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# Using Systems Archetypes to Understand COVID-19 Impacts on Surgical Systems

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## Introduction

**Background:** The COVID-19 pandemic has disrupted the livelihoods and the way many do things. In healthcare surgical systems, many elective surgeries have been postponed and surgical staffs were redeployed to aid with the COVID-19 response. These changes might result in backlogs of surgeries, resulting in long wait time for surgery and deterioration of patients' condition. This pilot study attempts to use system archetypes to explain and identify mitigation measures arising from key themes that emerged from the qualitative analysis of expert opinions.

**Aim:** To use systems archetypes as a tool to understand the impacts of COVID-19 and interventions in response to it in surgical systems

**Systems Archetypes:** Useful diagnostic tools to help identify the shortfalls of existing measures and

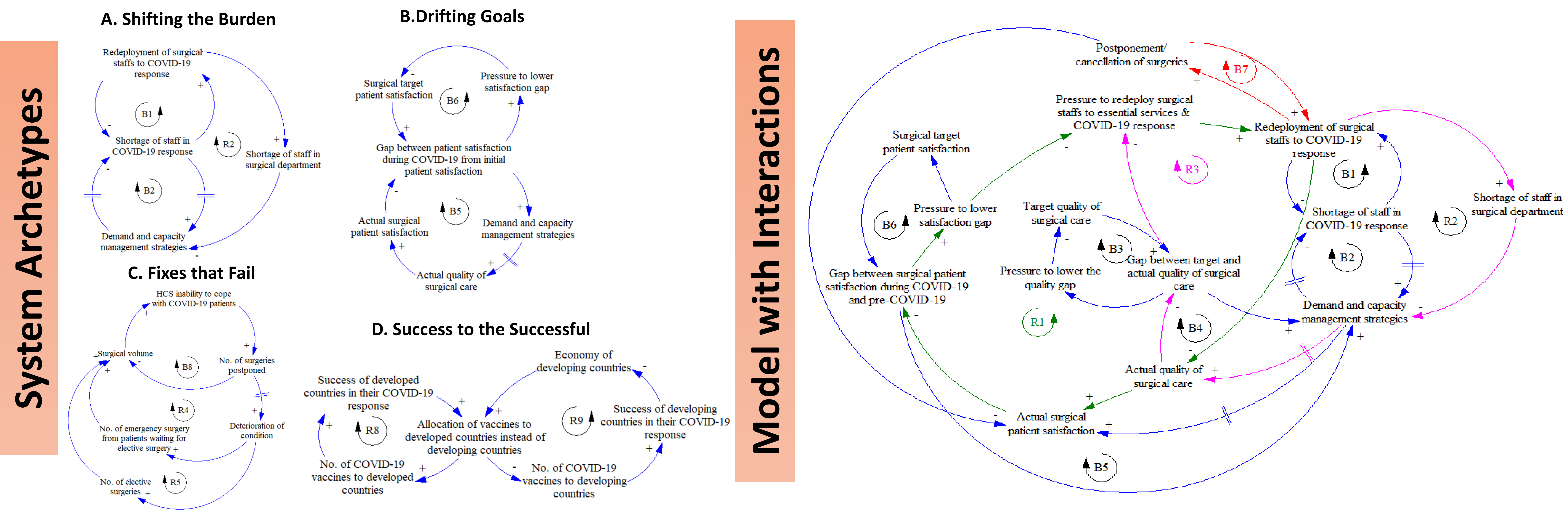
## Methodology

**Systems archetypes** were used to elaborate on the various impacts of the COVID-19 pandemic on surgical services and identify high-leverage interventions that will target the root cause of the problem and create fundamental change. The following archetypes were identified:

- **Shifting the Burden:** A solution that only targets the problem symptom is favoured over a solution that solves the root cause resulting in the problem exacerbating.
- **Drifting Goals:** Perceived inability to achieve a goal results in a lowering of the goal and corresponding performance over time.
- **Fixes that Fail:** A fix which is effective in the short-term creates side effects for the long-term behaviour of the system and may result in the need of even more fixes.
- **Success to the Successful:** Unequal distribution of resources, results in the resource rich party succeeding initially, providing justification for the party to continue receiving more resources reinforcing its success.

The potential problem symptoms were identified through focused group discussions and literature reviews. The main themes were mapped into 4 system archetypes resulting in 5 potential risks. The root cause of the problems was identified and linked back to the problem symptom. Finally, high-leverage interventions or fundamental solution were described.

## Results



**System Archetypes**

**Model with Interactions**

	A. Shifting the Burden	B. Drifting Goals		C. Fixes that Fail		D. Success to the Successful
<b>Issue</b>	Redeployment of surgical staff (B1, B2, R2)	Quality of surgical care (B3, B4)	Surgical patient satisfaction (B5, B6)	Growing backlog of surgeries (R4, R5, B8)	Patient's inability to pay for surgery (R6, R7, B9)	Unequal access to COVID-19 vaccine between developed and developing countries (R8, R9)
<b>Cause</b>	Shortage of staff in COVID-19 response	Shortage of surgical staff	Overloaded healthcare system; Risk of resurgence		Loss of job / lack of coverage	Lack of vaccines in developing countries
<b>Effect</b>	<ul style="list-style-type: none"> <li>➢ Difficult to expand capacity</li> <li>➢ Further worsening the staff shortage problem</li> </ul>	<ul style="list-style-type: none"> <li>➢ Relaxation of healthcare quality standards</li> <li>➢ Erosion of acceptable targets</li> </ul>	<ul style="list-style-type: none"> <li>➢ Reduce patient satisfaction due to surgical postponement</li> <li>➢ Erosion of acceptable targets</li> </ul>	<ul style="list-style-type: none"> <li>➢ Increase in number of surgeries postponed</li> <li>➢ Patients experience prolonged discomfort and deterioration of condition</li> <li>➢ Increase in surgical volume and emergency surgery</li> </ul>	<ul style="list-style-type: none"> <li>➢ Negative coping behaviour</li> <li>➢ Further worsening of their financial situation</li> </ul>	<ul style="list-style-type: none"> <li>➢ Disruption in economic activity</li> <li>➢ Worsening economy</li> <li>➢ Difficult to afford vaccines</li> <li>➢ Worsening the situation</li> </ul>
<b>Mitigation</b>	Take immediate and effective actions in demand and capacity management; Rapidly flexing of total trained healthcare manpower			Tiered postponements and phased resumption strategies	Close monitoring of vulnerable groups; 3M Safety Nets	An ongoing risk that requires global commitment to mitigate

## Conclusion

This paper serves as a preliminary study to demonstrate the use of thematic analysis coupled with systems archetypes in evaluating the impacts of the COVID-19 pandemic on surgical services. Systems archetypes prove to be useful in diagnosing the underlying reason for the various problem symptoms and raise awareness of the unintended effects that might result from some of the current pandemic response measures. This can facilitate forward planning and the development of effective mitigation measures and prevent any avoidable problems toward our fight in COVID-19.