

Stroke Recovery During the COVID-19 Pandemic: A Position Paper on Recommendations for Rehabilitation

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Stroke Recovery During the COVID-19 Pandemic: A Position Paper on Recommendations for Rehabilitation

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ABSTRACT

Healthcare delivery shifted and adapted with the coronavirus disease 2019 (COVID-19) pandemic caused by the novel severe acute respiratory syndrome (SARS) coronavirus 2 (CoV-2). Stroke care was negatively impacted across the care continuum and may lead to poor community living outcomes in those who survived a stroke during the ongoing pandemic. For instance, delays in seeking care, changes in length of stays, and shifts in discharge patterns were observed during the pandemic. Those seeking care were younger and had more severe neurological effects from stroke. Increased strain was placed on caregivers and public health efforts and community-wide lockdowns, albeit necessary to reduce the spread of COVID-19, had detrimental effects on treatment and recommendations to support community living outcomes. The American Congress of Rehabilitation Medicine (ACRM) Stroke Interdisciplinary Special Interest Group (Stroke ISIG) Health and Wellness Task Force convened to (1) discuss international experiences in stroke care and rehabilitation and (2) review recently published literature on stroke care and outcomes during the pandemic. Based on the findings in the literature, the task force proposes recommendations and interdisciplinary approaches at the (1) institutional and societal level, (2) healthcare delivery level, and (3) individual/interpersonal level spanning across the care continuum and into the community.

Keywords: stroke, stroke rehabilitation, COVID-19, delivery of healthcare

List of abbreviations: COVID-19: Coronavirus disease 2019; PPE: Personal Protective Equipment

STATEMENT OF PURPOSE

The coronavirus disease 2019 (COVID-19) pandemic caused by the novel severe acute respiratory syndrome (SARS) coronavirus 2 (CoV-2) posed unprecedented challenges to healthcare systems around the world. It is expected that the fallout from the COVID-19 pandemic will directly impact people who experience stroke during this time. The Health and Wellness Task Force within the American Congress of Rehabilitation Medicine (ACRM) Stroke Interdisciplinary Special Interest Group (Stroke ISIG) is concerned that during the ongoing pandemic, fewer people are seeking stroke care, and more people with stroke are living with the effects of untreated stroke, or being discharged with minimal rehabilitation or without critical early and intensive rehabilitation that is recommended for improving stroke outcomes.¹ The purpose of this position paper is to describe ongoing challenges and opportunities to support the short- and long-term needs of people surviving stroke during the COVID-19 pandemic. The task force proposes potential solutions across the care continuum to support a multi-level and interdisciplinary approach that addresses this major public health problem.

RATIONALE FOR POSITION PAPER

Enduring a Stroke During the Pandemic

Before the COVID-19 pandemic, stroke was widely regarded as a leading global cause of disability²⁻⁴ and the second leading cause of death (11.6% of global mortality).⁵ Despite advancements in medical interventions that increased stroke survival, disparities in stroke mortality and disability were prevalent, partly due to differences in country income and medical care quality (e.g., cost, access, availability).³ The COVID-19 pandemic presented an additional risk factor for stroke: COVID-19 infection. While there is no exact mechanism linking COVID-

19 to stroke, vascular symptoms associated with COVID-19 such as hypercoagulability and arterial and venous thrombosis are believed to be contributing factors to increased risk of stroke.^{6,7} Other coronavirus respiratory syndromes of the same nature including the SARS-CoV-1 and Middle East Respiratory Syndrome coronavirus were also related to increased incidence of acute ischemic stroke.⁷ Further, people with stroke risk factors (e.g., diabetes, smoking) have an increased COVID-19 mortality rate, possibly due to the same mechanisms attributed to stroke risk, such as large expression of angiotensin-converting enzyme 2 cell receptors for binding to SARS-CoV-2.⁸

Common deficits after stroke include impaired motor function, ability to carry out activities of daily living, cognitive impairments in memory, language, attention, and executive function, and mood, sensation, and perception.^{9,10} Stroke attributed to the SARS-CoV-2 infection can cause greater severity of stroke,¹¹ potentially leading to prolonged acute care and rehabilitation.¹² Natural recovery of broad stroke related impairments often occurs with haste within the first 6 months post-stroke, and then tends to plateau, though this may vary for cognitive, physical, and sensori-perceptual impairments.¹³ It is difficult to predict individual recovery because sequelae are multifaceted across multiple domains. As such, rehabilitation clinicians rely on their own judgment as to when to end rehabilitation post-stroke.¹³ The long term effects and recovery trajectory for individuals with simultaneous SARS-CoV-2 infection and stroke is unknown.

Stroke Care

Before the COVID-19 pandemic, patients with stroke symptoms received hyperacute and acute treatment at the nearest specialist stroke unit, primary stroke center, or comprehensive stroke center (CSC).¹⁴ After acute treatment, the patient entered one of two main pathways for post-

stroke rehabilitation: 1) subacute rehabilitation (e.g., inpatient rehabilitation, skilled nursing facility); 2) community rehabilitation, normally delivered via an outpatient facility or in the patient's home.¹⁵ A large scale RCT of working-aged stroke survivors across the UK, Australia, and Southeast Asia, found that within 3 months post-stroke, 67% of stroke survivors received either inpatient or community rehabilitation, and only 8% of those were still receiving rehabilitation at 12 months post-stroke.¹⁵ Milder strokes had the highest rates of receiving no rehabilitation (40%), followed by a lower proportion of moderate strokes (12%) and severe strokes (4%) who required no rehabilitation.¹⁵

During the pandemic, regions with high incidence of COVID-19 were forced to reorganize healthcare services. This included implementation of triage systems, separating confirmed/suspected COVID-19 patients from non-COVID-19 patients, and redeploying health care professionals to the frontline to deal with the influx of COVID-19 patients.¹⁶⁻¹⁸ Resources and clinicians were spread across usual clinical care and COVID-19 specific care, increasing the potential short- and long-term negative consequences of high stress and burnout.¹⁹ When resource strain occurred, where patient volume surges may be combined with reduced staff, reassignment of staff or beds may lead to care and service limitations to an overwhelmed healthcare system.²⁰

Overarching Rationale

Given the substantial number of adults enduring stroke annually, it is necessary to understand and address their needs during the ongoing COVID-19 pandemic. While it is well-documented that interdisciplinary stroke rehabilitation can enhance outcomes after stroke, the substantial shift in health care delivery during the COVID-19 pandemic may have major effects on short- and long-term outcomes. Researchers must further examine stroke outcomes related to

the COVID-19 pandemic. Practitioners must be prepared to identify problems and challenges among this population to address the fallout the pandemic has imparted on a generation of stroke survivors.

HEALTHCARE DELIVERY DURING THE COVID-19 PANDEMIC

Delays in Stroke Care

There was a reduction in the number of patients seeking medical emergency care for stroke, particularly at the start of the pandemic.²¹ Recent data demonstrates an average decrease in stroke presentation of 15.3% per week in 2020 compared to 2019.²² This may be due to fear of acquiring COVID-19 during hospital stays.²³ Additionally, patients who survived stroke and present with a clinical indication for inpatient rehabilitation may decline care related to fear of contagion or fewer choices related to bed allocation in community facilities. Although stroke is considered a medical emergency that requires immediate treatment and patients with acute stroke continue to receive immediate care during the pandemic, several problems exist across the care continuum which may restrict patients' access to necessary treatment across the continuum of care and lead to poor long-term outcomes.

Emergency departments often re-routed patients with stroke, limiting access to acute stroke diagnostic testing. This sometimes left other areas of the hospital or stroke centers to allocate already strained resources and staff to treat patients with stroke.²⁴ Some hospitals converted nontraditional spaces (e.g., meeting rooms, hallways) to inpatient units to handle surges in patients.²⁰ During the ongoing pandemic, a delay in acute and post-acute rehabilitation care was observed. Sielger and colleagues²⁵ completed a single tertiary stroke care center study and discovered a reduction in new stroke diagnosis (38% reduction) and mild stroke presentation

(29% reduction) through emergency services. However, the study also demonstrated a proportional doubling of severe stroke presentation (38% versus 21%) during the same period. Emergency services for patients with stroke were and continue to be compromised, which could translate to poor outcomes.

Some people experiencing stroke symptoms may not seek healthcare. In a recent study, 53% of participants with stroke reported missed or delayed healthcare visits specific.²⁶ For instance, people who experience mild symptoms, such as subtle aphasia or paresis, may have been unaware of their deficit. Social isolation related to public health measures designed to mitigate the spread of COVID-19, these individuals may have lacked awareness and social support required to seek care for these problems.²³

Length of Stay

Hospital lengths of stay are an indicator of efficiency, but during the pandemic, changes in length of stay were observed among some patients with stroke. First, the reallocation of stroke beds to COVID-19 patients, redeployment of stroke physicians and health care teams to look after patients, the delay in intravenous thrombolysis access, and the reduction of patients entering hospitals all potentially contributed to increased severity of stroke patients²⁷ and subsequently increased lengths of stay. Alternatively, a significantly shorter length of stay was observed for patients with coronary symptoms during the COVID-19 era compared to records from a pre-pandemic period.²⁸ Some observational studies concluded no change to quality of care indicators such as hospital length of stay, rate of successful reperfusion after thrombectomy, and good clinical outcome rates after discharge from hospitalization as compared to hospital data from 2019.²⁹ However, an analysis from Get With The Guidelines-Stroke registry from over 2,000 hospitals and 81,084 patients in the US found a decreased odds of length of stay greater than four

days during the COVID-19 pandemic.²² Nonetheless, each site or center across the globe is different and may observe various differences in length of stay.

Discharge to Post-Acute Care

Several observational studies report changes in post-acute care discharge patterns. Although discharge to inpatient rehabilitation remained relatively unchanged, more patients were discharged to hospice or home with fewer discharged to skilled nursing facilities, likely triaging patients away from high-risk COVID-19 environments.²² Additionally, home health care and outpatient therapies were often limited. A study of home health and home aid agencies in the Northeastern US showed a 98.7% reduction in requests for in-home services secondary to caution with face-to-face contact, resulting in family caregivers assuming additional roles.³⁰ The majority of candidates for home health services are greater than 65 years-of-age and have at least one comorbidity increasing their risk of infection.³¹ Home health services experienced greater demand for personal protective equipment (PPE) and disinfecting procedures, social distancing guidelines, and staffing shortages due to staff COVID-19 infections, triggering a reduction of provided services.³⁰ Service reduction may prompt greater delay-of-care in a population of people with stroke where recovery is heightened within the first 3-6 months.

Potential Effects on Stroke Outcomes

Individual and Interpersonal Level

Worse Outcomes for Stroke Patients with COVID-19

Patients affected by COVID-19 have increased risk of cerebrovascular events due to inflammatory responses and thrombotic risks.^{29,32} It has been documented that stroke severity is significantly different at discharge from hospitalization between patients with and without

COVID-19 where patients with the virus had higher National Institute of Health Stroke Scale (NIHSS) scores indicating more neurological impairment, higher risk for severe disability, and death. A multi-center cohort study in Spain found that despite similar acute management of stroke, patients with COVID-19 had greater stroke severity and greater level of disability and dependency at discharge.³³ Similar, a recent study found that patients presenting with COVID-19 who had a history of stroke have shown more severe clinical symptoms and worse outcomes than those without history of stroke.³⁴

Younger Acute Stroke Presentations

The demographic of patients presenting to emergency departments has shifted. It has been observed that the patients presenting for acute stroke are younger. A rapid review concluded that age of stroke onset has decreased globally and there is an association between COVID-19 and stroke in young populations without the typically occurring vascular risk factors.³⁵ Rudilosso et al.²⁹ also observed this trend but speculated older adults may be seeking stroke care less frequently out of fear for acquiring COVID-19 which has been shown to have a higher mortality rate in this population.

Systems-Level Impacts Contributing to Stroke Outcomes

Increased stress has been placed on the healthcare system to face long-term sequelae of COVID-19. The reorganization of stroke care during the COVID-19 pandemic has lead to reduced access to intravenous thrombolysis and the stop of “non-urgent” care.²⁷ In a recent global observational study, stroke care was observed to have a global decline across 124 centers with high, mid, and low COVID-19 hospitalization burden.³⁶ Centers with higher COVID-19 inpatient volumes were noted to have a more decline in stroke care. In addition, the stroke care centers with high- and

mid-volumes demonstrated a more profound volume decline in stroke hospitalization, potentially “related to the fact that larger renters were more likely to become the preferred destination for COVID-19 referrals leading to capacity issues.”³⁶ The scarcity of resources further limited access to stroke care to patients with COVID-19 and stroke. This has created increased stress to families, caregivers, and stroke health care professionals to provide optimal medical care and rehabilitation services.

HOME AND COMMUNITY

Adults with stroke often need supplementary support to optimize their independence in their home and to promote safe and successful community re-entry. These necessary supports in the home and community include post-acute care, paid and family caregivers, alternative options for transportation, social support groups, and other accessible community areas integrated into daily routines. The COVID-19 pandemic affected various levels of participation in daily routines and access in both home and community environments for those surviving strokes;³⁷ closing non-essential businesses, social distancing, and reducing face-to-face contact were among chief contributors to disadvantaged access and participation.

Caregivers, both paid and unpaid, afford people living with the effects of stroke the opportunity to live in preferred and less restrictive environments. During the pandemic, caregivers received inadequate training on procedures to minimize transmission and experienced limited communication with healthcare professionals as they assumed varied roles secondary to reduced home- and community access.³⁸ Caregivers experienced high levels of depression and stress, sometimes more frequently than people with stroke.³⁹ Less support from external sources, increased roles and care demands, and the stress of the pandemic all coalesce to reduce overall quality of care for people with stroke.

Potential Problems Related to Public Health Efforts

People surviving stroke during the pandemic may experience additional unanticipated complications during their recovery as a result of pandemic-related social distancing guidelines, mask mandates, and community lockdowns. These public health efforts, albeit necessary, have likely restricted recovery and community reintegration for various reasons. The Centers for Disease Control and Prevention (CDC) in the United States defined guidelines within community, work, and school settings to reduce transmission of the disease.⁴⁰ Clear guidelines and restrictions in community gatherings, compounded by increased risk of transmission for those with reduced immunity, presented barriers for community re-entry and engagement for those with stroke. These restrictions, including closing of businesses, restrictions on public transportation, and reduction of free community-based services, resulted in a vast and abrupt change to community-based routines and patterns and greater isolation from social interactions.⁴¹

Increasing community engagement after stroke presents a myriad of challenges,⁴² including barriers to engagement due to changes in mobility and self-efficacy with balance,⁴³ cognitive⁴⁴, language and visual impairment, reduced access to transportation, and psychosocial factors, such as reduced confidence with self-image.⁴⁵ However, community re-entry is often a goal for people with stroke and is valued as a mark of independence as well as a modality for continuity of holistic maintenance and remediation of various personal functions.

Closure of non-essential businesses and distancing mandates, varying by geographical location and times of increased transmission, further reduced opportunities for community activities such as exercising at a gym, attending in-person support groups, and physician office visits: all means of secondary prevention for stroke and other health conditions. Although technology became increasingly available to compensate for social distancing requirements,

lacking device access, and difficulty navigating different platforms further reduced accessibility to varied social circles and resources outside of the home. Complications associated with unmet needs and desires in any of these areas are correlated with greater risk of depression and social isolation as well as increased mortality rate, specifically among people living with the effects of stroke.^{46,47}

Ongoing efforts to reduce the spread of the virus may be contributing to the exacerbation of disability for individuals with stroke. For instance, mask wearing may contribute to challenges for people with (1) communication impairments after stroke such as aphasia or apraxia of speech, and (2) heightened risk of falls post-stroke where visual fields may be obstructed by the mask itself. Another example is the impact of social distancing and isolating on function. For instance, approximately 84% of people with stroke experience significant cognitive impairment at 4-years post onset.^{48,49} Although this area needs further study, it is critical that health care providers are aware of the potential double threat people with stroke may have for developing dementia during the pandemic due to neurocognitive impairments paired with social isolation. With fewer opportunities for participation, people returning to community living after stroke may be living more sedentary and isolated lifestyles, in turn creating negative health effects.⁵⁰

Due to the ongoing pandemic waves and global public health efforts, our taskforce posits that people with stroke may encounter the following challenges: (1) decreased social and instrumental support, (2) loss or decrease of financial resources, (3) less opportunities to engage with peers or support groups focused on supporting life after stroke, (4) stress related shifts in housing affordability with increased costs and moratoriums ending, (5) decreased physical health due to restrictions or fear for personal safety in public places such as gyms or other venues aiming at health and wellness, and (6) increased anxiety and depression.

CALL FOR ACTION

Our task force has identified several opportunities to address the needs of this population at the (1) institutional and societal level, (2) health care delivery level, and (3) individual and interpersonal level.

Institutional and Societal-Level

Social Determinants of Health

The importance of achieving health equity for people living with the effects of stroke cannot be underestimated. “Social determinants of health (SDOH) are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks.”⁵¹ Factors of SDOH include access to clean air and water, nutritious foods, physical activity opportunities, safe housing, modes of transportation, education, job opportunities, income, language and literacy skills. In addition, racism, discrimination, and other violence can also negatively impact a person’s health, well-being, and quality of life. Those persons from under-invested groups often experience economic and social systemic barriers that are harmful to achieving full health equity (e.g., racial and ethnic minority groups, individuals with disabilities, non-English speaking language).⁵² Intersectional identities may experience even more health inequities.

The COVID-19 pandemic has laid bare the gaps in the healthcare system that continue to contribute to worsening health inequities. Racial differences in stroke incidence were documented where the age-adjusted incidence of first ischemic stroke per 1000 was 0.88 in White individuals, 1.91 in Black individuals, and 1.49 in Hispanic individuals.⁵³ Racial and ethnic disparities were also noted with respect to post-stroke disability assessment tools and

outcomes.⁵⁴ It is apparent that COVID-19 disproportionately affects under-invested racial and ethnic minority groups across multiple domains.⁵⁵⁻⁵⁷ Rate ratios of COVID-19 cases compared to Non-Hispanic Whites (NHW) were: 1.5x in American Indian or Alaska Natives; 0.7x in Asian, 1.0x in Black/African American, and 1.5x in Hispanic or Latino persons. Rate ratios of deaths related to COVID-19 compared to NHW were: 2.2x in American Indian or Alaska Native, 0.8x in Asian, 1.7x in Black/African American, and 1.9x in Hispanic or Latino persons.⁵⁸ The American Heart Association highlighted the need to adequately recognize structural racism as a fundamental cause of poor health and disparities in cardiovascular disease.⁵⁹ As we work to establish a more inclusive system of care for stroke survivors, “a growing body of evidence requires us to expand our understanding of the sociopolitical influences affecting social determinants of health, which impact the overall health status of patients from disproportionately impacted communities.”⁶⁰ Increased research is critical for understanding specific and targeted needs of specific marginalized communities including tailored stroke interventions, telerehabilitation adoptions, and increased stakeholder input from marginalized communities in research development.

Health Authority and Healthcare System Opportunities

The COVID-19 pandemic has had a major impact on stroke care including disruption to hospital stays (shortened or lengthened), patients presenting with greater severity strokes both related and unrelated to COVID-19 infection, and increased mortality rates of stroke in the first wave of the pandemic.⁶¹ During the subsequent waves of the pandemic, the burden eased slightly including decreases in hospital stays, severity of stroke symptoms, and mortality rates in stroke.³³

In response to rapid changes, health authorities who are responsible for regional health services should prepare and rethink the stroke care pathway for present and future pandemics and

collaborate with physician leaders and allied healthcare teams to meet the needs and demands of patients following strokes. Health authorities should focus on long-term complications and sequelae management of stroke survivors in the context of the COVID-19 pandemic, as the neglect of care could exacerbate poor patient outcomes, increasing burden to the already stressed healthcare system.

Frontline health care workers have faced extreme challenges during the pandemic. Many stress factors, such as the fears of transmission, increased workload, inadequate PPE, the need of making ethically difficult decisions on the level of care, physical exhaustion, even increased family responsibilities due to closed school and day care, may result in significant negative effects on health care workers' physical and mental well-being. A recent meta-analysis suggests that prevalence rates of anxiety and depression among the health-care workers are 23.2% and 22.8%, respectively,⁶² while insomnia prevalence reaching 38.9% under COVID pandemics. Notably, nurses and female doctors are vulnerable to anxiety and depression.⁶²

An urgent need exists to support health care workers' emotional well-being and mental health during the pandemic. Reasonable workload and access to PPE are requisite needs. Evidence from previous pandemics suggests that early psychological assessment and intervention are particularly useful.^{63,64} Further, self-care as a mental health first aid tool may help health-care workers to process stress and anxiety in the current era of the COVID pandemics.⁶⁵

Be Prepared for People with More Severe Impairments and Needs in the Community

Referral patterns and access to traditional post-stroke care models were altered because of the COVID-19 pandemic. "Admission for stroke during the COVID-19 pandemic was associated

with a significantly lower probability of being discharged to an inpatient rehabilitation facility.”⁶⁶ As a result of rapid reductions in the immediate availability of healthcare providers and facilities, several stroke survivors may have experienced delayed care, shortened length of stay during inpatient care, and deviations from the standard of care according to established care models.⁶⁷ Subsequently, stroke survivors in the community may have more severe impairment, more complex medical complications, and greater needs for assistance.

Healthcare Delivery Level

Change in Delivery After Acute Hospitalization

Changes in healthcare have created opportunities to advance secondary prevention and empower patients to self-manage after hospitalization. Focusing on self-management has been trending in stroke rehabilitation in recent years and can be addressed face-to-face, via telehealth or remote communication technologies, or through a hybrid approach where technology is complementary to skilled provider training.^{68,69}

These remote communication technologies are regarded as effective options to support the delivery of health care interventions for neurorehabilitation. Examples of technologies leading these efforts include telemedicine, wearable sensors, smartphones, virtual reality, augmented reality, and rehabilitative games.^{26,70} In addition, strategy training intervention delivery was adapted for remote delivery integrating mobile health technology.⁷⁰ Further research is warranted to determine best strategies for implementation of rehabilitation techniques in the home setting.

Increase the Integration of Evidence-Based Intervention Programs and Strategies such as Telemedicine, Telerehabilitation, and Telepsychology Across the Continuum of Care

Prior to the COVID-19 pandemic, remote telestroke services in the setting of acute stroke were frequently being utilized.^{71,72} Further down the continuum, a Cochrane Review published in 2020 found that telerehabilitation programs for stroke showed a reduction in depressive symptoms, enhanced quality of life, and improved independence in activities of daily living compared to usual care. Furthermore, outcomes were not inferior to face-to-face rehabilitation and telerehabilitation were cost effective compared to traditional rehabilitation services.⁷³ Telehealth and telerehabilitation were viable alternatives to in-person visits during the height of the COVID-19 pandemic for individuals with stroke.²⁶ Isolation precautions during the pandemic forced the rapid expansion and integration of remote clinical care services through platforms like video-conferencing and mobile apps. Although patients with stroke-related deficits may require assistance to use the technology, advances in telehealth show the potential to provide access to healthcare that was once only offered in-person.

While individuals are relatively satisfied with telehealth use, telehealth is not a panacea, and effective implementation approaches have not been established.²⁶ A common barrier to use of telehealth is difficulty with technology use.^{26,74} Adaptation for remote delivery should be done with consideration to methods for training end-users on new technology use and the intervention.⁷⁵ Concerns about the Digital Divide, the gulf between individuals or groups who can access internet and those who cannot,⁷⁶ further exacerbate what services may be available to patients. Healthcare providers must not overlook existing healthcare disparities that limit access to this technology. Social determinants that affect telehealth access include economic stability (ability to access internet-capable devices), education (literacy and digital literacy), social and

community contexts (expectations of the person to use electronic internet devices) and the built environment (infrastructure for free or paid internet service).⁷⁷

Nonetheless, technology to support telehealth services after stroke is becoming ubiquitous as the population continues to own smartphones and use apps frequently throughout the day.^{69,78} In multiple studies, remote telehealth services have proven easy to use, less resource utilization (e.g. transportation, time off from work), and well received by patients, caregivers and clinical staff under the appropriate circumstances.^{79,80} Whether in-person or virtual, support to be encouraged include stroke rehabilitation therapies, maintaining a healthy lifestyle, physical activity, and preserving social networks.^{27,67,81,82} It is necessary that technology development teams continue to advance the infrastructure of telehealth services to provide opportunities for high-quality rehabilitation service delivery. Hospitals and clinics should continue to invest in state-of-the-art and state-of-the-science technologies, particularly as future pandemic waves are expected. Providers should continue to familiarize themselves with up-to-date advances in the technology and service-delivery to provide high-quality care to people surviving stroke during and after the pandemic. Future research is needed to understand the best approaches to implement telerehabilitation from the perspective of those that have survived stroke.

Stroke and Disability Management, Infection Control, Customization of Care Plan

Stroke care delivery during the COVID-19 pandemic has been challenged to incorporate infection control protocols across different settings to maintain safety of patients and clinical personnel. PPE such as masks, gloves, goggles, face shields, non-porous gowns, caps, shoe covers, and filtering respirator have been used as a standard practice for personal safety during clinical interaction. Prehospital and hospital stroke clinical care teams adjusted to use of diagnostic testing, incorporate extra time for sanitizing between patients, requiring patients to

wear masks if medically stable, as well as varying clinical staff work schedules due to redeployment, sickness, and quarantine. Changes in clinical infrastructure required frequent monitoring to remain compliant but also to provide stroke specific care to persons with deficits such as weakness, aphasia, vision deficits, and cognitive deficits.⁶⁷ It is imperative to continue the creation and modification of a customized care plan specific to the needs of each individual.

Professional Development at All Healthcare Levels

With the rapid changes in knowledge brought on by the pandemic, it is important that continuing professional education be intentionally incorporated within professional knowledge requirements that provides updates on the management of patient with and living with the effects of COVID-19. Multi-disciplinary teams involved in stroke care including physicians, physician assistants, nurses, physical therapists, occupational therapists, speech-language pathologists, psychologists, recreational therapists, vocational therapists, dietitians, and social workers will require advanced knowledge and adjustments to healthcare delivery in the setting of a pandemic. Professional societies and stroke specific organizations have invested in developing resources for patients, caregivers, and professional staff.⁶⁷ Additional research will help elucidate best practices for stroke and stroke rehabilitation during the COVID-19 pandemic.

Individual and Interpersonal Level

If Decline in Function is Observed, Actively Pursue/Resume Therapy Services

Many individuals with stroke suffered a decline in function across multiple domains during the COVID-19 pandemic due to quarantine isolation, closure of outpatient rehabilitation/fitness center facilities, and absence of available community resources.⁶⁷ When possible, individuals should resume post-stroke care and rehabilitation as soon as possible to continue stroke recovery

and avoid unnecessary secondary complications (e.g., worsening spasticity, diminished balance increasing fall risk). A comprehensive stroke recovery program including physiatry-directed coordination of care and “integrating modified cardiac rehabilitation may potentially benefit from reductions in all-cause mortality and improvements in cardiovascular performance and function.”^{74,83}

Support Persons and Caregivers as Healthcare Heroes

The idea of “health care heroes” should extend to caregivers who had to suddenly shift and take on/adjust to a system that was already strained with little additional resources. With the need for social distancing, many stroke survivors found themselves in a position where they were unable to (1) have hired help enter their home, or (2) leave their home to access community services.⁶⁷

The result was that family and/or friends suddenly had to take on the role of “caregiver” or “care partner” to fill the gap of required care. These non-professional caregivers were challenged with performing activities such as toileting, dressing, grooming, bathing, transfers, ambulation, meal preparation, medication management and laundry services. During the pandemic and lock down periods, many transportation options were not available. Tasks such as grocery shopping, attending medical and dental visits, and assistance to participate in social activities were also thrust upon non-professional caregivers. Prior to the pandemic, individuals with chronic health conditions found the healthcare system under stress and difficult to navigate. Often not acknowledged, these caregivers should also be recognized as “health care heroes” for their sacrifice and courage to navigate a cumbersome health care system with few resources.⁶⁷

Additional financial support options for caregivers supporting persons with stroke during the pandemic should be explored. For instance, advocacy for policies focused on providing monetary incentives or tax credits for family caregivers is important to support these “health care heroes.”

Furthermore, additional research is needed on approaches to decrease caregiver burden and stress among this population (Figure 1).

[Figure 1 about here]

CONCLUSIONS

People continue to endure stroke during the COVID-19 pandemic and despite adaptations in healthcare, this population may be met with healthcare, policy, and social changes that influence their recovery. A generation of people who survived a stroke during this time may be living with additional fallout from the pandemic which may include additional unmet and long-term needs. Practitioners must be prepared to meet the anticipated demand among this generation of stroke survivors. It is critical that interdisciplinary health care providers are prepared to identify and address additional problems this population may encounter at any point across the care continuum but particularly within the context of the community. The work of the Health and Wellness Task Force propose recommendations for addressing the needs of this population at the (1) institutional and societal level, (2) health care delivery level, and (3) individual and interpersonal level. Future research is necessary to better understand the short- and long-term needs of people who survived a stroke during the COVID-19 pandemic.

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Recommendations

Institutional and Societal Level

- Establish inclusive systems of care considering under-invested minority populations
- Re-think the stroke care pathway for current and future pandemics and collaborate with physicians and healthcare teams to meet the needs and demands of patients following strokes
- Systems should be prepared for people with stroke living in the community with more severe impairment, more complex medical complications, and greater need for assistance
- Health care workers should have reasonable workloads, access to PPE, early psychological assessment, and integrate self-care as a mental health first aid tool
- Conduct research for understanding targeted needs of marginalized communities with focus on tailored interventions, telerehabilitation adoption, and increased stakeholder input

Healthcare Delivery Level

- Technology development must continue to advance infrastructure of telehealth services for rehabilitation delivery
- Consider lack of access to healthcare delivery technology and feasible alternatives
- Continue creation and tuning of customized care plans for individualized needs despite changes in clinical infrastructure
- Provide continuing professional education for practitioners on management and effects of COVID-19 and best practices for stroke and stroke rehabilitation during the COVID-19 pandemic
- Conduct research to determine best technology-driven strategies for implementation of rehabilitation techniques in the home and best approaches for implementation from the perspective of those who have survived a stroke

Individual and Interpersonal Level

- Individuals should resume post-stroke care and rehabilitation to avoid unnecessary secondary complications
- Comprehensive stroke recovery programs with physiatry-directed coordination of care should be initiated
- The idea of "health care heroes" should be extended to unpaid family caregivers
- Consider financial support options like incentives or tax credits for family caregivers