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## Resilience in the Face of the COVID-19 Pandemic: How to Bend and not Break

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### INTRODUCTION

As a global medical community, we are facing an unprecedented time. The novel coronavirus-19 disease (COVID-19) pandemic has resulted in several nations experiencing a severe health crisis, at the center of which are medical professionals combating an invisible enemy at great personal risk. This has changed the way in which many of us are practicing medicine, and as neurosurgeons we are placed in a particularly challenging situation. Neurosurgeons are accustomed to dealing with critically ill patients and the complexities of making life and death decisions daily, and as such our profession has a long tradition of cultural resilience. This has resulted in neurosurgical trainees acquiring both physical and mental stamina very early in their training while facing extreme situations. These attributes have been called on in an intense manner as we have added to our scope of practice care and service of the critically ill, victims of COVID-19.

At the beginning of the pandemic, little was known about the natural history, pathophysiology, and infectivity risk of COVID-19, especially regarding potential self-endangerment while working with patients. Like other physicians and health care coworkers, we were called to assume the risk of working in a uniquely unknown health care environment. This led to a host of questions regarding our safety and well-being as neurosurgeons on the COVID-19 frontline: How do I protect myself, my family, and especially my parents? How can I build social distance? How can I avoid making mistakes in an unfamiliar working environment? The pandemic has resulted in a major paradigm shift in health care, with physicians in some countries being forced to triage, and many neurosurgeons having to make difficult decisions about the relative risk of neurosurgical intervention in patients for whom we know our treatment would otherwise

have a profoundly positive impact on life and quality of life. The scenario might be likened to that of a lifeguard on a sinking ship where not everyone can be rescued, and the ones left behind will knowingly face significant morbidity and mortality; the application of ethical and moral reasoning to neurosurgical problem-solving becomes extremely difficult in these cases.

At the time of publication, we are now 10 months into the pandemic, but the effects still compound on the widely known and acknowledged stresses of neurosurgery training and practice. In the early stages, the challenges that specifically threatened the well-being and performance of neurosurgeons, and neurosurgery trainees within our community, were as follows:

- Higher risk of contagion for neurosurgeons, similar to other frontline clinicians performing aerosol generating procedures, and therefore the need to separate ourselves from our family members during this time.<sup>1</sup>
- A high death toll paid by the medical community in general and the neurosurgical community in particular.<sup>1</sup>
- Progressive regional suspension of outpatient activity and elective neurosurgery cases with a substantial impact on the lives of patients with conditions that require neurosurgical treatment.<sup>1</sup>
- Far-reaching stresses on entire health systems that will leave an uncertain impact on the future of neurosurgery training and practice.<sup>1</sup>

An additional burden is now placed on staff who are facing physical exhaustion from being the backbone of service delivery

### Key words

- COVID-19 pandemic
- Global health
- Global neurosurgery
- Neurosurgeon well-being
- Resilience
- Wellness

### Abbreviations and Acronyms

**COVID-19:** Coronavirus-19 disease  
**DHEA:** Dehydroepiandrosterone

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Citation: *World Neurosurg.* (2021) 146:280-284.  
<https://doi.org/10.1016/j.wneu.2020.11.105>

during the pandemic. Literature has shown that during communicable disease outbreaks staff workforce numbers diminish, this can be attributed to personal stressors, unclear guidelines from administration along with financial stressors and burnout.<sup>2,3</sup> In a cross-sectional study among health care workers on factors associated with mental health outcomes, risk groups for depressive symptoms, anxiety, stress, and sleep disorders were nurses, women, and frontline workers directly engaged in the diagnosis, treatment, and care of patients with COVID-19. Consequently, psychiatrists from Italy and Iran recommended early involvement of mental health experts for health care workers with guidance on self-care, regular access to information, and maintaining social contacts and communication.<sup>4,5,6</sup> In a meta-analysis of 59 articles, the factors associated with reduced morbidity for clinicians were found to be clear communication, adequate rest, and access to adequate personal protection, as well as both practical and psychological support.<sup>7</sup>

Even before the COVID-19 pandemic, the mental well-being of doctors and its direct impact on patient well-being was being recognized as a concern, and a growing body of literature was emerging on this important topic.<sup>8-11</sup> Neurosurgical training and practice is already challenging in isolation, with the additional stressors stemming from the COVID-19 pandemic it has put neurosurgeons under incredible psychological stress.<sup>12-16</sup> In the absence of proactive interventions that will foster physician wellness, the increasing threat of this context on neurosurgeon well-being will ultimately put patient safety at increasing risk. In an effort to support our colleagues during this trying time, the WFNS Young Neurosurgeons Forum Resilience Task Force has prepared evidence-based recommendations and advice on developing resilience in an attempt to encourage healthy, protective mechanisms for neurosurgical trainees and practicing neurosurgeons who face the risks and adversity of the current era.

### What is Resilience/Resiliency?

From a psychological perspective, resilience is a multidimensional construct that has been defined as the ability to adapt positively to life conditions. Resilience may also be understood as the ability to, “bounce back from hardship and trauma,” and as defined by the American Psychological Association, “the process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of threat”.<sup>17,18</sup> This is a dynamic process that evolves over time and implies a type of adaptive functioning that specifically allows us to face difficulties by observing an initial balance or bouncing back as an opportunity for growth.<sup>19</sup>

### THE NEUROBIOLOGY OF RESILIENCE

Within the field of neuroscience, the quest for understanding resilience at a neurochemical level is a rapidly evolving field. Why do humans display such a wide spectrum of responses to life stressors? We readily observe that some people navigate life's gravest challenges with the ability to come out on the other side unscathed, while others who undergo similar circumstances experience psychological trauma that threatens their mental and/or physical well-being. What is it that differentiates the former group from the latter? The contemporary literature on resilience neurobiology suggests that resilience in humans is an adaptive, active process implicating multiple neurohormonal systems and

can no longer be simply viewed as the absence of a pathological response to stress.<sup>20,21</sup>

The hypothalamic-pituitary-adrenal axis appears to play a critical role in how humans respond to stress and perceived threat. As neurosurgeons, we have extensively studied neuroendocrine physiology as it pertains to pituitary disorders and the autonomic physiology and pathophysiology underlying phenomena such as the sympathetic “flight or flight response” and chronic diseases such as the metabolic syndrome. The relationship between the hypothalamic-pituitary-adrenal axis and disorders of mood or memory may however be less familiar to some of us. Other potential neural pathways implicated in the presence and expression of resilience traits include:

- Cortisol and dehydroepiandrosterone (DHEA): Glucocorticoid hormones involved in stress and resilience. When exposed to a stressor, the body's hypothalamic-pituitary-adrenal system is activated and corticotropin-releasing hormone is released from the hypothalamus, which in turn activates anterior pituitary secretion of adrenocorticotropic hormone, resulting in downstream release of cortisol from the adrenal glands, as well as DHEA to counteract the effects of hypercortisolemia. DHEA exerts a neuroprotective function by blocking glucocorticoid-induced neurotoxicity via interruption of normal uptake in the hypothalamus.<sup>1,20</sup> Numerous studies have suggested that DHEA has a positive correlation with psychological resilience, for example, with high DHEA-cortisol ratio offering putative protection against posttraumatic stress disorder and depression.<sup>20,22,23</sup>
- Neuropeptide Y: Counteracts the stress-related effects of corticotropin-releasing hormone, specifically at the amygdala.

**Table 1. Recommendations from the American Psychological Association<sup>25</sup>**

1. Build your connections
a. Prioritize relationships
b. Join a group
2. Foster wellness
a. Take care of your body
b. Practice mindfulness
c. Avoid negative outlets
3. Find purpose
a. Help others
b. Be proactive
c. Move toward your goals
d. Look for opportunities for self-discovery
4. Embrace healthy thoughts:
a. Keep things in perspective
b. Accept change
c. Maintain a hopeful outlook
d. Learn from your past

**Table 2.** Recommendations from Charney and Southwick, "10-Step Prescription for Resilience"<sup>26</sup>

1. Keep a positive attitude
2. Reframe your stressful thoughts
3. Develop your moral compass
4. Find a resilient role model
5. Face your fears
6. Develop active coping skills
7. Establish and nurture a supportive social network
8. Prioritize your physical well-being
9. Train your brain
10. Play to your strengths

The increase in neuropeptide Y is associated with decrease in stress-induced depression/anxiety.<sup>20</sup>

As this field continues to evolve with areas of investigation that include understanding genetic factors in proresilience or predisposition to psychopathology in the absence of resilience, novel psychotherapeutic strategies may emerge to support the development of resilience.<sup>21</sup>

**How Might the Development of Resilience Support Me as a Neurosurgeon?**

The response that human beings exhibit to extreme stress and trauma is varied and complex. Currently, as health care workers functioning during a global pandemic, each time a neurosurgeon or neurosurgery resident enters her or his hospital environment, she or he is exposed to a potentially life-threatening situation. As described earlier, the development of habits that enable neurosurgeons to adapt well in the face of these threats can protect them from pathological consequences of poor adaptations to ongoing professional stresses and threats.

**Can Resilience/Resiliency be Developed?**

Much of the literature fails to show a consistent relationship between demographic variables and resilience.<sup>24</sup> Resilience and resiliency therefore appear unlikely to be strongly associated with a physician's age or gender. It is encouraging to note that several modifiable factors likely favor and augment the development of resilience. As a multifactorial construct that includes a variety of gene-environment interactions, the heritability of resilience has been found to range between 33% and

**Table 3.** Recommendations from Southwick and Charney 2012<sup>18</sup>

1. Build social support networks
2. Cognitive and/or psychological interventions
3. Improving physical health
4. Comprehensive resilience training programs

**Table 4.** Recommendations from Leibniz Institute Resilience, "The 10 key recommendations for strengthening mental health during the coronavirus pandemic"<sup>27</sup>

1. Handle information with care
2. Maintain your routines or develop new ones
3. Maintain social contacts
4. Accept the complexity of the situation
5. Take care of yourself
6. Take responsibility
7. Reduce stress regularly
8. Be open with your children
9. Prepare for isolation
10. Seek professional help with acute stress

52%, suggesting that environmental factors can significantly influence the trait of resilience.<sup>25</sup> Moreover, several studies suggest that resilience and resiliency can be increased through behavioral interventions.<sup>18,25</sup>

**DEVELOPING RESILIENCE DURING THE COVID-19 PANDEMIC**

The development of resilience may begin with acknowledging that negative emotions, such as grief, anger, sadness, or anxiety, are natural consequences of being human in the midst of a crisis, and not necessarily a problem to be fixed. Emotional responses to crises or adverse events are usually finite; they have a beginning, middle, and end.

**Seek Help**

When emotional responses begin to interfere with one's ability to live a productive and fulfilling life, the gold-standard intervention is

**Table 5.** Recommended Reading List

1. First Responder Resilience: Caring for Public Servants, by Tania Glenn
2. Resilience: The Science of Mastering Life's Greatest Challenges, by Steven M. Southwick and Dennis Charney
3. Grit: The Power of Passion and Perseverance, by Angela Duckworth
4. Everyday Resilience: A Practical Guide to Build Inner Strength and Weather Life's Challenges, by Gail Gazelle, MD
5. The 7 Habits of Highly Effective People, by Stephen R. Covey
6. Resilience: It's Not About Bouncing Back: How Leaders and Organizations Can Build Resilience Before Disruption Hits, by Jennifer Eggers and Cynthia Barlow
7. Discovering Your Worth: Everything You Need to Feel Fulfilled, by Mardoche Sidor, MD
8. Option B: Facing Adversity, Building Resilience, and Finding Joy, Sheryl Sandberg and Adam Grant
9. The Alchemist, by Paulo Coelho
10. Mindsight: The New Science of Personal Transformation, by Daniel J. Siegel

structured psychosocial support. As the demands on a neurosurgeon's time can make it challenging to readily identify sources of such support, consider beginning by scheduling conversations with trusted colleagues, and lowering one's threshold to accept invitations for conversations with other colleagues. Remember that experiencing negative emotions during crisis is normal but failing to constructively express those emotions to others when they occur or recur can aggravate the negative experience.<sup>25</sup>

Although many recommendations for the development of resilience may appear to be "common sense," some may not be as intuitive to the practicing neurosurgeon or neurosurgical trainee, especially when engaged delivering health care during a uniquely threatening time. We therefore present, summarized in, **Tables 1–4** lists of evidence-based recommendations for fostering resilience during, and beyond, the COVID-19 pandemic. **Table 5** summarizes a reading list from the positive psychology and personal development literature that the WFNS Young Neurosurgeons Forum Resilience Task Force proposes as additional reading on the topic of the development of neurosurgeons' resilience.

### Change your Perspective and be Supported

There is a strong association between certain personality traits and the ability to function in a stressful environment. These include a *positive attitude, optimism, effective management of one's emotions*, and the ability to *observe failure as beneficial feedback*.<sup>28,29</sup> These traits tend to synergize with an environment that is supportive, and should therefore not

be viewed as sufficient, in isolation, for optimal stress management.<sup>30</sup>

### CONCLUSIONS

Left unaddressed, the challenges and uncertainties that medical professionals are facing in the current era can have dire consequences in the long run. Pathological responses, such as lasting bouts of depression and/or anxiety, substance abuse, addictive behaviors, or even suicide, can occur, with ensuing negative impact on the social networks in one's professional and personal life.<sup>31</sup> It is important that we encourage self-care within the neurosurgical community to ensure that we continue to be productive, happy surgeons that offer high-quality care to our patients.

The WFNS YNF Resilience Task Force would be happy to hear from any neurosurgeon and neurosurgeon-in-training around the world regarding any wellness-related concerns around training, dealing with the pandemic, or coping with burnout, as well as any further recommendations for the development of resilience that may contribute to our neurosurgical community. Please send inquiries or comments to Ernest J. Barthélemy, M.D., M.A., M.P.H. (corresponding author).

### CRedit AUTHORSHIP CONTRIBUTION STATEMENT

**Ernest J. Barthélemy:** Conceptualization, Data curation, Writing - original draft. **Nqobile S. Thango:** Conceptualization, Writing - original draft. **Julius Höhne:** Writing - review & editing. **Laura Lipa:** Writing - review & editing. **Angelos Kolias:** Conceptualization, Writing - review & editing.

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*Conflict of interest statement: The authors declare that the article content was composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.*

*Citation: World Neurosurg. (2021) 146:280-284. <https://doi.org/10.1016/j.wneu.2020.11.105>*

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