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Planning the Full Recovery Phase. An Antifragile Perspective on Surgery after COVID-19

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Planning the Full Recovery Phase.

An Antifragile Perspective on Surgery after COVID-19

"Never let a good crisis go to waste" – Winston Churchill

Introduction

The global COVID-19 pandemic has had dramatic effects on healthcare systems worldwide, being described as a "black swan," a rare and unexpected event whose magnitude will likely have a severe impact on history[1]. The COVID-19 emergency has pushed healthcare and surgical institutions to adapt, changing the conventional ways that clinicians have been used to working. In many parts of the world, the worst of the initial surge in cases has waned, and many institutions have entered the transition phase.[2] While the full recovery phase in a COVID-free era seems still far away, there are increasing calls for surgical systems to address some issues and concerns and rethink the "new normal" once the pandemic is over.

Recent literature has suggested the need for surgical systems to develop antifragile strategies, meaning that the systems can become stronger after a black swan event such as the current pandemic by "addressing all challenges posed by the enforced circumstances for successful management of the Transition Phase while on guard against another pandemic."[2] To apply an antifragile approach to surgery, it is necessary to consider principles[3] that can lead to the identification of essential topics as well as practical recommendations.

Building on the crisis management literature, we aim in the paragraphs below to investigate the meaning of antifragility, raise some questions about how surgery can employ such strategies, and identify important traits for surgical leaders of the future. Specifically, the purpose of this paper is to propose the applicability of principles borrowed from the crisis management sphere to a surgical context. We will address the following topics that will be essential for surgical programs to move to full recovery:

1. Cognitive biases
2. Optionality
3. Redundancy
4. Barbell strategy
5. Hormesis strategy
6. Balancing feedback loops.

Figure 1 and Table 1 summarize these main concepts and identify some tentative strategies.

1. Cognitive biases

Cognitive biases are errors in the decision-making occurring when the brain simplifies information processing. They are frequent in any field, generated by the knowledge that a person has and limits the will to consider a more comprehensive portfolio of options leading to risk underestimation. According to medical literature, up to 75% of all clinical errors have cognitive origins.[4]

The COVID-19 crisis showed the risk of cognitive biases in the clinical setting and surgery. For instance, in the initial phases of the emergency, the underestimation of the virus and its morbidity led to a lack of adequate protection of clinicians exposed to critically infected patients,[5] with several hundred healthcare workers dying from COVID-19.[6] Biases also involved the relationships between medical doctors and patients. While unconscious bias can lead to discrimination between surgical and medical teams and their patients,[7] the COVID-19 pandemic has highlighted the tragic disparities in death rates among African American and Latinx communities, resulting in worse surgical outcomes for racial minorities.[8]

Practical strategies for the future may include the set up of new knowledge sharing and decision-making protocols, requiring multidisciplinary teams[9] or second opinions in the diagnosis or operative and treatment plans. According to the literature and scientific societies,[10] diversity in surgical teams may also enhance the global performance, the outcome of the cure,[11] and the patients' satisfaction[10], helping to overcome biases.

2. Optionality

Optionality refers to the presence of flexible resources, that can easily be used or converted in case of need. COVID-19 forced healthcare institutions to build optionality that led to flexibility. In China, a brand-new COVID-19 hospital was built in only ten days, whereas everywhere in the world, former trade fairs and sports facilities were quickly converted into intensive care units (ICUs) and medical centers for COVID-19 patients. In New York, one of the global epicenters of the pandemic, innovative solutions were required to turn operating rooms (ORs) and postanesthesia care units (PACUs) into ICUs.[12] In the New York experience, ORs and PACUs to be converted were selected based on "their size, location, and available infrastructure, while preserving some ORs for emergency surgeries".[12(p1)]

Modern hospital design should include hybrid ORs, meaning operating rooms that are suitable for multiple medical imaging methods, techniques to be performed simultaneously, team coverage, and quickly convertible in terms of scope (e.g., into ICUs) and size (e.g., using moving walls). Defining some "pandemic-ready ORs" can also represent a winning strategy.[13] Still, the flexibility necessary for optionality goes beyond tangible resources, requiring surgeons to develop dedicated non-technical skills,[14] such as change management, adaptability and problem-solving attitudes.

3. Redundancy

Redundancy refers to the availability of extra stock and resources. As humans have redundancy of some key organs (like the kidneys)[1], having unused capacity can help to overcome a

crisis. However, accepting redundancy is difficult since "redundancy is ambiguous because it seems like a waste if nothing unusual happens. Except that something unusual happens — usually."[1]

The COVID-19 crisis has shown how countries with higher resources performed better. The lack of redundant surgical resources like ICU beds caused the cessation of non-urgent surgical activities, leading to unmet medical needs.[2] Understanding and planning the available resources for preoperative, intraoperative and postoperative surgical precautions (including ICU beds, drugs, PPE) is thus strategic.[13]

Resource monitoring[13], "just in case" stock strategies, and networking among different surgical departments or healthcare institutions[2] can help to gather the required resources when needed, enabling institutions to plan the investments on a more comprehensive basis.

4. Barbell strategies

Barbell strategies refer to the ability to reduce the exposure to adverse outcomes, e.g. portfolio balancing in finance, which increases the opportunity for gains if the more aggressive investments work, but limits those risks due to the weighing activity. The COVID-19 emergency required surgeons to develop special skills and be trained on the job.[2]

Education is expensive in terms of money and time, but when needed, the outcome can be strategic. Relationships with private healthcare organizations, universities and research centres, leading to open innovation and technological transfer may help. New paradigms in surgical and emergency education could be rethought, even using online and e-sources.[15] Despite the higher management costs, barbell strategies proved to be the winning choice in times of crisis.

5. Hormesis strategy

Hormesis is a term describing the beneficial effects of repeated stimulation or stress that ultimately augments an organism's defenses against potentially harmful influences. Organisms that are exposed to toxins tend to overcompensate in their response. The COVID-19 pandemic has highlighted the need for healthcare and surgical professionals to be trained to deal with disasters, no matter what their specialities are; as surgeons often had to change their usual tasks and approach challenging triage decisions.[16]

Modern clinical education should keep this in mind, not only in medical schools and residency programs but also during lifelong learning plans for surgeons and clinicians in general. Practical educational strategies to help surgeons learn to make difficult triage decisions when resources are scarce may include spending training time in other departments, overseas experiences in resource-poor clinical environments, and whenever possible, employing innovative educational techniques like gaming[15].

6. Balancing feedback loops

Focusing on the best practices and lesson learned[2] might lead to organizational improvements that work better than highlighting the losses and damages caused by a crisis. The COVID-19 crisis showed that a system strongly focused on efficiency creates specializations generating a loop by which more specialization leads to more efficiency. However, when new

challenges are posed, specialization can be tricky. Enhancing open innovation might work as balancing feedback since multidisciplinary experiences are brought together to improve problem-solving. Examples from the COVID-19 era come, for instance, from the case of the Decathlon snorkelling mask converted into a ventilation device for COVID-19 patients or the recently developed open-access project for mechanical lung ventilator based on simple design and easy-to-find components that can be produced anywhere with a rapid manufacturing process. A multidisciplinary approach is also recommended in surgery, as highlighted by experiences like the COVID-19 Bundled Response for Access (COBRA) team of the Massachusetts General Hospital.[17]

The hybrid role of medical doctors has inspired the establishment of new clinical curricula, like the Technical Medicine one for Technical Physicians.[18] The multidisciplinary nature of the various stakeholders involved increases the need for effective knowledge translation tools[19] to allow the transfer, sharing and creation of new knowledge.

Conclusions and future perspectives

The COVID-19 crisis has revealed how many communities across the globe were unprepared for the unpredictable chaos that emerges from black swan events, even when people had engaged in pre-disaster planning.[20] The central lesson learned is that the healthcare systems of many countries were set to handle typical situations but not the chaos of a black swan event. A different approach is required both for allowing the long-term recovery and for preventing similar circumstances from happening again. The adverse outcomes of the COVID-19 pandemic must be the starting point for a reorganization of the entire healthcare system to prevent such deleterious impacts in the future and thereby not to let the crisis be wasted.

Planning for long-term recovery seems a challenging task when there are pressing humanitarian, reorganization, and rebuilding needs to address. The speed and the quality of recovery matter. Applying an interdisciplinary approach, which includes crisis management, to an understanding of resources is challenging, given the complexities of delivering health care in a modern hospital. Still, it is essential for healthcare and surgical systems to overcome the COVID-19 crisis stronger than before, being inspired by an antifragile perspective. Through the application of the above-described management principles, an antifragile standpoint can be successfully applied to surgical departments. A call for an interdisciplinary decision-making process becomes imperative in the current transition phase to prioritize and better distribute resources to allow for full recovery.

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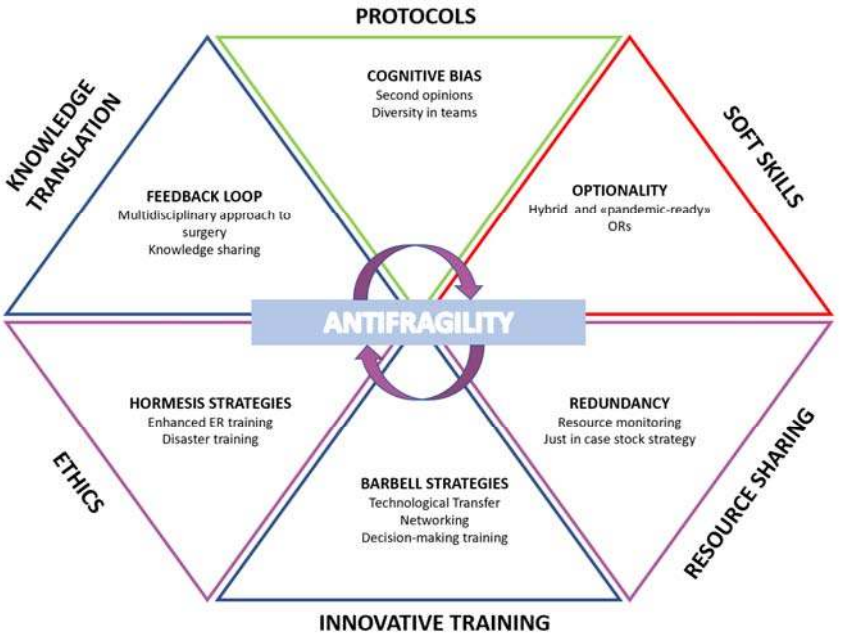

Figure 1. Antifragility in Surgery. A roadmap

Table 1. Antifragility in surgery. COVID-related examples and recommended strategies

Feature	Definition	Covid-related examples	References	Suggested Strategies
Cognitive biases	Errors in the decision-making when the brain simplifies information processing	Lack of protection due to underestimation Discrimination	Garcia-Alamino, 2020 Bonner et al., 2020	New protocols Knowledge sharing Second opinions Multidisciplinarity Diversity in teams
Optionality	Presence of flexible resources that might be activated when needed	Transforming ORs into ICUs	Peters et al., 2020 Liang et al., 2020	Hybrid or pandemic-ready ORs
Redundancy	Extra stock availability	Unredundant surgical resources like ICUs	Liang et al., 2020 Cobianchi et al., 2020	Networking Resource monitoring and sharing "Just in case" stock strategies
Barbell strategies	Reduced exposure to adverse outcomes due to a balanced portfolio	Enhanced training	Cobianchi et al., 2020 Garcia Vasquez et al,. 2020	New paradigms in surgical education Open innovation Technological transfer
Hormesis strategy	Repeated stimulation or stress that ultimately augments an organism's defences against potentially harmful influences	Triage and changes in the job tasks	Brindle at al., 2020	Training in other departments Overseas Training Innovative training (e.g. gaming) Protocols
Balancing feedback loops	Circles of cause and effect that counter a change with a push in the opposite direction: the harder the push, the harder the system pushes back	Multidisciplinarity vs specialization (e.g. MGH COBRA experience)	Albutt et al., 2020	Hybrid MDs Knowledge translation tools