The impact of the COVID-19 pandemic on rehabilitation care of post-stroke users in the province of Québec

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ABSTRACT

Background: During the first two waves of the COVID-19 pandemic, COVID-19-designated rehabilitation centers were established in the province of Québec, where hot and cold zones were created to minimize disease transmission. In the early phase of the pandemic, measures such as physical distancing, isolation and mandatory personal protection equipment requirements were implemented. There was also limited workforce capacity. These factors could have potentially affected post-stroke rehabilitation care. This study aimed to determine the impact of the COVID-19 pandemic on rehabilitation care indicators, based on the Post-Acute Care (PAC)-Quality rehabilitation framework, for post-stroke users with COVID-19 infection (COV+) and without (COV-) in COVID-19-designated rehabilitation centers in the province of Québec during the first two waves compared to those admitted the year before it (preCOV). **Methods:** A retrospective analysis of 292 medical record files of post-stroke users was performed in three rehabilitation centers. Demographic characteristics were collected (ex.: age, sex, and comorbidities). The length of stay in acute care, and the proportion of users that required intensive care unit (ICU) admission and/or intubation were extracted. Rehabilitation care indicators such as length of stay in inpatient rehabilitation care, episodes of rehospitalization to acute settings, and the number of physical/occupational therapy (PT/OT) sessions were also collected. The primary rehabilitation care indicator, the Functional Independence Measure (FIM), was extracted on admission (FIM pre) and discharge (FIM post) from rehabilitation. Non-parametric statistical tests, that are Wilcoxon rank-sum (for numerical variables) and Chi-squared (for categorical variables) were used to compare variables among the three groups. Multiple linear regression was performed to explore the influential factors on the functional outcome at discharge, considering COVID status. **Results:** COV+ users were older (79/74/73 years, p <0.01) and presented a lower prevalence of obesity than COV- and

preCOV ones (7/21/24%, p <0.01) and were more disabled on admission to a rehabilitation center (FIM pre: 66 vs 78 vs 75, p <0.01). They exhibited a higher rate of ICU admission (14/8/2%, p <0.001), longer stays in acute care (23/14/14 days, p < 0.001) and were more often rehospitalized (35/21/ 27%, p <0.002). Despite longer rehabilitation stays (65/37/48, p <0.001) and more PT/OT sessions (PT: 31/21/27, p <0.007; OT: 30/22/25, p <0.02), the COV+ group remained more disabled at discharge than the COV- and preCOV ones (FIM post: 100/111/106, p <0.002). On the other hand, COV- users showed rehabilitation care indicators resembling the ones pre-pandemic but spent less time in rehabilitation. COV- users also reached similar functional status at discharge as preCOV ones. The multiple linear regression model showed that the functional status at discharge, compared to preCOV, was influenced by COVID status and predictors such as age, length of stay in rehabilitation, rehospitalization, number of OT sessions and FIM score on admission. **Conclusions**: Being COV+ post-stroke users had an adverse impact on functional recovery at discharge from a COVID-19 designated rehabilitation center. This can be attributed to their deteriorated health conditions due to being infected with COVID-19, strict infection control measures such as physical distancing, isolation and limited workforce capacity. Contrary to our hypothesis, being COV- post-stroke users did not seem to impact the functional recovery at discharge. This suggests that being under less restrictive infection control measures allowed them to receive efficient rehabilitation care comparable to preCOV users. Therefore, it is important to recognize the challenges faced by COV+ individuals to allocate appropriate resources to maximize their functional recovery during future pandemics or similar socio-sanitary restrictions.

Résumé

Contexte: Lors de pandémie de COVID-19, des centres de réadaptation désignés COVID-19 ont été établis, où des zones chaudes et froides ont été créées pour minimiser la transmission de la maladie. Des mesures telles que la distanciation physique, d'isolement, et l'utilisation d'équipement de protection individuelle ont été mises en place. Il y a aussi eu une capacité limitée de la main-d'œuvre. Tous ces facteurs ont potentiellement eu une incidence négative sur les soins de réadaptation post-AVC. Cette étude visait à déterminer l'impact de la pandémie de COVID-19 sur les indicateurs de soins de réadaptation, basés sur le cadre de réadaptation de qualité des soins post-aigus (PAC), des usagers post-AVC infectés (COV+) ou non (COV-) par la COVID-19 dans les centres de réadaptation désignés COVID-19 dans la province de Québec lors des deux premières vagues par rapport à ceux admis l'année précédente (préCOV). Méthode: Une analyse rétrospective de 292 dossiers médicaux d'usagers post-AVC a été réalisée dans trois centres de réadaptation désignés COVID-19. Les caractéristiques démographiques ont été recueillies (ex. : âge, sexe et comorbidités). La durée du séjour en soins aigus et en réadaptation, les admissions et/ou intubation en unité de soins intensifs (USI), les épisodes de réhospitalisation en soins aigus et le nombre de séances de physio/ergothérapie (Pht/Erg) ont été répertoriés. Le principal indicateur de soins de réadaptation, la mesure de l'indépendance fonctionnelle (MIF), a été extrait à l'admission (MIF début) et au congé (MIF fin) du centre de réadaptation. Des tests statistiques non-paramétriques, soient la somme des rangs de Wilcoxon (pour les variables numériques) et le chi carré (pour les variables catégorielles) ont été utilisés pour comparer les variables entre les trois groupes. Une régression linéaire multiple a été effectuée pour explorer les facteurs influençant la MIF au congé, en tenant compte du statut COVID. Résultats: Les usagers COV+ étaient plus âgés (79/74/73 ans, p <0.01) et avaient une prévalence d'obésité plus faible que ceux COV- et préCOV, (7/21/24%,

p <0.01), et étaient plus atteints à l'admission en réadaptation (MIF début: 6/78/75, p <0.01). Ils présentaient des séjours plus longs en soins aigus (23/14/14 jours, p <0.001) et un taux plus élevé d'admission en USI (14/8/2%, p <0.001) et réhospitalisation (35/21/27%, p <0.002). Malgré des séjours en réadaptation plus longs (65/37/48, p <0.001) et plus de séances de Pht/Erg (Pht: 31/21/27, p <0.007; Erg: 30/22/25, p <0.02), le groupe COV+ est resté plus atteint au congé (MIF fin: 100/111/106, p <0.002). D'autre part, les usagers COV- ont montré des indicateurs de soins de réadaptation similaires à ceux d'avant la pandémie, mais ont passé moins de temps en réadaptation. Ils ont atteint un statut fonctionnel similaire au congé en réadaptation que les usagers préCOV. Le modèle de régression linéaire multiple a montré que la MIF au congé, par rapport au préCOV, était influencé par le statut COVID et des prédicteurs tels que l'âge, la durée du séjour en réadaptation, la réhospitalisation, le nombre de séances d'OT et le score MIF à l'admission. Conclusion: Le fait d'avoir été COV+ post-AVC a eu un impact négatif sur la MIF au congé. Cela peut être attribué à la détérioration de l'état de santé à la suite d'une infection à la COVID-19 et de mesures strictes de contrôle des infections. Contrairement à notre hypothèse, le fait d'avoir été COV- ne semble pas avoir d'impact sur la récupération fonctionnelle au congé. Cela suggère que la mise en œuvre de mesures de contrôle des infections moins restrictives n'a pas affecté les soins de réadaptation prodigués à cette clientèle. Par conséquent, il est important de reconnaître les défis auxquels ont été confrontés les usagers COV+ afin d'allouer les ressources appropriées pour maximiser leur récupération fonctionnelle lors de futures pandémies ou restrictions socio-sanitaires similaires.

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and Diana Zidarov (PhD, PT, Institut de réadaptation Gingras-Lindsay-de-Montréal (IURDPM)).

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The importance of this study is highlighted by the fact that the team was recently awarded acknowledged translation funding from CRIR to share our results with stakeholders, including clinicians, managers, and other caregivers in COVID-19 designated establishments. In addition, the insights from our findings might contribute to shaping policies, guidelines, and strategies related to COVID-19 and other similar scenarios. As such, we also plan to

disseminate our results to governmental entities such as Institut national de santé publique du Québec (INESPQ) and the Ministry of Health and Social Services (MSSS) of Québec.

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CONTRIBUTION OF AUTHORS

I, Palak Vakil, am the main contributor and lead author of all chapters in this thesis. My contribution extends to the research design, experimental setup, data collection, data analysis, statistical analysis, interpretation of findings, preparation of figures/tables, as well as thesis writing and revisions.

The research project presented here was developed under Pr. Marie-Hélène Boudrias and Ms. Perrine Ferré's supervision. Both oriented the selection of the research design, experimental setup, data analysis, statistical analysis, and interpretation of the findings and critically reviewed and provided constructive feedback on this thesis.

The authors listed below contributed to the selection of the research design and provided constructive feedback on the interpretation of the findings: Pr. Johanne Higgins, Pr. Louis-David Beaulieu, Pr. Claude Vincent, Ms. Kimberley Singerman, Pr. Diana Zidarov, and Pr. Marie-Hélène Milot.

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PREFACE

CHAPTER 1: BACKGROUND

1.1 Timeline of the COVID-19 pandemic

On March 11th, 2020, the COVID-19 outbreak was declared a global pandemic by the World Health Organization (WHO)[1]. A public health emergency was announced in the province of Québec, Canada, on March 13th, 2020[2]. The Institut national de santé publique du Québec (INESPQ) suspended all non-essential government and commercial activities and hospital visits until April 13th, 2020. Compulsory confinement in Centres d'hébergement et de soins de longue durée (CHSLD), and social distancing were implemented in the province of Québec. The first wave of the COVID-19 pandemic spanned from February 25th to July 11th, 2020 (**Fig. 1**)[2]. There was an interwave from July 12th to August 22nd, 2020. The second wave took place between August 23rd and March 20th, 2021. Over 300,000 confirmed COVID-19 cases were reported during the first two waves, including the interwave period, with many individuals requiring hospitalization in intensive care and over 14,000 deaths reported by INSPQ[3].

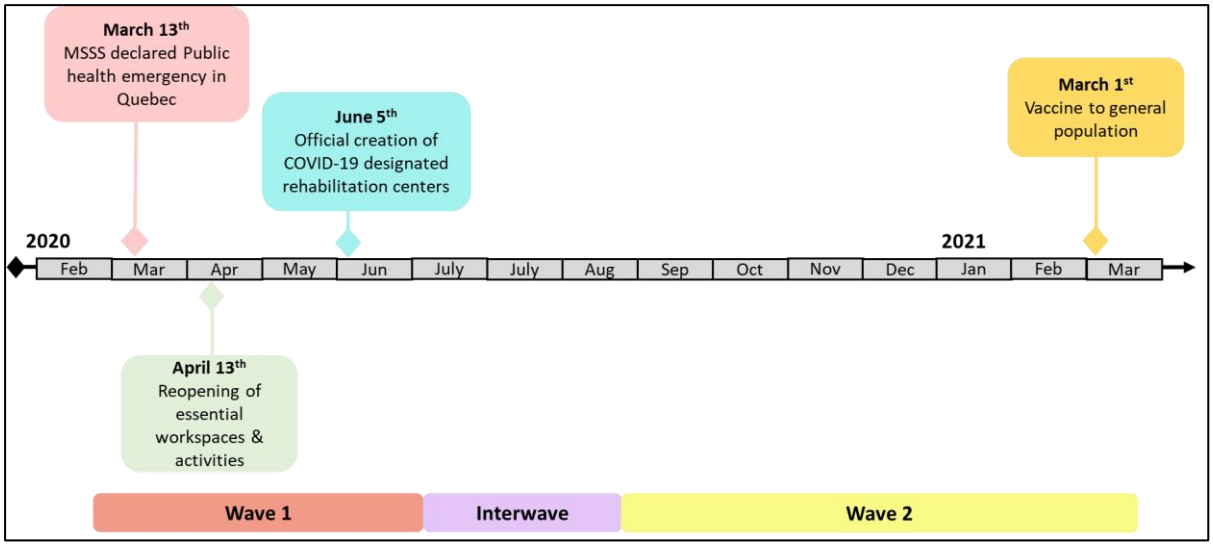

Fig. 1. Timeline of the first 2 waves of the COVID-19 pandemic in the province of Québec.

Meanwhile, COVID-19 vaccination became available to the general population on March 1st 2021[2]. However, the peak of the vaccination in the general population took place between May and July 2021[3]. This means that very few individuals were vaccinated during the first two waves of the pandemic. This could have increased the chance of acquiring severe acute infections, further requiring more hospital admissions[4,5]. In the province of Québec, during the period from January 2020 and March 2021, 17% of hospitalized COVID-19 individuals were admitted to Intensive Care Units (ICU). Among those, approximately 46% received ventilation support, and more than 27% died at the ICU facility[6].

In preparation for the anticipated second wave of the COVID-19 pandemic, the Ministry of Health and Social Services (MSSS) of Québec requested that the rehabilitation establishments develop contingency plans for all their programs, including post-stroke rehabilitation[7,8]. To prioritize the prevention of disease transmission, COVID-19 designated rehabilitation centers were officially established at the beginning of the pandemic[9]. As part of these efforts, each COVID-19 designated rehabilitation center was required to deploy designated COVID-19 rehabilitation environments and implement a trajectory of care that involved multiple transfers of users within three zones: hot, warm, and cold[7,8]. The hot zone was a designated area for users infected with COVID-19 virus (**COV+**) in the designated COVID-19 rehabilitation centers. The users were admitted in isolated rooms, where they were kept under strict infection control measures such as Personal Protective Equipment (PPE) and physical distancing**.** The cold zone was a designated area for asymptomatic and non-infected COVID-19 users (**COV**). This zone was separated from the hot one to prevent cross-contamination. The users in the cold zone did not require preventive isolation but were kept under strict infection control measures such as mask and glove usage. The warm zone accommodated newly admitted users requiring 14-day preventive isolation due to potential exposure or developing symptoms during rehabilitation. In warm zone, the interdisciplinary team provided daily symptom monitoring,

limited user movements outside rooms, and encouraged PPE usage and infection prevention measures. After 14 days of preventive isolation in the warm zone, users without symptoms were transferred to the cold zone. This approach aimed to facilitate the provision of continuous rehabilitation care while ensuring the safety of users and staff by preventing the spread of the virus.

1.2 Impact of the COVID-19 pandemic on healthcare services

The rapid spread of the COVID-19 virus resulted in a significant increase in the number of individuals requiring healthcare services in Canada[3]. According to a survey by Statistics Canada from March 2020 to May 2021, approximately half of Canadian adults encountered difficulties accessing necessary healthcare services[10]. These challenges included issues with appointment scheduling, long waiting times, access barriers due to quarantine rules or office closures, referral difficulties, cost concerns, limited-service availability, and transportation obstacles[10]. A systematic review by Moynihan *et al*. (2021) reported an overall reduction of 37% in healthcare services during the pandemic compared to the pre-pandemic period in 20 countries, including USA and Canada[11]. The results showed a reduction of 42% in hospital visits, emergency, community and outpatient care, lower hospital admissions (28%), diagnostic testing (e.g., imaging), pathology and screening investigations (31%) and delivery of therapies such as immunization and primary care (30%). This situation increased the risk of severe and sometimes fatal outcomes, contributing to the phenomenon known as COVID collateral damage syndrome (CCDS)[12]. Consequently, healthcare users were at risk of presenting greater severity health conditions, potentially requiring more rehabilitation care.

1.3 Impact of the COVID-19 pandemic on stroke rehabilitation care

The COVID-19 pandemic has brought unprecedented challenges to healthcare systems worldwide, including rehabilitation services. Stroke users, as stated by the Public Health Agency of Canada and Centres for Disease Control and Prevention (CDC), were at higher risk of experiencing more severe disease or adverse outcomes when infected with COVID-19 due to their underlying health conditions[13,14]. They faced a higher risk of infection when admitted to healthcare settings for stroke care, as hospitals and rehabilitation centers became hotspots for outbreaks[15]. Additionally, the presence of comorbidities such as diabetes, hypertension, and obesity, which are risk factors for both stroke and COVID-19 infection, further increased the prevalence of the infection among this population[13,16,17], contributing to a higher mortality rate[18,19]. Therefore, this suggests that the above-mentioned comorbidities increase the risk for severe COVID-19 infection, with and without stroke history, further challenging rehabilitation care and leading to poorer functional outcomes.

Infection by the COVID-19 virus can affect multi-systems, including respiratory, cardiovascular, neurological (neuropsychiatric), and musculoskeletal systems, leading to complex health conditions[20–22]. These symptoms impacted rehabilitation care and overall functional recovery, with fatigue, pulmonary issues, musculoskeletal problems, and cognitive impairment being the most common manifestations. In post-stroke users, the COVID-19 infection further exacerbated the sensory and motor deficits due to neurological complications[23].

In Canada, stroke users receive rehabilitation care that follows high-quality standards to achieve optimal functional recovery from stroke-related disabilities (cognitive/sensory/motor)[24]. However, during the first two waves of the pandemic, various factors challenged rehabilitation stroke care. These included: (i) **Limited bed availability**: to

accommodate the COVID-19-infected users, several inpatient neuro-rehabilitation facilities underwent temporary closures to reallocate beds to dedicated acute care COVID-19 units[25]; (ii) **Staff shortage**: there was major staff absenteeism due to illness, and the highly skilled healthcare providers (HCP) were redeployed to frontline COVID-19 units[15,26]; and (iii) **Infection Prevention and Control measure (IPC)**: infection prevention and control measures were implemented to ensure the safety of both stroke users and clinical personnel[26]. The IPC measures included using PPE kits such as masks, gloves, goggles, face shields, gowns, caps, shoe covers, and filtering respirators. Isolation protocols restricted the ability to bring therapy equipment and tools into isolation rooms, and the users could not meet their families[15,25]. These measures added complexity and time-consuming procedures to rehabilitation services. In addition, users feared getting infected[26]. Stroke users also experienced a lower probability of being transferred to an in-patient rehabilitation facility (IRF)[26,27].

These disruptions in care services highlight the need to comprehensively examine the impact of the pandemic on the rehabilitation care indicators of post-stroke users, which can be extracted from medical records. The rehabilitation care indicators encompass various clinical and demographic characteristics elements based on the Post-Acute Care (PAC) rehabilitation quality-of-care framework[28]. This framework provides a comprehensive approach to rehabilitation care to capture relevant information about user demographics such as age, sex, and comorbidities and emphasizes the assessment of various clinical aspects, including the trajectory of care, such as the length of stay in acute and rehabilitation care, the proportion of users requiring intubation, the number of therapy sessions provided, and the functional outcomes during rehabilitation care. Among the functional outcomes, the Functional Independence Measure (FIM) is a validated assessment tool in rehabilitation care[29–31] and recommended by the Canadian Stroke Best Practices[32]. The FIM is a standardized tool for assessing the change (improvement) in functional status from admission to discharge from an

inpatient rehabilitation program[32]. The FIM scale scores from 1 to 7 across 18 items and measures functional abilities in rehabilitation, with a maximum score of 126. The higher scores indicate greater independence, and lower ones reflect higher dependence[30]. Therefore, the FIM score provides a standardized rehabilitation outcome indicator that assists healthcare professionals in goal setting, treatment planning, progress monitoring, and discharge decision-making.

Currently, not much is known about how being infected with COVID-19 and/or undergoing rehabilitation impacted post-stroke in-patient rehabilitation care during the first two waves of the pandemic in the province of Québec. This knowledge is essential to better understand the effects of the pandemic on rehabilitation care indicators and functional outcomes compared to the pre-pandemic scenario.

CHAPTER 2: OBJECTIVES & HYPOTHESES

2.1 Main Objective

The main objective was to determine the impact of the first 2 waves of the COVID-19 pandemic on rehabilitation care indicators extracted from the medical files of post-stroke users, with and without COVID-19 infection (COV+ and COV-), in comparison to the pre-pandemic scenario (preCOV).

Subobjectives

1) To determine the impact of being COV+ on rehabilitation care indicators in comparison to COV- and preCOV users.

2) To determine the impact of being admitted to a rehabilitation center without contracting the COVID-19 virus on rehabilitation care indicators compared to the preCOV scenario.

3) To explore the influence of significant associations between predictor factors and the COVID status (COV+ and COV-) on the functional status at discharge from a rehabilitation center, compared to the pre-COV status.

2.2 Alternate Hypotheses

We hypothesized that:

1) COV+ users would demonstrate impacted rehabilitation care indicators compared to the COV- and preCOV ones.

- This would be attributed to the worsening of their health conditions and exacerbated post-stroke deficits due to a COVID-19 infection. In addition, since they were

admitted in the hot zone, COV+ users would have experienced challenges in receiving rehabilitation care. These challenges include mandatory infection control measures such as PPE usage, isolation, and healthcare staff shortage, further impacting care delivery.

2) COV- users would demonstrate impacted rehabilitation care indicators compared to the preCOV scenario.

- This would be attributed to challenges in receiving rehabilitation care when they were admitted to a cold zone. These challenges include infection control measures such as mask and glove usage and healthcare staff shortage.

3) In comparison with the preCOV scenario, we expected that the functional status at discharge would be influenced by significant associations between predictor factors such as age, sex, comorbidities, length of stays in acute and rehabilitation care and the number of OT/PT therapy sessions undergone and COVID status (COV+ and COV-) in pandemic post-stroke users.

CHAPTER 3: METHODOLOGY

3.1. Overview of Research Design

A retrospective cross-sectional study was performed on medical-record files (Dossier Santé Québec (DSQ)) of in-patient stroke rehabilitation users admitted to COVID-19 designated rehabilitation centers in Québec. The study focuses on the initial two waves of the COVID-19 pandemic, before mass vaccination took place and more stringent socio-sanitary measures were implemented.

3.2. Ethical Considerations, Financial Support & Consent

Ethical approval was obtained from the Centre de recherche interdisciplinaire en réadaptation du Montréal métropolitain (CRIR)/CIUSSS Centre intégré universitaire de santé et de services sociaux de l'Ouest-de-l'Île-de-Montréal du Center-Sud-de-l'Île-de-Montréal on July 13th, 2021 (MP-50-2022-1297). The study received financial support from *Nouvelles Initiatives* from CRIR and *Appel à projets ciblés sur la COVID-19* from Réseau provincial de recherche en adaptation-réadaptation (REPAR). Institutional suitability was obtained for each of the COVID-19-designated rehabilitation centres before data extraction took place.

3.3. Inclusion & Exclusion Criteria

3.3.1 Inclusion Criteria

The study included adults (>18 yrs. of age) with a diagnosis of stroke who were admitted to a COVID-19 designated rehabilitation center in the province of Québec between March 2020 and March 2021. The COV+ group consisted of stroke users who tested positive for COVID-19 either on or after their admission to a rehabilitation center (rehab-nosocomial), which was

confirmed by a Reverse Transcription- Polymerase Chain Reaction (RT-PCR) test. The COV- group included stroke users who did not have a COVID-19 infection during the same period. The pre-COV group consisted of post-stroke users who were admitted to a rehabilitation center in the year prior to the pandemic, specifically from March 2019 to February 2020. We did our best to balance the groups to obtain a similar sex ratio (female/male).

3.3.2 Exclusion Criteria

The study excluded participants who did not meet the specified timeline of admission to rehabilitation care.

3.4. Data Extraction

Out of the eighteen COVID-19 designated rehabilitation centers in the province of Québec, three were included in the study, namely Hôpital de réadaptation Villa Medica (HRVM), CISSS Laval- Jewish Rehabilitation Hospital (JRH) Site, and CIUSSS Montreal West Island - Catherine Booth (CB) & Richardson (RH) Sites. Eight Research Assistants (RAs) were involved in the data extraction process from the medical records of post-stroke users. To ensure the quality and reproducibility of the extracted data, an inter-judge double-blinded scoring methodology was employed. Each RA independently scored a subsample of approximately ten charts, and consensus was reached through discussion. The data extracted were inputted into a RedCap dataframe (**Appendix 1**), utilizing encryption techniques to safeguard confidentiality. Furthermore, all collected data from various sites were securely stored on password-protected USB flash drives, following strict measures to maintain confidentiality throughout the entire process of data extraction, collection, and analysis.

More than two hundred variables were extracted from the medical chart of participants. These indicators were selected a priori based on previous literature and recommendations from the Canadian Stroke Best Practices. Also, discussions with clinical partners**,** Ms. Perrine Ferré (HRVM) and Ms. Kimberley Singerman (JRH)**,** were held to reach a consensus about the most typical and standardized post-stroke rehabilitation care indicators. Following data collection, some indicators had to be removed because they were too often missing in the medical charts. Thirteen stroke rehabilitation care indicators were included in the study. The demographic and descriptive indicators collected consisted of age, sex, proportion of users with specific comorbidities (e.g., diabetes, hypertension, obesity), length of stay in acute care (Acute LOS), proportion of users being intubated during acute care (Intubation), length of stay in rehabilitation care (from admission to discharge from the rehabilitation centers - Rehab LOS), proportion of users rehospitalized to acute settings during their rehabilitation stay (Rehosp), number of PT/OT sessions, COVID status (COV+, COV- & preCOV) (see the full list of variables in **Appendix 1**. The primary rehabilitation outcome indicator was the FIM score assessed on admission (FIM pre) and at discharge (FIM post).

Further, to assess the overall impact of rehabilitation interventions on the functional outcomes (FIM score), Rehabilitation Impact Indices (RII)[33] were calculated, which consisted of:

-the Rehabilitation Effectiveness (RE), expressed as a percentage reflecting the proportion of potential improvement in FIM score during rehabilitation, using the formula:

$$RE = \frac{\text{FIM post} - \text{FIM pre}}{126 - \text{FIM pre}} \times 100\%$$

-the Rehabilitation Efficiency (REy), regarded as the average increase in the FIM score per day during rehabilitation, using the formula:

$$REy = \frac{\text{FIM post} - \text{FIM pre}}{\text{Rehab LOS}}$$

-the Absolute Functional Gain (AFG), expressed as the difference in FIM score before and after rehabilitation:

AFG = FIM post – FIM pre

The therapy dose was also calculated for PT/OT by dividing the total number of therapy sessions received by the post-stroke users in rehabilitation care by the total Rehab LOS:

$$\text{PT/ OT dose} = \frac{\text{PT/OT session}}{\text{Rehab LOS}}$$

3.5. Statistical Analysis

3.5.1 Group Comparisons

The numerical variables were described using median and interquartile range (IQR) due to their non-normal distribution (Shapiro-Wilk normality test: $p < 0.05$). Categorical variables were presented as percentages. Group comparisons were conducted using non-parametric Kruskal-Wallis test for numerical variables, and Pearson's Chi-squared test for categorical variables. To account for multiple comparisons, pairwise Wilcoxon rank-sum tests and pairwise Proportion tests with Bonferroni correction were performed.

3.5.2 Influential factors on FIM at discharge

To explore the influential factors on rehabilitation outcome at discharge (FIM post) in association with COVID status (COV+ & COV-) compared to preCOV status, a multiple linear regression (MLR) analysis was conducted. First, a simple linear regression analysis was performed to identify factors significantly associated with FIM post. The significant variables were then incorporated into the final MLR model, which included numerical variables such as age, Acute LOS, Rehab LOS, PT/OT sessions, and FIM pre, as well as categorical variables

such as diabetes and Rehosp. Interaction terms between all independent variables and COVID status were included in the model to capture potential associations. The parameter estimates of all the factors in the model were accompanied by 95% confidence intervals to assess the precision and confirm statistical significance (p <0.05). Additionally, a post-hoc power analysis was conducted to determine the statistical power of the multiple regression model in detecting the variable effects. The statistical software R, version 2022[34], was used for all statistical analyses.

CHAPTER 4: RESULTS

4.1 Stroke Users Characteristics

Data were extracted from 292 post-stroke files from three COVID-19 designated rehabilitation centers including 85 COV+, 107 COV- and 100 preCOV users (**Table 1**). Among the COV+ group, 26 users (31%) were already positive for COVID-19 upon admission to a rehabilitation center, while 59 users (69%) contracted the virus during their rehabilitation stay (rehab-nosocomial). Among those who tested positive upon rehabilitation admission (31%), the majority (23%) were transferred directly from an acute care setting. Only 7 users (8%) were transferred from a non-designated rehabilitation center or cold zone after testing positive for COVID-19.

4.2 Demographic Characteristics & Comorbidities

The demographic characteristics and the comorbidities of the individuals in the three groups are presented in **Table 1**. There were significant differences observed in terms of age and comorbidities (obesity) among the three groups (p <0.05).

The COV+ group was significantly older than the COV- and pre-COV ones (p <0.02). Regarding comorbidities, there were no significant differences in the prevalence of diabetes and hypertension among the three groups (p >0.05). However, the COV+ group had a significantly lower percentage of obesity compared to the other groups (p <0.007).

Table 1: Comparison of demographic characteristics & comorbidities between groups

	COV+ (85)	COV- (107)	preCOV (100)	All groups	COV+ vs preCOV	COV- vs preCOV	COV+ vs COV-
					p- value		
Age† (years)	79 (12)	74 (15)	73 (15)	**0.008****	**0.01***	0.98	**0.01***
Sex (M/F)	54/46	52/48	55/45	0.93	-	-	-
Comorbidities							
Diabetes#	38	46	41	0.51	-	-	-
Hypertension#	82	80	82	0.93	-	-	-
Obesity#	7	21	24	**0.007****	**0.01***	1	**0.05***

M/F: Male to Female sex ratio, Comorbidities: in percentage
† : median (Interquartile Range- IQR), # : Percentage, *p*-values :: <0.05 : *, <0.01 : **, <0.001 : ***

4.3 Rehabilitation Care indicators

The rehabilitation care indicators of the three groups are presented in **Table 2**. The COV+ group had significantly longer LOS in acute care compared to the COV- and preCOV ones (p <0.001) (Table 2 & **Fig. 2a**) and a higher percentage of intubation compared to the preCOV scenario (p <0.01). The COV+ group had lower FIM pre when admitted to a rehabilitation center compared to the other groups (p <0.003) (**Fig. 2c**). They received more PT and OT sessions (PT: p <0.006, OT: p <0.02) (**Fig. 2e, f**), but had lower OT dose compared to COV- users. In addition, the COV+ group had a higher proportion of users requiring rehospitalization to acute care (p <0.002) than the COV- one. The COV+ group had longer LOS in rehabilitation (p <0.001) (**Fig. 2b**) and lower FIM post compared to the other groups (p <0.002) (**Fig. 2d**). The COV+ group also had lower RE compared to the COV- one (p <0.05), and lower REy (p <0.001) compared to both the COV- and preCOV groups. The AFG was not significantly different among the three groups.

Table 2: Comparison of rehabilitation care indicators between groups

	COV+	COV-	preCOV	All groups	COV+ Vs preCOV	COV- Vs preCOV	COV+ Vs COV-
					p- value		
Acute LOS†	23(22)	14(15)	14 (14)	**<0.001 *** **	**<0.001 ** *	0.85	**<0.001 * **
Intubation#	14	8	2	**0.009 ****	**0.01****	0.24	0.92
Rehab LOS†	65(54)	37(33)	48 (33)	**<0.001 *** **	**0.008****	**0.01***	**<0.001 * **
Rehosp#	35	13	22	**0.001 ****	0.2	0.4	**0.002****
PT session†	31(36)	21(25)	27(25)	**0.007 ****	0.13	0.13	**0.006****
OT session†	30(36)	22(20)	25 (29)	**0.02***	0.15	0.22	**0.01***
PT dose†	0.53 (0.25)	0.61 (0.22)	0.57 (0.32)	0.48	-	-	-
OT dose†	0.49 (0.25)	0.58 (0.22)	0.53 (0.26)	**0.004 ****	0.24	0.09	**0.002****
FIM pre†	66 (34)	78 (58-93)	75 (56-94)	**0.003 ****	**0.01***	0.75	**0.004****
FIM post†	100 (37)	111 (20)	106 (26)	**0.002 ****	**0.02***	0.23	**0.001****
RII							
RE#	52.1 (46.1)	62.8 (34.8)	57.3 (42)	**0.04***	0.11	0.44	**0.04***
REy†	0.3 (0.5)	0.7 (0.62)	0.5 (0.45)	**<0.001 *** **	**0.005****	**0.02***	**<0.001 * **
AFG†	25 (32.5)	25 (21.5)	24 (24.0)	0.97	-	-	-

LOS: Length of stays in days, PT/OT sessions: Physical / Occupational Therapy in number of sessions, PT/OT dose: ratio of number of therapy sessions to LOS in rehabilitation, RII: Rehabilitation Impact Indices, RE: Rehabilitation Effectiveness in percentage, REy: Rehabilitation Efficiency in score, AFG: Absolute Functional Gain in score.

† : median (Interquartile Range- IQR), # : Percentage, *p*-value :: <0.05 : *, <0.01 : **, <0.001 : ***

The COV- group had similar rehabilitation care indicators in terms of LOS in acute care, proportion of those being intubated, FIM score on admission, number of rehospitalization and PT and OT sessions compared to the preCOV group (p >0.05). The COV- group had significantly shorter LOS in rehabilitation compared to the preCOV one (p <0.02). The COV- group also showed similar FIM scores at discharge (p >0.05) from the rehabilitation centers

compared to the preCOV group. Further, the COV- group showed higher REy score compared to the preCOV one (p <0.02).

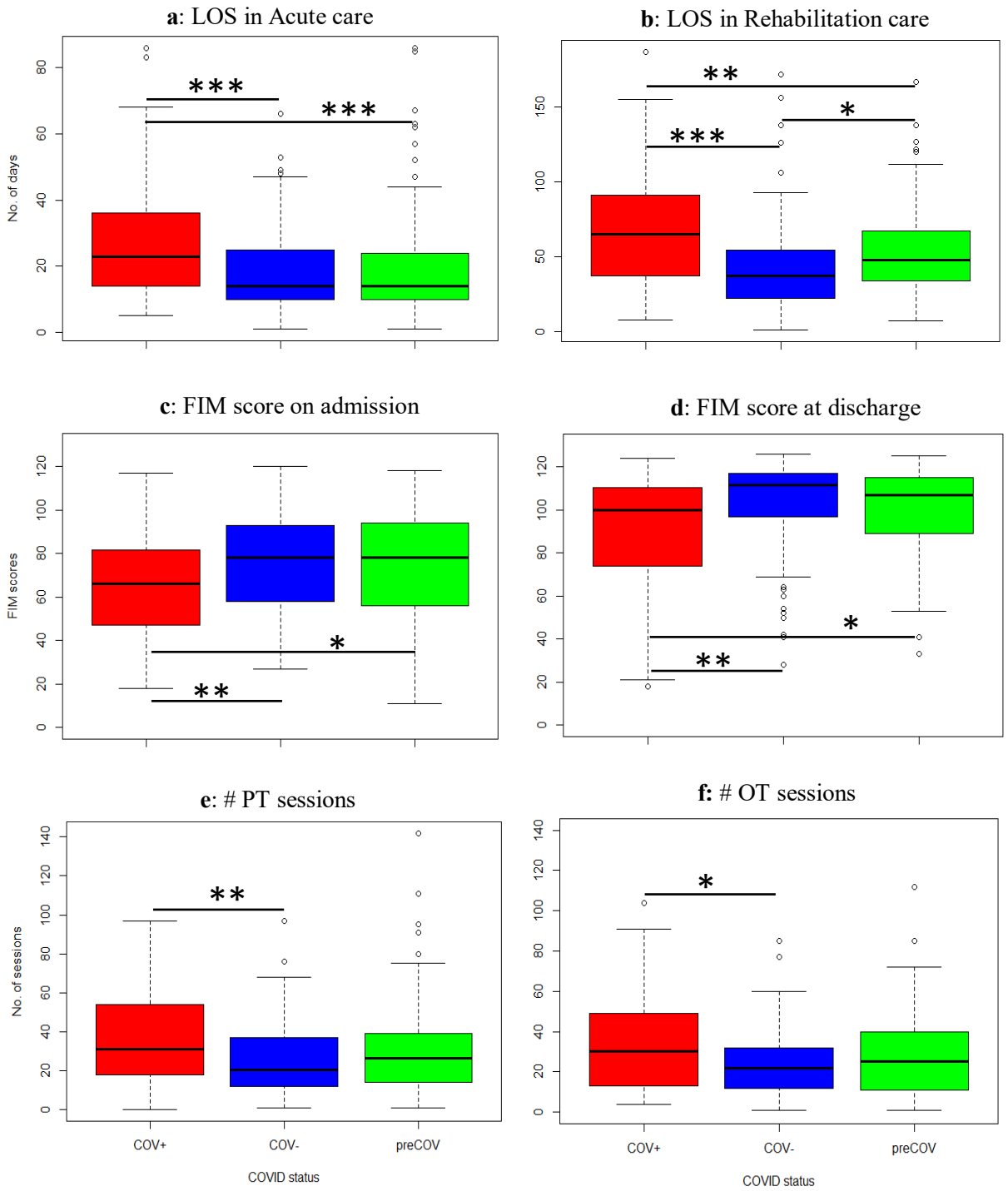

Fig 2: Comparison of rehabilitation care indicators between groups. a) LOS in Acute care, b) LOS in Rehabilitation care, c) FIM score on admission, d) FIM score at discharge, e) # PT sessions, f) # OT sessions. LOS: Length of stay in days, #: Number of sessions, PT: Physical therapy, OT: Occupational therapy

p-value :: * : <0.05, ** : <0.01, *** : <0.001

4.4 Influential factors on functional rehabilitation outcome at discharge

In comparison to preCOV users, older age in COV+ had a significant negative effect on the FIM post (Table 3).

Table 3: Factors influencing FIM score at discharge

	Estimate	SE	*p*-value	CI (95%)
Age x COV+	-0.7	0.3	**0.04***	-1.4, -0.04
Age x COV-	-0.4	0.2	0.06.	-0.9, 0.02
Diabetes x COV+	7.9	5.7	0.16	-3.3, 19.2
Diabetes x COV-	2.1	4.6	0.65	-6.9, 11.1
Acute LOS x COV+	-0.08	0.2	0.64	-04, 0.2
Acute LOS x COV-	-0.01	0.2	0.97	-0.4, 0.3
Rehab LOS x COV+	0.1	0.2	0.5	-0.3, 0.5
Rehab LOS x COV-	-0.3	0.1	**0.05***	-0.6, -0.001
Rehosp x COV+	-26.7	7.7	**<0.001*****	-41.9, -11.6
Rehosp x COV-	-28.9	7.6	**<0.001*****	-43.9, -13.9
PT session x COV+	-0.1	0.2	0.68	-0.5, 0.3
PT session x COV-	-0.1	0.2	0.56	-0.6, 0.3
OT session x COV+	0.2	0.3	0.43	-0.3, 0.8
OT session x COV-	0.5	0.2	**0.02***	0.1, 0.9
FIM pre x COV+	-0.04	0.1	0.8	-0.3, 0.2
FIM pre x COV-	-0.3	0.1	**0.05***	-0.6, -0.003
Intercept	41.4	15.8	**<0.01****	10.3, 72.5

LOS: Length of stay, Rehosp: Rehospitalization, PT/OT sessions: number of therapy sessions;
SE: Standard Error, CI: Confidence Interval; p-value :: <0.05 : *, <0.01 : **, <0.001 : ***

Furthermore, rehospitalization episodes in association with either being COV- or COV+ was found to have a negative effect on the FIM score at discharge. Being COV- in conjunction with a longer LOS in rehabilitation and higher FIM score on admission also had a negative effect on FIM score at discharge. However, being COV- and having more OT sessions had a positive effect on FIM score at discharge. The regression model showed reliable estimates within the 95% confidence intervals, with an adjusted R-squared value of 0.63, indicating a good fit of the model. The F-statistic was significant ($p < 0.001$), supporting the model's validity. The Shapiro-Wilk normality test for the residuals of the multiple regression model showed that the assumption of normality was not violated (W = 0.99, $p > 0.5$). Additionally, a post-hoc power

analysis indicated that the sample size (n=292) and number of predictors (p1=8) were sufficient to achieve a power of 1 at alpha = 0.05 and effect size (f2) of 1.7. The effect size was calculated using Cohen's f2[35] based on the adjusted R-squared of the regression model and yielded a value of 1.7, indicating a large effect size.

CHAPTER 5: DISCUSSION

This study provided valuable insights into the impact of the COVID-19 pandemic on rehabilitation care indicators among post-stroke users with and without COVID-19 infection compared to the pre-pandemic scenario. Consistent with our first hypothesis, COV+ users had impacted rehabilitation care indicators, including longer stays in acute and rehabilitation care, higher rates of intubation and rehospitalization. Importantly, COV+ users had lower functional status on rehabilitation admission than COV- and preCOV users. They were also more impaired at discharge even though they stayed longer in rehabilitation care and underwent a greater number of therapy sessions compared to COV- users.

Contrary to our second hypothesis, COV- users had rehabilitation profiles that resembled the pre-pandemic scenario, with similar days spent in acute care, rate of intubation care and rehospitalization. COV- users also achieved similar functional status at discharge despite spending less time in rehabilitation care and receiving a similar number of PT/OT sessions compared to preCOV users.

In line with our third hypothesis, we found that in comparison with the pre-pandemic scenario, the functional status at discharge was significantly influenced by the association between the COVID status (COV+ and COV-) and various predictors factors such as age, FIM score on admission, rehospitalization, LOS in rehabilitation and number of OT sessions.

5.1 Impact of being infected with COVID-19 on rehabilitation care indicators

In this study, 69% of the COV+ users were rehab-nosocomial, which means they caught COVID-19 during their rehabilitation stay. COV+ users were older, making them more at risk of catching the COVID-19 virus and experiencing more severe symptoms[13,14]. The impact of being infected with the COVID-19 virus on rehabilitation care indicators was evident in the COV+ group when admitted to the hot zone. They spent a longer time in acute care, with a higher proportion requiring intubation care than COV- and preCOV groups. They were also more functionally disabled when admitted to a rehabilitation facility since. This is partly because those who caught COVID in acute care (23%) were already more disabled before being admitted to rehabilitation care. This is in line with the fact that in addition to their stroke-related deficits, COV+ individuals ended up facing a multi-system affection due to the infection of the virus COVID-19 itself, including cardio-respiratory system and fatigue leading to a slower recovery curve[20–22].

In addition, the COV+ individuals were also more frequently rehospitalized to acute care during their rehabilitation care. This is in alignment with previous studies demonstrating adverse effects of acute care unit readmission (ACUR) on rehabilitation outcomes[36]. Despite longer rehabilitation stays and receiving a greater number of PT/OT sessions, the COV+ group did not achieve the same level of functional recovery as the preCOV one. In fact, the gain in FIM score per day (REy) was less in COV+ compared to both COV- and preCOV groups. Consequently, COV+ users were more disabled at discharge (lower FIM post and RE) than the COV- and preCOV ones. In fact, only 42% of COV+ users achieved the minimally clinically important difference (MCID)[37] (FIM post – FIM pre (AFG) $\geq$ 22) in FIM scores, while 51% of COV- and 47% of preCOV users achieved it.

The COV+ group also received lower OT dose intensity than the COV- group. This can be attributed, in part, to the stricter mandatory infection control measures used for COVID-19 infected individuals in the hot zone, such as isolation, PPE usage, and limited access to therapy equipment[15,25]. Adding time-consuming procedures might have also affected the real time spent providing one-to-one care to the infected COVID-19 users[15,25].

The reduced functional status at discharge in COV+ further suggests a higher burden of care when transitioning to post-stroke rehabilitation life, whether returning home, in the community or residing in CHSLDs. This highlights the need to improve the functional independence level of COV+ users by allocating appropriate resources during future pandemics or similar socio-sanitary restriction scenarios.

5.2 Impact of being admitted to rehabilitation care without infection during the pandemic on rehabilitation care indicators

Contrary to our hypothesis, being COV- in the cold zone of COVID-19 designated rehabilitation centers did not seem to impact the rehabilitation continuum of care. COV- individuals had similar profiles compared to the preCOV ones regarding length of stay in acute care, frequency of intubation and rehospitalization, as well as comparable functional status on admission in a rehabilitation facility. The COV- users also had a comparable number and doses of PT/OT sessions. The main difference is that they spent less time in rehabilitation care than in the pre-pandemic scenario. Remarkably, they achieved similar functional status at discharge from a rehabilitation center compared to preCOV users. This aligns with the fact that daily FIM score gain (REy) was higher for the COV- group (0.7±0.62) compared to preCOV one (0.5±0.45). This suggests that the less restrictive infection control measures in place in the cold zone than in the hot one, did not significantly impacted the rehabilitation care directed to these

individuals. Although it remains unclear why they spent less time in rehabilitation, one possible explanation is that the COV- users admitted in the cold zone received therapy treatment of longer duration compared to the pre-pandemic scenario. Therefore, the rehabilitation care provided to COV- users was efficient to reach the expected functional status at discharge. This contradicts previous studies showing collateral damage syndrome due to limited access to healthcare services during the pandemic, leading to an increase in the severity of primary illness[12,26].

5.3 Influential factors on functional rehabilitation outcome at discharge

As hypothesized, the functional status at discharge compared to the preCOV scenario was significantly influenced by the association between COVID status (COV+ and COV-) and predictor factors such as age, length of stay in rehabilitation care, rehospitalization and functional status on rehabilitation admission. In comparison to the preCOV group, being COV+ and of older age had an adverse impact on the FIM score at discharge, supporting the fact that being older puts an individual of being more at risk of experiencing more severe symptoms[13,14]. Further, COV- users who experienced an extended stay in rehabilitation care exhibited poorer functional independence levels at discharge. This would mean that some COV- users who were more disabled on admission (lower FIM score on admission) would require longer stay in rehabilitation and would achieve poorer FIM score at discharge. This could be attributed to the psychological factors related to stress and fear of catching a COVID-19 infection, as stated in the PAC rehabilitation quality of care framework[26–28]. Also, the occurrence of rehospitalizations was strongly associated with decreased FIM scores at discharge for both COV+ and COV- status. One possible reason could be that pandemic users (COV+ and COV)

who experienced rehospitalization might have encountered more complexity in transitioning between rehabilitation and acute care settings. This would have further increased the risk of catching COVID-19 infection. Infection control measures such as isolation could have also delayed rehabilitation interventions compared to the pre-pandemic scenario[10,25,26]. By undergoing a greater number of OT sessions, COV- users showed improvement in functional status compared to preCOV ones. As mentioned above, although it remains unclear why this is the case, it could be due to the fact that COV- users showed more efficient rehabilitation care compared to preCOV, despite undergoing a similar number of therapy sessions. Surprisingly, the COV- status associated with a higher FIM score on admission, resulted in a poorer FIM score at discharge compared to the preCOV scenario. This observation suggests the possibility of a "ceiling effect", where individuals with higher FIM scores on admission may have limited room for improvement[30].

Overall, these findings highlight the importance of considering the COVID status in association with rehabilitation care indicators to predict the functional status as discharge.

5.4 Study Limitations

Only three out of the eighteen COVID-19 designated rehabilitation centers were included in this study. The exclusion of fifteen centers was due to their non-admission of stroke users as well as unconventional locations, such as hotels or community centers for admitting pandemic users.

Furthermore, the time spent in rehabilitation care for the COV+ groups may have been underestimated due to transfers to non-COVID designated rehabilitation centers or CHSLDs for further rehabilitation care once users tested negative for COVID-19. The study also faced limitations with multiple missing information in the medical charts, such as comorbidities, the

performance of standardized tests as part of the recommended Canadian Best Stroke Practices, ICU admission dates, the occurrence of rehospitalization in acute care, and the number of therapy sessions. This could be attributed, in part, to the infection control measures where no external object could be taken to the room of COV+ users in isolation in the hot zone, including chart and pen. This implies the inability to mark on the spot the results of tests performed in the room and use of equipment to perform standardized tests such as goniometric for range of motion, dynamometers for grip strength and to access the proper space to perform the 6 Minute Walk Test endurance assessment. In addition, family visits were not allowed. This could have affected the mental status of users, who could have been more depressed, stressed and fearful of contracting the infection, which made them less fit to undergo rehabilitation care. This impacted the study in terms of understanding the holistic view of the pandemic scenario on the quality of rehabilitation care in post-stroke users.

It is important to note that the findings of this study are based on data collected from designated COVID-19 rehabilitation centers in urban the province of Québec. Therefore, caution should be made when generalizing the results to other provinces, countries, or rural areas with different healthcare systems and/or practices.

CHAPTER 6: CONCLUSION

In conclusion, this study shows that being infected with COVID-19 during the pandemic had a negative impact on the functional recovery of post-stroke individuals admitted in a hot zone of a COVID-19 designated rehabilitation center. This could be attributed to their deteriorated health due to being infected with the COVID-19 virus. It could also be due to the less efficient rehabilitation care provided to the infected COVID-19 users, because of more strict infection control measures, such as isolation, PPE usage, limited access to the necessary equipment to perform and mark tests, as well as limited workforce capacity, compared to the pre-pandemic scenario. On the other hand, non-infected COVID-19 users admitted in the cold zone did not experience a significant impact on their functional recovery. This can be attributed to receiving more efficient rehabilitation care, probably due to fewer infection control restrictions, which allowed them to achieve optimal functional status comparable to the pre-pandemic users.

The understanding of the detrimental impact of being COVID-19-positive on rehabilitation care indicators can help develop targeted interventions to improve functional recovery and outcome. The appropriate resource allocation could ultimately reduce the higher burden of care and improve overall quality of care for the affected COVID-19-positive post-stroke population.

Future Directions

Further research plans include expanding the scope of the study to users from other rehabilitation programs, including those from physical conditions, other neurological conditions, and traumatic injuries. Further research is also needed to understand better the long-

term consequences of being infected with COVID-19 during in-patient stroke rehabilitation, including long COVID symptomatology.

Another part of this study (data not presented) involved gathering feedback via questionnaires and interviews from users, clinicians, and stakeholders on their experience with receiving/providing care during the pandemic on topics such as possible unmet needs, limited availability of healthcare resources, safety measures and modified healthcare plans. This additional information will provide greater insight into the precise way the delivery of rehabilitation care was impacted during the pandemic. Further, it will shed light on the potential difficulties encountered by healthcare providers in providing care for the users admitted within the COVID-19 designated rehabilitation centers during the initial phase of the COVID-19 pandemic.

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APPENDICES

Appendix 1: Data extraction REDCap frame

	#	Variable / Field Name		Field Label *Field Note*	Field Attributes	
Instrument: **Demographics**			(demographics)			
	1	record_id		Record ID	text	
	2	site		Section Header: *SITE* Site	dropdown	
					0	CCSMTL (Application Mère)
					1	BSL
					2	Saguenay-Lac-St-Jean
					3	Capitale-Nationale
					4	Mauricie-et-du-Centre-du-Québec
					5	Estrie
					6	Ouest-de-l'Île-de-MTL
					7	Outaouis
					8	Abitibi-Temiscamingue
					9	Côte-Nord
					13	Laval
					14	Lanaudière
					15	Laurentides
					16	Montérégie-Ouest
					17	Villa-Medica
	3	name		Section Header: *DEMOGRAPHIQUE* Nom	text, Identi er	
	4	birthdate		Date de naissance	text (date_ymd), Identi er	
	5	sex		Sexe	radio, Identi er	
					1	F
					2	M
					3	Autre

	6	gender		Genre	radio		
					1	F	
					2	M	
					3	Autre	
	7	address		Addresse	notes, Identi er		
	8	telephone		Telephone	text (phone), Identi er		
	9	language		Langue maternelle	radio		
					1	Fr	
					2	En	
					3	Autre	
	10	laterality		Latéralité	radio		
					1	Gauche	
					2	Droite	

	11	civilstatus	État civil	radio		
				1	marié et/ou conjoint de fait	
				2	divorcé	
				3	veuf	
				4	séparé	
				5	célibataire	
				6	autre	
	12	occupation	Occupation	radio		
				1	Étudiant	
				2	travailleur temps plein	
				3	Travailleur temps partiel	
				4	retraité	
				5	sans emploi	
				6	Autre	
	13	soc_occ_level	Niveau occupationnel SOC	text (integer, Min: 1000, Max: 9999)		
	14	adm_program	Programme d'admission	radio		
				1	Neurologie	
				2	Santé physique	
				3	Traumatologie	
				4	Grand Brulé-amputés	
	15	comorbidity	Co-morbidité	radio		
				1	Oui	
				0	Non	
	16			checkbox		

		comorbidity_spec	Co-morbidité (spéci er)	1	comorbidity_spec___1	diabete
				2	comorbidity_spec___2	HBP
				3	comorbidity_spec___3	obésite
				4	comorbidity_spec___4	maladie rénale
				5	comorbidity_spec___5	Chirurgie antérieure (remplacement genou, hanche)
				6	comorbidity_spec___6	MPOC/asthma
				7	comorbidity_spec___7	dyslipidemia
				8	comorbidity_spec___8	cardiovascular diseases
				9	comorbidity_spec___9	Autre {comorbidity_other}
	17	comorbidity_other	Co-morbidité - Autre	text		
	18	date_rehab_debut	Section Header: *CONTINUUM* Date admission réadaptation (Début)	text (date_ymd)		
	19	date_rehab_ n	Date admission réadaptation (Fin)	text (date_ymd)		
	20	prior_intensive_care_debut	Séjour préalable en soins intensif (Début)	text (date_ymd)		

	21	prior_intensive_care_ n	Séjour préalable en soins intensif (Fin)	text (date_ymd)
	22	prior_acute_care_debut	Séjour préalable en soins aigus (Début)	text (date_ymd)
	23	prior_acute_care_ n	Séjour préalable en soins aigus (Fin)	text (date_ymd)
	24	emergency_debut	Retour au Soins ingus / Urgence (Début)	text (date_ymd)
	25	emergency_ n	Retour au Soins ingus / Urgence (Fin)	text (date_ymd)
	26	death_date	Section Header: *COMPLICATIONS MÉDICALES PRÉ ou PER SÉJOUR en RÉADAPTATION* Décès - incertain	text (date_ymd)

	27	intubation	Intubation	radio 1 Oui 0 Non
	28	intubation_when	Intubation	radio 1 PRÉ 2 PER
	29	intubation_days	Intubation - durée des soins en jours	text (integer)
	30	press_sores	Plaies de pression	radio 1 Oui 0 Non
	31	press_sores_when	Plaies de pression	radio 1 PRÉ 2 PER
	32	press_sores_days	Plaies de pression - durée des soins en jours	text (integer)
	33	neuropathy	Neuropathies	radio

				1 Oui 0 Non
	34	neuropathy_when	Neuropathies	radio 1 PRÉ 2 PER
	35	neuropathy_days	Neuropathies - durée des soins en jours	text (integer)
	36	contracture	Contractures	radio 1 Oui 0 Non
	37	contracture_days	Contractures - durée des soins en jours	text (integer)
	38	delirium	Section Header: *Autres complications* Delirium	radio 1 Oui 0 Non
	39	delirium_days	Delirium - durée des soins en jours	text (integer)
	40	dysphagia	Dysphagie (post intubation)	radio 1 Oui 0 Non
	41	dysphagia_days	Dysphagie (post intubation) - durée des soins en jours	text (integer)
	42	oxygen	Besoins oxygène	radio 1 Oui 0 Non
	43	oxygen_days	Besoins oxygène - durée des soins en jours	text (integer)
	44	relapse		radio

			Section Header: *Relapse* Relapse	1	Oui	
				0	Non	
	45	relapse_transfert_acutecare	Relapse - transfert aux soins aigus	radio		
				1	Oui	
				0	Non	
	46	relapse_transfert_emergency	Relapse - transfert aux urgences	radio		
				1	Oui	
				0	Non	
	47	relapse_days	Relapse - durée des soins en jours	text (integer)		
	48	status	Section Header: *Congé* Congé / Décès	radio		
				1	Congé {discharge_date}	
				2	Décès {deceased_date}	
	49	discharge_date	Congé - Date	text (date_ymd)		
	50	deceased_date	Décès - Date	text (date_ymd)		
	51	exercise_program	Remise d'un programme d'exercices	radio		
				1	Oui	
				0	Non	
	52	rst_covidtest_date	Section Header: *COVID* 1er Date test COVID	text (date_ymd)		
	53	rst_covidtest_result	Resultat test COVID	radio		
				1	COVID plus (+)	
				2	COVID negatif (-)	
	54	num_covid_infections	Number of COVID infections	text (integer)		
	55	last_covidtest_date	Last test COVID	text (date_ymd)		
	56	last_covidtest_result	Resultat test COVID (last)	radio		
				1	COVID plus (+)	
				2	COVID negatif (-)	
	57	covid_progress	Si COVID+	radio		
				1	infecté avant l'hospitalisation et rétabli à l'admission	

				2	infecté avant l'hospitalisation et non rétabli à l'admission
				3	infection nosocomiale (contracté durant hospitalisation)
	58	covidpos_date	DATE (ou "vague") MOIS	text (date_ymd)	
	59	covidpos_variant	variant connu? (si oui spéci er ex. "anglais"...)	text	

	60	demographics_complete	Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unveri ed 2 Complete
Instrument: **Clinicians** (clinicians)				Collapse
	61	pt_treatment	Physiothérapeute	radio 1 Oui 0 Non
	62	pt_treatment_num	Physiothérapeute - selection d'un chi re	text (number, Min: 1, Max: 1000)
	63	ot_treatment	Ergothérapeute	radio 1 Oui 0 Non
	64	ot_treatment_num	Ergothérapeute - selection d'un chi re	text (integer, Min: 1, Max: 1000)
	65	orthophon_treatment_dysphagia	Orthophoniste (sur référence seulement)	radio 1 Oui

				0 Non
	66	orthophon_treatment_speech	Orthophoniste (sur référence seulement)	radio 1 Oui 0 Non
	67	orthophon_treatment_num	Orthophoniste (sur référence seulement) - selection d'un chi re	text (integer, Min: 1, Max: 1000)
	68	psych_treatment	Psychologue (sur référence seulement)	radio 1 Oui 0 Non
	69	psych_treatment_num	Psychologue (sur référence seulement) - selection d'un chi re	text (integer, Min: 1, Max: 1000)
	70	neuropsych_treatment	Neuropsychologue (sur référence seulement)	radio 1 Oui 0 Non
	71	neuropsych_treatment_num	Neuropsychologue (sur référence seulement) - selection d'un chi re	text (integer, Min: 1, Max: 1000)
	72	social_worker_treatment	Travailleur social (sur référence seulement)	radio 1 Oui 0 Non
	73	social_worker_treatment_num	Travailleur social (sur référence seulement) - selection d'un chi re	text (integer, Min: 1, Max: 1000)
	74	specialized_educator_treatment	Éducateur spécialisé (sur référence seulement)	radio 1 Oui 0 Non
	75	specialized_educator_treatme nt_num	Éducateur spécialisé (sur référence seulement) - selection d'un chi re	text (integer, Min: 1, Max: 1000)
	76	nurse_assessment	Soins in rmiers (dépistage dysphagie 24h (AVC))	radio 1 Oui 0 Non

	77	respiratory_therapist_treatme nt		Inhaloterapeute (sur référence seulement)	radio 1 Oui 0 Non	
	78	respiratory_therapist_treatme nt_num		Inhaloterapeute (sur référence seulement) - selection d'un chi re	text (integer, Min: 1, Max: 1000)	
	79	dietician_treatment		Dietician	radio 1 Oui 0 Non	
	80	dietician_treatment_num		Dietician	text (integer, Min: 1, Max: 1000)	
	81	other_treatment		Autres	radio 1 Oui 0 Non	
	82	other_treatment_specify		Autres - Lesquels (Musicothérapeute, specialiste recreationel, ...)	text	
	83	other_treatment_num		Autres - selection d'un chi re	text (integer, Min: 1, Max: 1000)	
	84	clinicians_complete		Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unveri ed 2 Complete	
Instrument: **Outcome Measures**			(outcome_measures)			Collapse
	85	m		Section Header: *Fonctions Organiques et structures anatomiques* Mesure d'indépendance fonctionnelle (MIF)	radio 1 Oui 0 Non	
	86	m_admission		Mesure d'indépendance fonctionnelle - Admission	text (number)	

	87	m_post		Mesure d'indépendance fonctionnelle - Post	text (number)	
	88	braden		Niveau de risque de plaies de pression (Braden)	radio 1 Oui 0 Non	
	89	braden_score_pre		Niveau de risque de plaies de pression (Braden) - Score (Pre)	text (number)	
	90	braden_score_post		Niveau de risque de plaies de pression (Braden) - Score (Post)	text (number)	
	91	depression		Dépression	radio 1 Oui 0 Non	
	92	depression_score_pre		Dépression - Score (Pre)	text (number)	
	93	depression_score_post		Dépression - Score (Post)	text (number)	
	94	hads		Hospital Anxiety and Depression Scale (HADS)	radio 1 Oui 0 Non	
	95	hads_score_pre		Hospital Anxiety and Depression Scale (HADS) - Score (Pre)	text (number)	
	96	hads_score_post		Hospital Anxiety and Depression Scale (HADS) - Score (Post)	text (number)	
	97	qsp		Questionnaire sur la santé du patient (QSP9)	radio 1 Yes 0 Non	
	98	qsp_score_pre		Questionnaire sur la santé du patient (QSP9) - Score (Pre)	text (number)	
	99	qsp_score_post		Questionnaire sur la santé du patient (QSP9) - Score (Post)	text (number)	
	100	sadq			radio	

			Stroke Aphasic Depression Questionnaire	1 Yes 0 Non
	101	sadq_score_pre	Stroke Aphasic Depression Questionnaire - Score (Pre)	text (number)
	102	sadq_score_post	Stroke Aphasic Depression Questionnaire - Score (Post)	text (number)
	103	ssgds	Stroke speciof Geriatric depression scale (SS GDS)	radio 1 Yes 0 Non
	104	ssgds_score_pre	Stroke speciof Geriatric depression scale (SS GDS) - Score (Pre)	text (number)
	105	ssgds_score_post	Stroke speciof Geriatric depression scale (SS GDS) - Score (Post)	text (number)
	106	moca	Fonctions cognitives (MOCA)	radio 1 Yes 0 Non
	107	moca_score_pre	Fonctions cognitives (MOCA) - Score (Pre)	text (number)
	108	moca_score_post	Fonctions cognitives (MOCA) - Score (Post)	text (number)
	109	usn	Négligence spatiale Unilat	radio 1 Yes 0 Non
	110	usn_score_pre	Négligence spatiale Unilat - Score (Pre)	text (number)
	111	usn_score_post	Négligence spatiale Unilat - Score (Post)	text (number)
	112	albert	Test d'Albert modi é	radio 1 Yes 0 Non

	113	albert_score_pre	Test d'Albert modi é - Score (Pre)	text (number)
	114	albert_score_post	Test d'Albert modi é - Score (Post)	text (number)
	115	bells	Test des cloches	radio 1 Yes 0 Non
	116	bells_score_pre	Test des cloches - Score (Pre)	text (number)
	117	bells_score_post	Test des cloches - Score (Post)	text (number)
	118	dysphagia_test	Dysphagia	radio 1 Yes 0 Non
	119	dysphagia_pre	Dysphagia- Score (Pre)	text (number)
	120	dysphagia_post	Dysphagia - Score (Post)	text (number)
	121	pain	Douleur (visual analog scale)	radio 1 Yes 0 Non
	122	pain_score_pre	Douleur (visual analog scale) - Score (Pre)	text (number)
	123	pain_score_post	Douleur (visual analog scale) - Score (Post)	text (number)
	124	cmsa_shoulder_pain	Douleur a l'épaule (CMSA)	radio 1 Yes 0 Non
	125	cmsa_shoulder_pain_score_pre	Douleur a l'épaule (CMSA) - Score (Pre)	text (number)
	126	cmsa_shoulder_pain_score_post	Douleur a l'épaule (CMSA) - Score (Post)	text (number)
	127	cmsa_postural_control	CMSA Postural Control	radio 1 Yes

				0	Non	
	128	cmsa_postural_control_score_ pre	CMSA Postural Control - Pre	text (number)		
	129	cmsa_postural_control_score_ post	CMSA Postural Control - Post	text (number)		
	130	cmsa_motor_arm	CMSA Motor Arm	radio		
				1	Yes	
				0	Non	
	131	cmsa_motor_arm_score_pre	CMSA Motor Arm - Pre	text (number)		
	132	cmsa_motor_arm_score_post	CMSA Motor Arm - Post	text (number)		
	133	cmsa_motor_hand	CMSA Motor Hand	radio		
				1	Yes	
				0	Non	
	134	cmsa_motor_hand_score_pre	CMSA Motor Hand- Pre	text (number)		
	135	cmsa_motor_hand_score_pos t	CMSA Motor Hand- Post	text (number)		
	136	cmsa_motor_leg	CMSA Motor Leg	radio		
				1	Yes	
				0	Non	
	137	cmsa_motor_leg_score_pre	CMSA Motor Leg - Pre	text (number)		
	138	cmsa_motor_leg_score_post	CMSA Motor Leg - Post	text (number)		
	139	cmsa_motor_foot	CMSA Motor Foot	radio		
				1	Yes	
				0	Non	
	140	cmsa_motor_foot_score_pre	CMSA Motor Foot - Pre	text (number)		
	141	cmsa_motor_foot_score_post	CMSA Motor Foot - Post	text (number)		
	142	cmsa_activity_inventory	CMSA Activity Inventory	radio		
				1	Yes	

				0	Non
	143	cmsa_activity_inventory_score_pre	CMSA Activity Inventory - Pre	text (number)	
	144	cmsa_activity_inventory_score_post	CMSA Activity Inventory - Post	text (number)	
	145	emnsa	Sensibiltié (EmNSA or Nottingham)	radio	
				1	Yes
				0	Non
	146	emnsa_score_pre	Sensibiltié (EmNSA or Nottingham) - Score (Pre)	text (number)	
	147	emnsa_score_post	Sensibiltié (EmNSA or Nottingham) - Score (Post)	text (number)	
	148	ashworth	Spasticité (Ashworth)	radio	
				1	Yes
				0	Non
	149	ashworth_score_pre	Spasticité (Ashworth) - Score (Pre)	text (number)	
	150	ashworth_score_post	Spasticité (Ashworth) - Score (Post)	text (number)	
	151	muscle_strength	Force musculaire (méthode Daniel and Worhinham or others)	radio	
				1	Yes
				0	Non
	152	muscle_strength_score_pre	Force musculaire (méthode Daniel and Worhinham or others) - Score (Pre)	text (number)	
	153	muscle_strength_score_post	Force musculaire (méthode Daniel and Worhinham or others) - Score (Post)	text (number)	

	154	grip_strength	Force de préhension (dynamomètre manuel)	radio 1 Yes 0 Non
	155	grip_strength_score_pre	Force de préhension (dynamomètre manuel) - Score (Pre)	text (number)
	156	grip_strength_score_post	Force de préhension (dynamomètre manuel) - Score (Post)	text (number)
	157	smaf	Section Header: *Activité: autonomie fonctionnelle, mobilité, équilibre* Évaluation de l'incapacité (SMAF)	radio 1 Yes 0 Non
	158	smaf_score_pre	Évaluation de l'incapacité (SMAF) - Score (Pre)	text (number)
	159	smaf_score_post	Évaluation de l'incapacité (SMAF) - Score (Post)	text (number)
	160	walk_speed_10m	Vitesse de marche naturelle et rapide	radio 1 Yes 0 Non
	161	walk_speed_10m_score_pre	Vitesse de marche naturelle et rapide - Score (Pre)	text (number)
	162	walk_speed_10m_score_post	Vitesse de marche naturelle et rapide - Score (Post)	text (number)
	163	walk_dist	Distance de marche (admission et congé)	radio 1 Yes 0 Non

	164	walk_dist_score_pre	Distance de marche (admission et congé) - Score (Pre)	text (number)		
	165	walk_dist_score_post	Distance de marche (admission et congé) - Score (Post)	text (number)		
	166	sixmin_walk	Capacité de marche fonctionnelle (test de marche 6 minutes)	radio		
				1	Yes	
				0	Non	
	167	sixmin_walk_score_pre	Capacité de marche fonctionnelle (test de marche 6 minutes) - Score (Pre)	text (number)		
	168	sixmin_walk_score_post	Capacité de marche fonctionnelle (test de marche 6 minutes) - Score (Post)	text (number)		
	169	twomin_walk	Capacité de marche fonctionnelle (test de marche 2 minutes)	radio		
				1	Yes	
				0	Non	
	170	twomin_walk_score_pre	Capacité de marche fonctionnelle (test de marche 2 minutes) - Score (Pre)	text (number)		
	171	twomin_walk_score_post	Capacité de marche fonctionnelle (test de marche 2 minutes) - Score (Post)	text (number)		
	172	berg	Équilibre (Berg)	radio		
				1	Yes	
				0	Non	

	173	berg_score_pre	Équilibre (Berg) - Score (Pre)	text (number)
	174	berg_score_post	Équilibre (Berg) - Score (Post)	text (number)
	175	minibest	Équilibre (Mini BESTest)	radio 1 Yes 0 Non
	176	minibest_score_pre	Équilibre (Mini BESTest) - Score (Pre)	text (number)
	177	minibest_score_post	Équilibre (Mini BESTest) - Score (Post)	text (number)
	178	tug	Timed Up and Go test (TUG)	radio 1 Yes 0 Non
	179	tug_score_pre	Timed Up and Go test (TUG) - Score (Pre)	text (number)
	180	tug_score_post	Timed Up and Go test (TUG) - Score (Post)	text (number)
	181	cahai	Section Header: *Activité: Fonction du membre sup* Fonction bilatérale (CAHAI, version 9)	radio 1 Yes 0 Non
	182	cahai_score_pre	Fonction bilatérale (CAHAI, version 9) - Score (Pre)	text (number)
	183	cahai_score_post	Fonction bilatérale (CAHAI, version 9) - Score (Post)	text (number)
	184	bbt	Dextérité grossière (Box and Block)	radio 1 Yes 0 Non
	185	bbt_score_pre	Dextérité grossière (Box	text (number)

			and Block) - Score (Pre)	
	186	bbt_score_post	Dextérité grossière (Box and Block) - Score (Post)	text (number)
	187	peg	Dextérité ne (9 Hile peg)	radio 1 Yes 0 Non
	188	peg_score_pre	Dextérité ne (9 Hile peg) - Score (Pre)	text (number)
	189	peg_score_post	Dextérité ne (9 Hile peg) - Score (Post)	text (number)
	190	purdue	Dextérité ne (Purdue Pegboard)	radio 1 Yes 0 Non
	191	purdue_score_pre	Dextérité ne (Purdue Pegboard) - Score (Pre)	text (number)
	192	purdue_score_post	Dextérité ne (Purdue Pegboard) - Score (Post)	text (number)
	193	mpai	Section Header: *Participation* MPAI-4 partie C, Participation	radio 1 Yes 0 Non
	194	mpai_score_pre	MPAI-4 partie C, Participation - Score (Pre)	text (number)
	195	mpai_score_post	MPAI-4 partie C, Participation - Score (Post)	text (number)
	196	euroqol	EuroQol-5D-3L	radio 1 Yes 0 Non
	197	euroqol_score_pre	EuroQol-5D-3L - Score (Pre)	text (number)
	198	euroqol_score_post	EuroQol-5D-3L - Score (Post)	text (number)

	199	poststroke	Section Header: *Autre* Liste de contrôle post AVC (Redcap/Laval)	radio 1 Yes 0 Non
	200	poststroke_score_pre	Liste de contrôle post AVC (Redcap/Laval) - Score (Pre)	text (number)
	201	poststroke_score_post	Liste de contrôle post AVC (Redcap/Laval) - Score (Post)	text (number)
	202	fallrisk	Despistage de risque de chute	radio 1 Yes 0 Non
	203	fallrisk_score_pre	Despistage de risque de chute - Score (Pre)	text (number)
	204	malnutr	Despistage/évaluation de la malnutrition	radio 1 Yes 0 Non
	205	malnutr_score_pre	Despistage/évaluation de la malnutrition - Score (Pre)	text (number)
	206	malnutr_score_post	Despistage/évaluation de la malnutrition - Score (Post)	text (number)
	207	glasgow	Section Header: *Si TCC* Glasgow comas scale	radio 1 Yes 0 Non