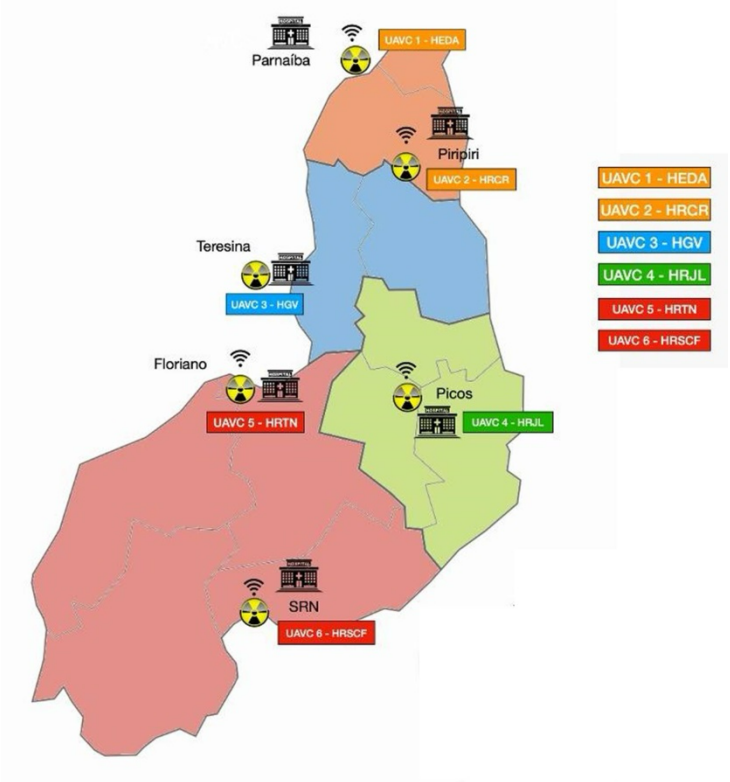

Figure 01. Regionalization of Stroke Treatment Centers at regional hospitals in the state of Piauí. HEDA, Hospital Estadual Dirceu Arcoverde; HRCR, Hospital Regional Chagas Rodrigues; HGV, Hospital Getúlio Vargas; HRJL, Hospital Regional Justino Luz; HRTN, Hospital Regional Tibério Nunes; HRSCF, Hospital Regional Senador Cândido Ferraz.

Telemedicine and Triage Protocol

Medical teams contact a 24/7 telemedicine smartphone platform with eight stroke neurologists for immediate imaging review and diagnosis. Patients within 4.5 hours of stroke onset are urgently referred to a nearby Stroke Reference Hospital. If onset exceeds 4.5 hours or if transportation issues arise, patients are sent to the nearest general hospital, possibly without specialized stroke evaluation. Uncertain or inconclusive cases by SAMU are also directed to general hospitals for further assessment. Reference hospitals, functioning as open-door facilities, also accommodate walk-in patients.

Assessment and Management Strategy

At the Stroke Reference Hospital, patients receive a thorough neurological evaluation and diagnostic imaging to verify the presence of an acute ischemic stroke. Upon confirmation, the treatment pathway can include intravenous thrombolysis or mechanical thrombectomy. The confirmation and management of stroke adhere to the protocols set forth by the Brazilian Stroke Society and the Brazilian Academy of Neurology[11], [12], which are in line with international guidelines[13].

Ethical Compliance

The study received approval from the ethics committee of the UNINOVAFAPI university center, with the Health Secretariat of Piauí (SESAPI) granting access to data, thus ensuring strict compliance with ethical norms. The requirement for a consent form was waived by the ethics committees, given that the data collection serves the purpose of monitoring care quality and aims to refine post-stroke care recommendations. Under no circumstances is patient personal data disclosed

Statistical analysis

Means, standard deviation, medians, and interquartile intervals were used to describe patients' characteristics. Categorical variables were presented as percentages. The Student's T and Mann-Whitney tests were used to compare quantitative variables for parametric and non-parametric samples, respectively. For paired groups, the T and Wilcoxon tests were used for parametric and non-parametric samples. Categorical variables were compared using the chi-square test. Statistical analysis was performed using Jamovi 2.3.28 statistical software (The Jamovi project, Sydney, Australia).

RESULTS

Our analysis, spanning from October 2022 to September 2023, incorporated data from 868 patients across 100 cities. The cohort's mean and median age were 67.2 and 69 years, respectively, with males accounting for 55.5% (462) of the cohort. There was no age difference between the two genders ($p>0.05$) (Table 1).

The cities with the highest patient contributions were Picos (105), Parnaíba (86), Teresina (62), São Raimundo Nonato (54), Floriano (52), and Piripiri (48) (Table 1). .

Hypertension and Diabetes Mellitus (DM) emerged as the most common pre-existing conditions among the participants, with 57.8% reporting a history of hypertension and 22.5% diagnosed with Diabetes Mellitus (DM). There was no difference in the prevalence of hypertension between men and women [$p>0.05$, OR 1.03 (CI 0.78-1.35)]. However, the frequency of DM was higher in women [$p<0.05$, OR 0.69 (CI 0.50-0.95)] (Table 1).

Hospitalization details indicated 41.2% of patients were admitted to the emergency room, 12.7% required ICU care, 16% were in the general ward, and 31.1% were treated in other hospital departments (Table 01).

A significant portion of the cohort, 64.7% (561 patients), were diagnosed with a stroke or TIA. Specifically, ischemic stroke was identified in 49.1% (425 patients), hemorrhagic stroke in 8.2% (71 patients), and TIA in 7.4%. The remainder of the group included stroke mimics or cases where diagnosis was impeded by logistical or communication issues (Figure 01). In our cohort, ischemic strokes accounted for 75.6% of cases, hemorrhagic strokes for 12.6%, and transient ischemic attacks (TIA) for 11.8%(Table 1).

The mean onset-to-door time was recorded at 3.3 hours, and the door-to-CT time averaged 23 minutes. Thrombolysis with alteplase was administered to 135 patients, representing 31.8% of those with ischemic stroke (135/425) and an overall thrombolysis rate of 15.6% (135/868). The average door-to-needle time was 67.1 minutes, and the mean NIHSS score was lower post-thrombolysis ($p<0.05$). Moreover, two patients underwent endovascular thrombectomy (Table 02).

Table 1: Epidemiological Characteristics of Stroke Patients in Piauí (October 2022 - September 2023)

Parameter	Value
Total Patients	868
Mean Age, SD (years)	67.2 ± 15.9
Median, 1º and 3º IQR	69; 58 and 79
Male Gender (%)	55.5%
Cities with Highest Number of Patients	
- Picos	105
- Parnaíba	86
- Teresina	62
- São Raimundo Nonato	54
- Floriano	52
- Piripiri	48
Pre-existing Comorbidities	
- Arterial Hypertension (%)	57.8%
- Diabetes Mellitus (%)	22.5%
Location of Patient Admission	
- Emergency Room (%)	41.2%
- Intensive Care Unit (ICU) (%)	12.7%
- General Ward (%)	16.0%
- Other Hospital Departments (%)	31.1%
- Stroke Unit Hospitalization (%)	10.9%
Stroke Diagnosis and Treatment	
- Diagnosed with Stroke or TIA (%)	64.7%
- Ischemic Stroke (%)	49.1%
- Hemorrhagic Stroke (%)	8.2%
- TIA (%)	7.4%
Onset-to-Door Time (hours)	3.3 (CI 3.0-3.5)
Door-to-CT Time (minutes)	23 (CI 20.3-25.7)

SD indicates standard deviation; IQR, interquartile interval; TIA, transient ischemic attack; CI, confidence interval; CT, computed tomography.

Table 2: Recanalization therapy parameters

Parameters	Value
Thrombolysis Rate for Ischemic Stroke (%)	31.8 (135/425)
Mechanical thrombectomy (among ischemic stroke) (%)	0.5 (2/425)
Overall Thrombolysis Rate (%)	15.6 (135/868)
Door-to-Needle Time (minutes)	67.1 (CI 61.7-72.3)
NIHSS Score Before Thrombolysis	14.2 (±6.8)*
NIHSS Score After Thrombolysis	9.7 (±7.6)*

*p<0.05; NIHSS indicates National Institute of Health Stroke Scale; CI, confidence interval.

DISCUSSION

In its first year, Piauí's stroke care initiative aligned with Brazil's national epidemiological trends[14] and pioneered the introduction of thrombolytic therapy in a previously unknown region. Showcasing exceptional efficiency, the program quickly transitioned patients from their arrival to diagnostic imaging, setting a precedent in patient care management. Despite these advancements, the time from arrival to the initiation of treatment, although showing improvement, still falls short of meeting global stroke care recommendations[13]. This initiative achieved thrombolysis rates significantly above the national average[15]–[17], establishing a new benchmark for stroke care in areas previously lacking access to these essential services.

In our analysis of the inaugural year of Piauí's integrated stroke care program, we observed that the epidemiological characteristics of stroke, including patient age, gender distribution, and the prevalence of risk factors, aligned closely with those reported in previous Brazilian studies[14], [15], [17]. Notably, our findings corroborate the pattern observed in other Brazilian cohorts, where the high frequency of intracerebral hemorrhages, commonly reported in South American stroke series, was not replicated[14], [15], [17]–[20]. Furthermore, the incidence of TIA in our study fell within the Brazilian prevalence range of 3-29% previously documented [15], [21] confirming the consistency of TIA occurrences across different regions. The rate of stroke mimics identified in our study, which includes patients presenting acutely with sudden onset neurological deficits, was comparable to prior research, showing a prevalence as high as 30% in some studies and ranging from 11%-22% in telestroke settings[7]. Such findings emphasize the critical importance of accurate initial assessment and diagnosis in managing stroke and stroke-like episodes, underscoring the value of telestroke in extending specialist diagnostic support to remote areas.

Moreover, the distribution of patients from 100 cities, including major urban centers like Teresina and numerous rural locations, showcases the program's extensive reach and profound impact. This wide geographical spread of patients demonstrates the program's successful penetration across Piauí and highlights the effectiveness and necessity of its decentralized approach to stroke care. By facilitating access to specialist care and thrombolysis treatment across diverse settings, the

program exemplifies a scalable model for stroke care delivery in regions with varied healthcare infrastructure.

Our program demonstrates commendable efficiency in patient management, with a mean onset-to-door time of 3.28 hours and a door-to-CT scan time of 23 minutes. These metrics reflect the program's capability to rapidly process patients from their arrival to diagnostic imaging. However, the average door-to-needle time of 67.08 minutes, though showing significant efforts toward rapid care, still exceeds the international benchmarks recommended by stroke guidelines[13]. The critical nature of time in stroke treatment underscores the necessity of immediate intervention; the faster a patient receives thrombolytic therapy, the better the outcomes[22], highlighting the importance of minimizing door-to-needle times. The importance of swift treatment is emphasized by stroke guidelines, advocating for the establishment of structured protocols and a multidisciplinary stroke team for the prompt evaluation of suspected stroke cases. In line with this, the Brazilian Stroke Society[11], adhering to the American Stroke Association guidelines[13], recommends conducting cranial CT scans within 25 minutes of arrival and initiating intravenous tPA therapy within 60 minutes for acute ischemic stroke patients.

In its first year, our stroke care initiative in Piauí has made significant strides, achieving thrombolysis rates of 15.6% across all stroke patients and 31.8% among those with ischemic strokes. These figures are particularly noteworthy given the varied thrombolysis rates across Brazil—ranging from as low as 1.1% in the northeastern regions to between 4.6% and 8.9% in the southeastern parts, and 6% to 23% in the south[15], [17], [21], [23]. The introduction of thrombolysis treatments in Piauí, a region previously without such services, has not only aligned with but also, in certain cases, exceeded the regional averages throughout the country. This achievement represents a major step forward in improving stroke care accessibility and quality in Brazil.

The notable success of our program is largely due to its focused strategy on identifying patients who are candidates for thrombolysis and improving the process for transferring those who fall outside the optimal treatment window. This method is in line with worldwide research showing the beneficial effects of telestroke services, which have led to a substantial increase in the use of thrombolytic therapy. Telestroke networks report thrombolysis rates ranging from 18% to 36%, far exceeding the 5% to 8% typically observed in the United States[7], [24]. Such advancements are the result

of targeted implementation and comprehensive training for telestroke services, as well as the strategic selection of patients based on local clinical guidelines. Amorim et al.[25], For instance, the introduction of telestroke services in a network of hospitals increased thrombolysis rates from 2.8% to 6.8%, underscoring telestroke's profound capability to improve stroke treatment outcomes significantly.

Our study's findings, showing a reduction in NIHSS scores following thrombolysis, underscore the critical importance of timely intervention in stroke care. This aligns with existing research, highlighting thrombolytic therapy's effectiveness in improving acute ischemic stroke outcomes when administered within the crucial 4.5-hour window post-symptom onset[26]. This finding highlights the need for healthcare systems to enhance rapid response protocols for acute ischemic stroke, aiming to improve patient outcomes by ensuring early treatment.

Our retrospective study from hospitals in economically disadvantaged areas of Piauí highlights significant challenges due to inadequate record-keeping, limiting our analysis of stroke epidemiology. The focus of our public stroke care program on thrombolysis-eligible patients, facilitated by telemedicine, might introduce a selection bias, potentially not reflecting the broader stroke patient population in Piauí. Addressing these issues requires further research with improved data collection methods for a fuller understanding of stroke care in the region. Enhancing training and resources is critical as our program grows to ensure equitable, high-quality care for all stroke patients.

To address the need for thorough investigation and management in stroke units, particularly in remote areas, we are planning a substantial expansion of our stroke care infrastructure by 2024, including establishing specialized stroke units across the state. This initiative is designed to improve patient management and care quality in underserved areas and to enhance our capacity for comprehensive data collection on patient outcomes, thrombolysis safety, and epidemiological trends. This strategic development underlines our commitment to advancing stroke care services, ensuring accessible care for every patient in Piauí, and stresses the importance of continuous research and data improvement.

The achievements of our integrated care program, powered by telemedicine, represent a crucial step forward in mitigating healthcare disparities and improving stroke care in Piauí. This progress not only illustrates the program's potential as a

blueprint for similar regions globally but also underscores the need for continued enhancements in healthcare infrastructure and professional training.

REFERENCES

[1] M. F. Dos Reis and A. Chaoubah, “The Burden of Stroke in the Southeast Region of Brazil in 2019: an Estimate Based on Secondary Data from the Brazilian United Health System,” *Int. J. Cardiovasc. Sci.*, vol. 36, pp. 1–9, 2023.

[2] O. M. Pontes-Neto *et al.*, “Stroke awareness in Brazil: Alarming results in a community-based study,” *Stroke*, vol. 39, no. 2, pp. 292–296, 2008.

[3] “Linha de Cuidado do Acidente Vascular Cerebral (AVC) no adulto,” p. 52, 2021.

[4] L. H. Schwamm *et al.*, “Recommendations for the implementation of telemedicine within stroke systems of care: A policy statement from the American heart association,” *Stroke*, vol. 40, no. 7, pp. 2635–2660, 2009.

[5] G. S. Silva and L. H. Schwamm, “Use of telemedicine and other strategies to increase the number of patients that may be treated with intravenous thrombolysis,” *Curr. Neurol. Neurosci. Rep.*, vol. 12, no. 1, pp. 10–16, 2012.

[6] J. Kepplinger, K. Barlinn, S. Deckert, M. Scheibe, U. Bodechtel, and J. Schmitt, “Safety and efficacy of thrombolysis in telestroke,” *Neurology*, vol. 87, no. 13, pp. 1344–1351, 2016.

[7] L. R. Wechsler *et al.*, “Telemedicine quality and outcomes in stroke: A scientific statement for healthcare professionals from the American Heart Association/American Stroke Association,” *Stroke*, vol. 48, no. 1, pp. e3–e25, 2017.

[8] Y.-C. Huang, R.-K. Lyu, S.-T. Chen, Y.-C. Chu, and Y.-R. Wu, “Parkinsonism in a patient with antiphospholipid syndrome--case report and literature review.,” *J. Neurol. Sci.*, vol. 267, no. 1–2, pp. 166–9, 2008.

[9] J. J. Craig, “Women and valproate: what should neurologists do?,” *Pract. Neurol.*, vol. 18, no. 3, pp. 219–221, 2018.

[10] J. D. Easton *et al.*, “Definition and evaluation of transient ischemic attack: A scientific statement for healthcare professionals from the American heart association/American stroke association stroke council; council on cardiovascular surgery and anesthesia; council on cardiovascular radiology and intervention; council on cardiovascular nursing; and the interdisciplinary council on peripheral vascular disease,” *Stroke*, vol. 40, no. 6, pp. 2276–2293, 2009.

[11] S. C. O. Martins *et al.*, “Guidelines for acute ischemic stroke treatment: part I.,” *Arq. Neuropsiquiatr.*, vol. 70, no. 11, pp. 885–93, 2012.

[12] O. M. Pontes-Neto *et al.*, “Brazilian guidelines for endovascular treatment of patients with acute ischemic stroke,” vol. 467322, pp. 2014–7, 4023.

[13] W. J. Powers *et al.*, *Guidelines for the early management of patients with acute ischemic stroke: 2019 update to the 2018 guidelines for the early management of acute ischemic stroke a guideline for healthcare professionals from the American Heart Association/American Stroke A*, vol. 50, no. 12. 2019.

[14] N. L. Cabral *et al.*, “Incidence of stroke subtypes, prognosis and prevalence of risk factors in Joinville, Brazil: A 2 year community based study,” *J. Neurol. Neurosurg. Psychiatry*, vol. 80, no. 7, pp. 755–761, 2009.

[15] J. J. F. De Carvalho *et al.*, “Stroke epidemiology, patterns of management, and outcomes in Fortaleza, Brazil: A hospital-based multicenter prospective study,” *Stroke*, vol. 42, no. 12, pp. 3341–3346, 2011.

[16] C. H. C. Moro *et al.*, “Trends of the Incidence of Ischemic Stroke Thrombolysis over Seven Years and One-Year Outcome: A Population-Based Study in Joinville, Brazil,” *Cerebrovasc. Dis. Extra*, vol. 3, no. 1, pp. 156–166, 2013.

[17] E. dos Santos *et al.*, “Incidence, lethality, and post-stroke functional status in different Brazilian macro-regions: The SAMBA study (analysis of stroke in multiple Brazilian areas),” *Front. Neurol.*, vol. 13, 2022.

[18] F. J. C. Artal and A. Q. C. Araujo, “Neurological complications in adults with Zika and chikungunya virus infection,” *Lancet Neurol.*, vol. 19, no. 10, pp. 799–801, 2020.

[19] G. Saposnik and O. H. Del Brutto, “Stroke in South America: A systematic review of incidence, prevalence, and stroke subtypes,” *Stroke*, vol. 34, no. 9, pp. 2103–2107, 2003.

[20] G. Saposnik *et al.*, “Differences in stroke subtypes among natives and Caucasians in Boston and Buenos Aires,” *Stroke*, vol. 31, no. 10, pp. 2385–2389, 2000.

[21] F. A. de Carvalho, L. H. Schwamm, G. W. Kuster, M. Bueno Alves, M. Cendoroglo Neto, and G. Sampaio Silva, “Get With The Guidelines Stroke Performance Indicators in a Brazilian Tertiary Hospital,” *Cerebrovasc. Dis. Extra*, vol. 2, no. 1, pp. 26–35, 2012.

[22] J. Emberson *et al.*, “Effect of treatment delay, age, and stroke severity on the effects of intravenous thrombolysis with alteplase for acute ischaemic stroke: A

meta-analysis of individual patient data from randomised trials," *Lancet*, vol. 384, no. 9958, pp. 1929–1935, 2014.

[23] G. W. Kuster *et al.*, "Outcome determinants of stroke in a brazilian primary stroke center," *Stroke Res. Treat.*, vol. 2014, 2014.

[24] B. C. Meyer and B. M. Demaerschalk, "Telestroke network fundamentals," *J. Stroke Cerebrovasc. Dis.*, vol. 21, no. 7, pp. 521–529, 2012.

[25] E. Amorim *et al.*, "Impact of telemedicine implementation in thrombolytic use for acute ischemic stroke: The university of pittsburgh medical center telestroke network experience," *J. Stroke Cerebrovasc. Dis.*, vol. 22, no. 4, pp. 527–531, 2013.

[26] M. D. Werner Hacke, M.D., Markku Kaste, M.D., Erich Bluhmki, Ph.D., Miroslav Brozman, M.D., Antoni Dávalos, M.D., Donata Guidetti, M.D., Vincent Larrue, M.D., Kennedy R. Lees, M.D., Zakaria Medeghri and for the E. I. Thomas Machnig, M.D., Dietmar Schneider, M.D., Rüdiger von Kummer, M.D., Nils Wahlgren, M.D., and Danilo Toni, M.D., "Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke Werner," *N. Engl. J. Med.*, vol. 359, pp. 1317–29, 2008.

APÊNDICE A: INSTRUMENTO DE COLETA DE DADOS

INSTRUMENTO DE COLETA DE DADOS

N° _____

Hospitais N° _____

Sexo:	
Idade:	
Comorbidades:	
Tempo (horário) desde início dos sintomas:	
Horário de chegada no serviço:	
Tempo (horário) para realizar tomografia (porta -TC):	
Tempo (horário) para a trombólise (porta-agulha):	
Suspeita de AVC:	
AVC isquêmico:	
AVC hemorrágico:	
AIT:	

APÊNDICE B: TCUD

UNINOVAFAPI CENTRO UNIVERSITÁRIO | Afya EDUCAÇÃO TECNOLOGIA SAÚDE

TERMO DE COMPROMISSO DE UTILIZAÇÃO DE DADOS – TCUD

Eu Irapuá Ferreira Ricarte (pesquisador responsável) e Camila Victória da Silva, Cristina Calmon de Araújo Mascarenhas e Matheus Felipe da Silva (pesquisadores participantes) abaixo assinados, pesquisadores envolvidos no projeto de título: PERFIL EPIDEMIOLÓGICO DOS PACIENTES ATENDIDOS NA LINHA DE CUIDADO DO AVC NO PIAUÍ, nos comprometemos a manter a confidencialidade sobre os dados coletados nos arquivos do SESAPI – Governo do estado do Piauí , bem como a privacidade de seus conteúdos, como preconizam os Documentos Internacionais e a Resolução CNS nº 466/2012 do Conselho Nacional de Saúde.

Informamos que os dados a serem coletados dizem respeito à casos de Acidente Vascular Cerebral ocorridos entre as datas de outubro de 2022 a outubro de 2023, referentes às cidades de Floriano-PI, Picos-PI, Parnaíba-PI, São Raimundo Nonato-PI e Teresina-PI.

Teresina, 29 de Novembro de 2023.

Nome do Pesquisador	RG	Assinatura
IRAPUÁ FERREIRA RICARTE	2.276.826 SSP/PI	Irapuá Ferreira Ricarte
CAMILA VICTÓRIA DA SILVA	8.063.377 SSP/PI	Camila Victória da Silva
CRISTINA CALMON DE A. MASCARENHAS	4.350.175 SSP/PI	Cristina Calmon de A. Mascarenhas
MATHEUS FELIPE DA SILVA	9.370.600 SDS/PE	Matheus Felipe da Silva

Observação Importante:
TODOS OS PESQUISADORES QUE TERÃO ACESSO AOS DOCUMENTOS DO ARQUIVO DEVERÃO TER O SEU NOME e RG INFORMADO E TAMBÉM DEVERÃO ASSINAR ESTE TERMO. SERÁ VEDADO O ACESSO AOS DOCUMENTOS A PESSOAS CUJO NOME E ASSINATURA NÃO CONSTAREM NESTE DOCUMENTO.

APÊNDICE C: COMPROMISSO DOS PESQUISADORES

UNINOVAFAPI CENTRO UNIVERSITÁRIO | Afya EDUCAÇÃO TECNOLOGIA SAÚDE

DECLARAÇÃO DE COMPROMISSO DOS PESQUISADORES

Teresina, 30 de maio de 2023

Ao Comitê de Ética em Pesquisa do Centro Universitário UNINOVAFAPI

Eu **IRAPUÁ FERREIRA RICARTE**, pesquisador responsável e **CAMILA VICTÓRIA DA SILVA, CRISTINA CALMON DE ARAÚJO MASCARENHAS e MATHEUS FELIPE DA SILVA**, pesquisador(es) participantes(es) da pesquisa intitulada "**PERFIL EPIDEMIOLÓGICO DOS PACIENTES ATENDIDOS NA LINHA DE CUIDADO DO AVC NO PIAUÍ**", declaro (amos) que:

- Assumo (imos) o compromisso de cumprir os Termos da **Resolução nº 466/12**, do CNS.
- Os materiais e os dados obtidos ao final da pesquisa serão arquivados sob a responsabilidade de **IRAPUÁ FERREIRA RICARTE** da área de **MEDICINA** do **CENTRO UNIVERSITÁRIO UNINOVAFAPI**, que também será responsável pelo descarte dos materiais e dados, caso os mesmos não sejam estocados ao final da pesquisa.
- Não há qualquer acordo restritivo à divulgação pública dos resultados;
- Os resultados da pesquisa serão tornados públicos através de publicações em periódicos científicos e/ou em encontros científicos, quer sejam favoráveis ou não, respeitando-se sempre a privacidade e os direitos individuais dos participantes da pesquisa;
- O CEP/ UNINOVAFAPI será comunicado da suspensão ou do encerramento da pesquisa por meio de relatório circunstanciado apresentado anualmente ou na ocasião da suspensão ou do encerramento da pesquisa com a devida justificativa;
- O CEP/ UNINOVAFAPI será imediatamente comunicado se ocorrerem efeitos adversos resultantes desta pesquisa com o participante da pesquisa;
- Esta pesquisa ainda não foi realizada.

Irapuá Ferreira Ricarte

IRAPUÁ FERREIRA RICARTE – CPF: **019.082.913-38**
Pesquisador Responsável

Camila Victória da Silva

CAMILA VICTÓRIA DA SILVA – CPF: **083.047.983-01**
Pesquisador Participante

Cristina Calmon de Araújo Mascarenhas

CRISTINA CALMON DE ARAÚJO MASCARENHAS – CPF: **082.204.593-10**
Pesquisador Participante

Matheus Felipe da Silva

MATHEUS FELIPE DA SILVA – CPF: **068.803.573-69**
Pesquisador Participante

APÊNDICE D: AUTORIZAÇÃO DA INSTITUIÇÃO CO-PARTICIPANTE

GOVERNO DO ESTADO DO PIAUÍ

SECRETARIA DE ESTADO DA SAÚDE - SESAPI - PI

SECRETARIA DA SAÚDE · SESAPI

GOVERNO DO PIAUÍ

AQUI TEM TRABALHO AQUI TEM FUTURO

DECLARAÇÃO DE AUTORIZAÇÃO DA INSTITUIÇÃO CO-PARTICIPANTE

Declaro estar ciente que o Projeto de Pesquisa **"PERFIL EPIDEMIOLÓGICO DOS PACIENTES ATENDIDOS NA LINHA DE CUIDADO DO AVC NO PIAUÍ"** será avaliado por um Comitê de Ética em Pesquisa do sistema CEP/CONEP e concordar com o parecer ético emitido por este CEP, conhecer e cumprir as Resoluções Éticas Brasileiras, em especial a **Resolução CNS 466/12**. Esta Instituição está ciente de suas co-responsabilidades como instituição co-participante do presente Protocolo de Pesquisa, e de seu compromisso no resguardo da segurança e bem-estar dos participantes da pesquisa nela recrutados dispondo de infra-estrutura necessária para a garantia de tal segurança.

Autorizo os *pesquisadores* **Irapuá Ferreira Ricarte e Camila Victória da Silva, Cristina Calmon de Araújo Mascarenhas e Matheus Felipe da Silva** realizarem as etapas **de acesso a plataforma JOIN/MEDSAFE e coleta de informações epidemiológicas relacionadas ao AVC referentes a linha de cuidados do AVC no Piauí do período de outubro de 2022 a outubro de 2023** utilizando-se da infra-estrutura desta Instituição.

Teresina, 17 de 10 de 2023.

Antônio Luiz Soares Santos
Secretário de Saúde do Estado do Piauí

Carimbo e Assinatura do responsável pela Instituição

Antonio Luiz Soares Santos

Secretário de estado da Saúde do Piauí

SESAPI

APÊNDICE E: SOLICITAÇÃO DE DISPENSA DO TCLE

UNINOVAFAPI CENTRO UNIVERSITÁRIO | Afya

SOLICITAÇÃO DE DISPENSA DO TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Eu,
Irapuá Ferreira Ricarte, Pesquisador responsável pelo projeto "PERFIL EPIDEMIOLÓGICO DOS PACIENTES ATENDIDOS NA LINHA DE CUIDADO DO AVC NO PIAUÍ", solicito perante este Comitê de Ética em Pesquisa a dispensa da utilização do **TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO** para realização deste projeto com a seguinte justificativa: Há a impossibilidade de acesso aos participantes para assinatura do TCLE, pois na plataforma JOIN/MEDSAFE não há informações referentes ao contato, endereço e telefone dos participantes; A plataforma disponibiliza relatório com os dados dos participantes agrupados, assegurando desta forma, o anonimato dos mesmos.

Os pesquisadores envolvidos no estudo acima se comprometem, individual e coletivamente, a utilizar os dados provenientes deste, apenas para os fins descritos e a cumprir todas as diretrizes e normas regulamentadoras descritas na Res. CNS Nº 466/12, e suas complementares, no que diz respeito ao sigilo e confidencialidade dos dados coletados.

Teresina, 29 de Novembro de 2023

Irapuá Ferreira Ricarte
Assinatura do Pesquisador Responsável pelo Projeto

Camila Victoria da Silva
Assinatura do Pesquisador Participante pelo Projeto

Cristina Calmon de A. Nascimento
Assinatura do Pesquisador Participante pelo Projeto

Matheus Felipe da Silva
Assinatura do Pesquisador Participante pelo Projeto

ANEXO A: PARECER DO CEP

CENTRO UNIVERSITÁRIO DA FACULDADE DE SAÚDE, CIÊNCIAS HUMANAS E TECNOLÓGICAS DO PIAUÍ - UNINOVAFAPI

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: PERFIL EPIDEMIOLÓGICO DOS PACIENTES ATENDIDOS NA LINHA DE CUIDADO DO AVC NO PIAUÍ

Pesquisador: IRAPUÁ FERREIRA RICARTE

Área Temática:

Versão: 2

CAAE: 75254723.8.0000.5210

Instituição Proponente: INSTITUTO DE ENSINO SUPERIOR DO PIAUI LTDA

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 6.569.830

Apresentação do Projeto:

Trata-se de um protocolo de segunda versão vinculado ao Trabalho de Conclusão do Curso de Bacharelado em Medicina do Centro Universitário UNINOVAFAPI. Os pesquisadores descrevem o estudo como descritivo exploratório com abordagem quantitativa. A pesquisa será realizada utilizando dados referentes a 5 cidades localizadas no estado do Piauí, sendo elas Floriano, Picos, Parnaíba, São Raimundo Nonato e Teresina. Irão participar da pesquisa pacientes com diagnóstico de AVC, isquêmico ou hemorrágico, residentes nas 5 cidades localizadas no estado do Piauí. Serão excluídos pacientes com diagnóstico de acidente isquêmico transitório, tumores no sistema nervoso central, hematoma subdural, trauma encefálico, distúrbios tóxicos-metabólicos ou outras patologias com sintomatologia compatível com déficit neurológico semelhante ao AVC. A coleta de dados será realizada utilizando a plataforma JOIN/MEDSAFE, na qual estão presentes dados epidemiológicos dos pacientes com diagnóstico ou em tratamento do AVC, atendidos pela linha de cuidado do AVC no Piauí. O acesso aos dados será feito de forma remota on-line. Os dados serão analisados por meio de criação de gráficos e tabelas no próprio Microsoft Excel.

Objetivo da Pesquisa:

Objetivo Geral: conhecer o perfil epidemiológico dos pacientes atendidos na linha de cuidado do AVC no Piauí.

Endereço: Rua Vitorino Orthiges Fernandes, 6123
Bairro: Bairro do Uruguai **CEP:** 64.073-505
UF: PI **Município:** TERESINA
Telefone: (86)2106-0738 **Fax:** (86)2106-0740 **E-mail:** cep@uninovafapi.edu.br

ANEXO B: DECLARAÇÃO DE REVISÃO ORTOGRÁFICA

DECLARAÇÃO

Eu, [illegible], CPF 01408241338, formado(a) em medicina pela Universidade Federal do Piauí, DECLARO, para os devidos fins, que realizei a revisão ortográfica e gramatical da obra Telemedicine Transforming Stroke care in Piauí de responsabilidade de Matheus Felipe da Silva, Camilo Victório da Silva, Cristina Colman de Araya

Teresina-PI, 08/05/24
Local e data.

Irapuá Ferreira Ricarte
Neurologista
CRM 5301

Assinatura

ANEXO C: AUTORIZAÇÃO PUBLICAÇÃO ELETRÔNICA

UNINOVAFAPI CENTRO UNIVERSITÁRIO | Afya

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[X] TCC Artigo

2. Identificação do Trabalho Científico:

Curso de Graduação: Bacharelado em Medicina
Programa de pós-graduação:
Título: Telemedicina Transformando o cuidado de AVC no piauí
Data da Defesa: 28/05/2024

3. Identificação da Autoria:

Autor: Camila Victória da Silva
Orientador: Irapuã Ferreira Ricarte
Coorientador:
Membros da Banca: Irapuã Ferreira ; Denise Cury , Carlos Daniel

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Local: Uninovafapi , Teresina - PI Data: 28 / 05 / 2024

Camila Victória da Silva
Assinatura do(a) Autor(a):

UNINOVAFAPI CENTRO UNIVERSITÁRIO | Afya

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2. Identificação do Trabalho Científico:

Curso de Graduação:	Bacharelado em Medicina
Programa de pós-graduação:	
Título:	Telemedicina Transformando o Cuidado de AVC no Piauí
Data da Defesa:	28/05/2024

3. Identificação da Autoria:

Autor:	Cristino Coleman de Araújo Mascarenhas
Orientador:	Iarquió Ferreira Ricarte
Coorientador:	
Membros da Banca:	Iarquió Ferreira, Denise Cury, Caio Daniel

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Local: Uninovafapi, Teresina - PI Data: 28 / 05 / 2024

Cristino Coleman de Araújo Mascarenhas
Assinatura do(a) Autor(a):

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Programa de pós-graduação:	
Título:	Telemedicina Transformando o cuidado do AVC no Piauí
Data da Defesa:	28/05/24

3. Identificação da Autoria:

Autor:	Matheus Felipe do Silva
Orientador:	Tropiá Ferreira Ricarte
Coorientador:	
Membros da Banca:	Tropiá Ferreira; Denise Cury; Carlos Daniel

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Local: Uninovafapi, Teresina - PI Data: 28/05/24

Matheus Felipe do Silva

Assinatura do(a) Autor(a):