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**Acute neurology during the COVID-19 pandemic: Supporting the front line**

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Neurologists are affected by the COVID-19 pandemic in several key ways, including: a reduced ability to admit and accept in transfer critically ill neurologic patients due to census overflow; personal risk of exposure to COVID-19; and potentially redeployment of the acute neurologist workforce towards general medicine to assist our colleagues managing the surge of medical patients. As providers of inpatient and emergency-based acute neurologic care, we have been attempting to locally prepare for and manage the COVID-19 pandemic by focusing on three key areas: creating an integrated preparation plan that supports hospital measures; building an optimized, flexible, and redundant workforce; and maintaining a high level of neurologic care in our hospital and across our region despite limited transfer capabilities during the pandemic. This final concern is of key relevance in our region where our tertiary hospital supports numerous smaller community hospitals, typically by providing an open door to patient transfers. These hospitals are often in rural or frontier regions and are also affected by COVID-19, so not only are beginning to experience their own bed and clinician shortages,<sup>1</sup> but are understandably nervous about what the pandemic means for the availability of traditional support systems for other non-COVID-related diseases.

#### *Integration with Hospital-Wide Preparations:*

As is happening across the world, our hospital has proactively developed deep and wide preparations for the COVID-19 pandemic. The hospital leadership provides daily briefs on systems-wide planning to the Neurology Chief Value Officer (CVO) and Chair, including screening protocols, contingency staffing plans, and expansion of ICU and acute care capabilities. The Chair has designated the CVO to communicate all relevant information to the rest of faculty, trainees, and staff. This one-point of contact has been critical because of the ever-changing nature of the directives. The Neurology CVO not only relays such information to neurology faculty but also acts as a point person to bring our concerns back to hospital leadership. For example, early in the

pandemic, residents and faculty were unmasked when examining patients who were later under investigation for COVID-19. The CVO helped us to work with Infection Prevention specialists to identify appropriate sources of PPE as needed in the ED to ensure adequate protection for our stroke team.

#### *Workforce Optimization:*

At a department level, we reorganized our acute teams to optimize our workforce, with dual goals of creating redundancy in our coverage models in the event team members become ill or quarantined and protecting high risk department members from exposure. In particular, we redesigned our inpatient faculty call schedule by removing faculty over 60 years of age or in other high risk categories and split the remaining faculty into primary and back-up groups. The primary faculty were put into a rotating schedule of our two inpatient teams, primary neurology wards and neurology consults. Each primary faculty is assigned a back-up faculty member, in case of illness. The back-up faculty also conduct telestroke (and outpatient clinic) from off-site locations, freeing the primary in-hospital faculty to focus on in-person evaluations within the hospital walls. Resident schedules were treated similarly, with the residents on non-essential duties sent home, prepared to be back-up if the inpatient residents become ill. As a team, the CVO, Chair, and ward, consult, and telestroke attendings have a daily virtual huddle to ensure we all know who is sick, work through any coverage gaps, and deploy back up team members when needed.

#### *Maintaining High Level of Inpatient and Regional Neurologic Care in a Pandemic:*

Patients presenting acutely to the hospital often cannot provide a history and their respiratory symptoms may not yet be apparent. Though we do not yet know the true co-prevalence of neurologic disease and COVID-19, pre-print publications support that non-specific neurologic symptoms are common<sup>2</sup> and that stroke complicated COVID-19 infection in 5.9% of patients

admitted with confirmed COVID-19 to one Chinese hospital.<sup>3</sup> Recognizing that patients with suspected COVID-19 can also present with acute stroke, we moved a telestroke unit into the ED-based COVID-19 and respiratory illness evaluation areas to allow for remote evaluation of patients with acute stroke symptoms. The ED leadership agreed to house all neurology patients being evaluated for COVID-19 to this area and to utilize the telestroke cart. This was immediately beneficial by enabling a telestroke attending to avoid activation and exposure of an entire stroke team in a patient with fever, hypoxia, and worsening prior stroke symptoms while still assisting the ED physicians in conducting a rapid assessment.

Initially we had only the stroke fellows and attendings evaluating such patients but we quickly realized that excluding neurology residents resulted in a loss of continuity. So we rapidly trained the neurology residents on performing acute teleneurology examinations and gave them access to the technology platforms. Once telestroke was established, we extended the use of the telestroke COVID-19 unit to non-stroke presentations, such as new onset seizures, encephalopathy, and multiple sclerosis exacerbations. The operations of this unit have faced some unique challenges, such as background noise from the air filtering units and masks on providers making it difficult to hear. We trouble shot the operations after each encounter while our volumes were low to enable smoother operations as we prepare to climb the steep part of the pandemic curve.

To further reduce exposure risk, rounding style has changed for us. While we have continued in-person rounding, we now have 6 feet distances between team members and limit the number of residents in the room. We are aware of neurology services at other institutions having moved towards pre-rounding via video-platform with the attending and resident subsequently entering the patient rooms at different times to reduce exposures. Consulting services at other institutions with widespread in-room telemedicine capabilities have moved towards telemedicine-based

rounding with no patient contact. We suspect that rounding “styles” will continue to evolve and require different solutions for different hospital systems with different capabilities, neurologic disease complexity, and levels of COVID-19 prevalence.

Despite phenomenal work by our hospital leadership to expand ICU and acute medicine capacity, we anticipate in the near future a time when we will not have available beds for all acute neurology transfers. Our hospital provides complex neurologic and neurosurgical services for 10% of the continental US landmass, with many of our surrounding community hospitals having very limited sub-specialty availability. As acute care neurologists, we wish to maintain a high level of neurologic care for these patients, even during the pandemic. Our first step was to develop criteria for which patients we will still accept in transfer for unique services offered versus the patients who may be able to stay in place, particularly if we offer additional long-distance support. For example, as we are one of only two comprehensive stroke centers in the Intermountain West, we still accept patients needing thrombectomy. However, we will now be more insistent on requiring CT angiograms pre-transfer, to ensure presence of a large vessel occlusion and an opportunity to change the outcome of a morbid disease. Similarly, as the vast majority of our community hospitals do not have continuous EEG capabilities, patients with suspected status epilepticus will continue to be prioritized for transfer.

These two examples are somewhat straightforward, but the lack of neurologists in our region<sup>4</sup> means that even standard neurologic diagnoses, such as new onset seizure, may not be comfortable for hospitals to manage. Thus we determined which of our region’s community hospitals have the highest neurology transfer volumes to us and with whom we have established telestroke or other systems connections. We then offered, free to them, phone- or video-based follow-up, for any patients staying imbedded in those hospitals due to our inability to accept

transfers. Hospital leadership has been fully supportive, allowing our teleneurology coordinator to coordinate these calls and, on a financial level, guaranteeing physician pay for the additional phone- and video-based work, despite lack of formal contracts. Communication about this service has been enabled by our tight relationships with our telestroke sites, including our regular bi-directional quality review between telestroke sites. As we are in the infancy of this program, we cannot report results but are hopeful that our telemedicine-savvy neurologists and our capable community hospitalists will manage this population well. We believe it is our duty to help manage neurologic disease for our community, particularly when patients are denied access to us within our hospital walls.

On a different and last note, managing our own fears and anxiety in this time is critical.<sup>5</sup> For an attending on a ward or consult service, we have found that being present, responding to and solving critical problems, knowing when to be on point versus when to bring in levity, and even providing food goes a long way towards calming a nervous team. Our community hospitals are also worried, with one ED physician saying that when our hospital is full, his shift becomes infinitely more complicated. We believe it is important to have regular communication with our stroke and neurology champions at those hospitals to be a source of education in this constantly changing environment, including newly published, high-yield information<sup>6</sup> at a national level and up-to-date information about our own hospital's status, and reassurance that we are still here for them in these unprecedented times.

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