# The COVID trolley dilemma

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**Abstract**

Due to the COVID-19 pandemic, hospital systems have had to drastically reduce the number of surgeries being performed, and in many cases eliminate certain procedures altogether. Restricting our current surgical volume is an attempt to decrease exposures for our patients and healthcare workers while preserving personal protective equipment. As the first wave of this pandemic subsides, hospital systems are faced with prioritizing which surgical services can resume while simultaneously minimizing the disruption of ongoing care for the remaining COVID-19 patients. This is all while ensuring our patient population at home is able to receive appropriate care.

Surgical management of patients is seldom "elective". The effects of general anesthesia, the trauma of undergoing an incision, is a physical breach unwanted by those who can avoid it. However, in the era of limited resources in a pandemic, this word has developed a new meaning. "Elective" – a normally one-dimensional word reflective of whether a surgery is an emergency or not now has an added dimension of temporality. How does one quantify an emergency? Will this patient survive one week, one month, one pandemic without undergoing surgery? In a medical structure now limited by resources, as well as patient and provider exposure, guidelines have been disseminated by multiple bodies. CMS created guidelines to guide surgical management stratified by local COVID-19 disease burden, resource availability, and patient disease severity. Hospitals now function with a new set of perioperative management to limit exposure of healthcare workers.1

Guidelines on surgical management of oncologic care were previously established with years of literature to support and create the NCCN guidelines. Patients requiring oncologic surgery now face a "double jeopardy" of increased exposure to COVID-19 due to frequent interactions with medical facilities, but also worse outcomes associated with delaying surgery. ACS created a set of guidelines relying on anticipated phases of the pandemic:

The patient:

Recently, a patient with plans for elective repair of his ventral hernia presented to the emergency department with a now incarcerated hernia requiring emergent repair. With trenchant fear in his eyes, he told his surgical team of his siblings who had both gotten sick and passed in the last year. His team offered him safety - he had done the right thing to come to the hospital, to be in the care of physicians who knew exactly how to fix the cause of his pain. There was no better place for him than here in the hospital, where everything was now in our hands. As a surgeon, quiescence is as close as one can come to a nonsurgical remedy for fear, knowing that the true resolution comes with the belly of the blade and the curtain of sedation.

He was emergently brought to the operating room and underwent induction of general anesthesia. The circulating nurse was painting his abdomen in betadine when his rhythm suddenly changed from normal sinus to ventricular tachycardia, then fibrillation. Compressions started. A crash cart appeared. The room populated within minutes. He became profoundly hypoxic. After half an hour of ACLS, he finally regained return of spontaneous circulation. His bedside EKG and echo showed antero-lateral infarction with a hypokinetic septal wall consistent with ischemia of his left anterior descending coronary artery – he had suffered a massive heart attack. His road toward recovery now led him to ECMO and the catheterization lab.

Had his elective procedure continued with its normal timeline of pre-operative workup, would a stress echo would have brought his underlying cardiac pathology to light and led to a pre-operative PCI? Would he have been spared knowing a world in which he had chest compressions, cannulation for ECMO, and emergent catheterization to salvage a dying heart? For the determinists, perhaps a world without a pandemic would have still resulted in these events in some other way. But to extend one's hand to a patient in treacherous waters and watch a buoy become an anchor places the weight of the unseen costs of this pandemic on a very personal set of shoulders.

The dilemma:

How long should we continue to delay care to ensure we are doing what is best for all of our patients? This pandemic has proven itself to be a trolley problem incarnate. The trolley problem is a classic thought experiment introduced in 1905 – to watch a train go down the main track and kill five people, or to flip a switch for the trolley to go down a side track, killing only one, but then becoming directly responsible for that person's death. While typical variants include changing the number of people on each track or making one of the possible victims the switchman's family member, the current variant brings a tremendous number of considerations:

• As the train moves forward, the number of people on both the main and side tracks increases, but the actual number at each track is unknown. The mortality and morbidity associated with being in the way of the trolley is also unknown. Some may survive only to be injured, others may

survive with no sign of injury at all.

• There are groups of people demanding that it is a violation of their rights to not be positioned on the main track. They are eventually on the main track and their occupation of resources puts additional people on the side track.

• The governing body supplying funding for the trolley reopens ticket sales for additional passengers, who find themselves on the main track in the path of the trolley. Investing in the trolley also lengthens the tracks, increasing the amount of time before the trolley hits and thus the number of people on either track.

•The tracks do not target isolated groups of people; rather, there is an infinite number of options that will result in morbidity and mortality in both groups to varying degrees.

•The subsequent groups of people on main and side tracks (i.e. second and third waves) are dictated by current decisions with an impact that can be anticipated but not predictable.

The trolley dilemma engages the praxis of our intentions and hopes for our patients. What will come of loosened shelter-in-place orders as economies suffer? How long will our patients wait at home until their elective surgeries become urgent? How long can you treat a patient's cancer with chemotherapy before their cancer becomes unresectable? How will patients be affected by increasing length of stay to avoid returning for follow up visits, or by decreasing length of stay with home monitoring devices and telehealth to decrease exposure? Without a vaccine or widespread testing to sequester patients who have contracted COVID-19, the trolley will not reach its end until everyone has had a pass on the tracks. With data and guidelines changing continuously, it is important to maintain ongoing, transparent discussions of frameworks developed by different institutions to provide the best care for our patients.

Mitigating spread:

To have some understanding of how the tracks of the trolley populate requires an understanding of pandemic modeling. Alabama has been fortunate enough to be trending somewhere between the early and late phase recovery of the ACS guidelines. The decision to start caring for patients who have been getting sicker at home is based on an incredibly complicated trolley in which the focus is on damage control, both actively and in anticipation. Though the current burden of the pandemic is different in every state, eventually each will need to determine whether it is an appropriate time to resume "elective" cases, as well as tier which cases are to be resumed at which time. As the ACS described, "understanding both the local facility capabilities (e.g., beds, testing, operating rooms [ORs]) as well as potential constraints (e.g., workforce, supply chain), while keeping an eye on potential subsequent waves of COVID-19 will continue to be important."

Due to strict measures, both institutionally and on a policy level, the spread of COVID in Alabama has maintained a steady state for two weeks, as seen by a Ro value consistently around 1 as calculated by rt.live and shown below. Ro reflects the infectivity of the virus – the general concept is simplified and described below:

References:

1. M. Al-Balas, H.I. Al-Balas, H. Al-BalasSurgery during the COVID-19 pandemic: a comprehensive overview and perioperative care