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Emergency Restructuring of a General Surgery Residency Program During the Coronavirus Disease 2019 Pandemic
The University of Washington Experience

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Seattle, Washington, is an epicenter of the coronavirus disease 2019 epidemic in the United States. In response, the Division of General Surgery at the University of Washington Department of Surgery in Seattle has designed and implemented an emergency restructuring of the facility's general surgery resident care teams in an attempt to optimize workforce well-being, comply with physical distancing requirements, and continue excellent patient care. This article introduces a unique approach to general surgery resident allocation by dividing patient care into separate inpatient care, operating care, and clinic care teams. Separate teams made up of all resident levels will work in each setting for a 1-week period. By creating this emergency structure, we have limited the number of surgery residents with direct patient contact and have created teams working in isolation from one another to optimize physical distancing while still performing required work. This also provides a resident reserve without exposure to the virus, theoretically flattening the curve among our general surgery resident cohort. Surgical resident team restructuring is critical during a pandemic to optimize patient care and ensure the well-being and vitality of the resident workforce while ensuring the entire workforce is not compromised.

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Coronavirus disease 2019 (COVID-19) has emerged as a global pandemic. As of March 31, 2020, there have been more than 850 000 confirmed cases and an estimated 42 000 deaths worldwide.[1] The number of COVID-19–associated fatalities in the US now exceeds 3800, and 210 deaths have occurred in the Seattle, Washington, area,[2] making it an epicenter of the outbreak in the US.

For health care professionals on the front lines of care, it is only a matter of time before the workforce is affected by illness. At the University of Washington, in Seattle, we anticipate that some of the surgery resident house staff and faculty will eventually contract the virus. The current recommendation from the Centers for Disease Control and Prevention is 14 days of self-isolation for any confirmed COVID-19 infection that does not require hospitalization.[3] The Washington State Department of Health mandates that anyone who had close contact with a patient with confirmed COVID-19 while not wearing proper personal protection equipment self-isolate at home for 14 days.[4] This has the potential to put incredible strain on the health care system by limiting the number of clinicians available for patient care.

In an attempt to mitigate this scenario, the Division of General Surgery at the University of Washington Department of Surgery has implemented an emergency restructuring of our general surgery resident clinical teams. Our goal has been to minimize exposure to COVID-19 and protect our surgical resident workforce. To do this, we have limited the number of surgery residents with direct patient contact and have created independent resident physician teams that are isolated from one another, to create physical distancing in case of contagion among residents (**Box**).

Box. The Key Elements for a Functional Restructuring of a Surgical Residency During a Pandemic

Key Points for a Successful Restructuring

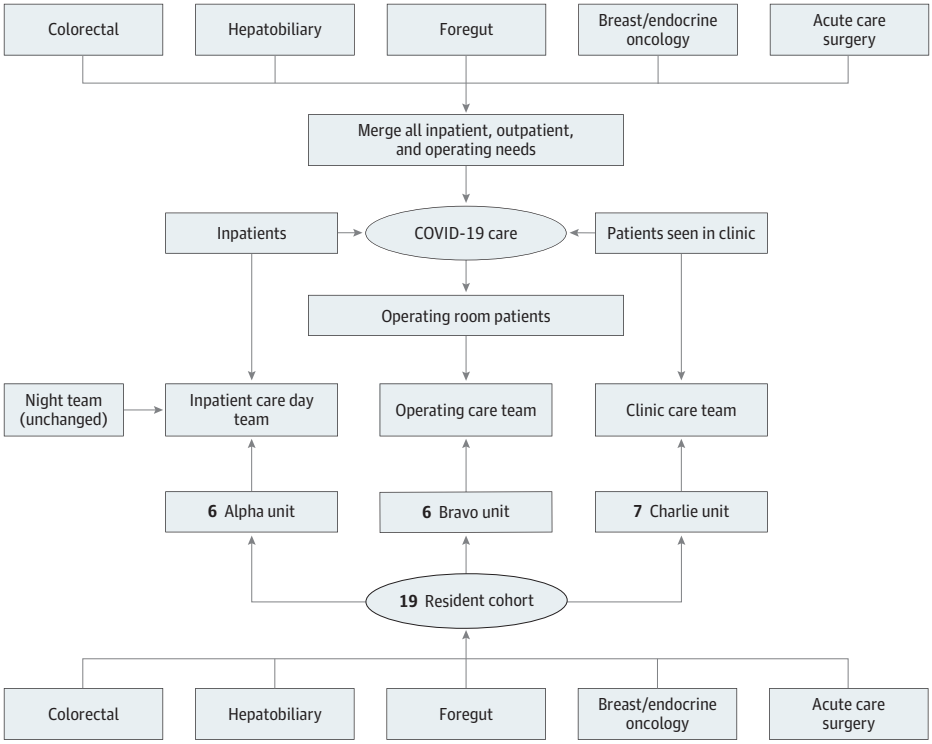
Physical Distancing
- Interteam isolation
- Intrateam distancing
- Virtual handoffs and digital communication
- Specified workstations
- Virtual rounding
- Assigned bedside rounds

Team Structure
- Larger teams
- Functionally independent teams
- Capability to withstand member loss
- Residents of all levels per team

Macrostructure
- Supplement members affected by illness or subject to self-isolation with research residents
- Fluidity to deconstruct remaining large teams and reconstruct smaller teams as needed
- Inclusion of at-home residents in the workforce

Conceptual Points
- Resident and faculty buy-in
- Swift conception and assembly
- Committee for the triaging and implementation of revisions

Figure 1. Diagram of Restructuring



Changes were made to merge different services into an inpatient daytime team, an operating team, and a clinic care team. (The in-house nighttime team structure was not changed.) This Figure illustrates the distribution of the resident workforce to these clinical teams. COVID-19 indicates coronavirus disease 2019.

We began by critically analyzing 3 factors at each of our hospitals: the clinical surgical resident cohort, the clinical workload, and mandatory staffing needs. The clinical surgical resident cohort is the entire available general surgery resident workforce at a hospital at a single point; this provides us with the total number of residents at each level who can be deployed strategically in an emergency. The clinical workload consists of the entire inpatient, outpatient, and operative demands for a given week. Mandatory staffing needs are the subset of the clinical workload that requires residents for effective and safe patient care.

Our previous team structure at one of our hospitals, the University of Washington Medical Center, consisted of 5 subspecialty general surgery teams with a mean of 4 residents each. Thus, any prolonged absence of even a single resident, as would be required for COVID-19 infection, would affect that entire team's ability to function safely and efficiently. However, the creation of larger teams would allow more resilience to team member absence. We thus proceeded to deconstruct the previous 5 daytime subspecialty teams and create 3 new larger teams called Alpha, Bravo, and Charlie. Each new team consisted of residents of all ranks, complemented by nurse practitioners. The clinical workload and mandatory staffing needs were similarly divided into 3 patient care domains: inpatient, operative, and clinic. A fourth facet of clinical care, the night care team, was kept intact and staffed by in-house night-float junior residents and a home-call senior resident.

Team Structure

We assigned the new teams to the patient care domains, aligning with our workload and staffing needs (**Figure 1**). Recognizing the need to isolate each care team to optimize physical distancing, the Alpha, Bravo, and Charlie teams were assigned to the following clinical duties, rotating every 7 days (**Figure 2**).

Inpatient Care

This team performs all inpatient clinical duties, including daily rounds, new consult staffing, admissions and discharges, and documentation. The senior resident on this service leads virtual rounds using medical record reviews of the patients and then assigns team members for bedside rounds based on clinical scenario. This minimizes the number of clinicians entering each patient room and eliminates groups of residents rounding in the traditional model. The senior resident also assigns individual residents to evaluate new consultations, with a goal of minimizing patient exposure for each individual resident.

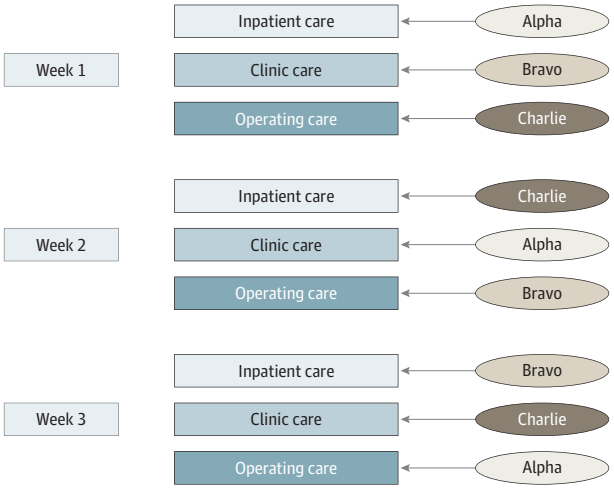
Operating Care

This team coordinates the operative care of patients and participates in the operations. These residents present directly to the operating room, perform the operations assigned, and then sign out operative patients to the inpatient care team. They do not visit other areas of the hospital or interact with other patients or clinicians. They are excluded from the resident team workroom to limit cross-contamination of teams.

Clinical Care

This team participates in outpatient clinics as needed. The University of Washington has adopted telehealth for most clinic visits during this time, and thus resident staffing in a clinic is rarely needed. As such, members of this team are placed into home-call status to

Figure 2. Rotating Schedule of Alpha, Bravo, and Charlie Units Among the 3 Care Teams



isolate from the general population in the hospital, but they are available for clinic coverage or backup inpatient coverage as needed. They participate in daily virtual rounds and are available to input orders from home as needed.

Additional Insights

We elected not to modify our existing junior resident night-float structure; however, we modified our senior overnight home call to be made up of members from the inpatient care team. As such, these senior residents do not have overnight call duties during the other 2 weeks (during operating care and clinic care), thus minimizing overall time in the hospital. This also maximizes continuity of patient care, because the senior residents from the inpatient team care for the same patients overnight on call. The junior night-float structure was kept intact, because currently it is staffed by 2 junior residents who, except for times of handoffs, do not come into contact with any other residents. We have transitioned to virtual handoff methods, using technology to further limit resident interaction between the inpatient and night care teams.

There are certain factors that must be considered to create an effective restructuring during this pandemic. The teams must work in isolation from one another to encourage physical distancing, both between the different teams as well as within each team in the hospital setting. The 3 teams would theoretically never physically interact, thus preventing the spread of contagion from one team to another. Furthermore, we specified a computer workstation for each resident on the inpatient care teams (day and night) for the duration of the week, with a distance of 6 ft (2 m) to the next work station to provide these team members with as many aspects of physical distancing as possible while still in the hospital. The use of Health Insurance Portability and Accountability Act–compliant texting applications and other methods of digital communication between team members is critical to ensure safe transition of patient care while avoiding face-to-face contact. Moreover, the teams must be large enough to support an entire spectrum of patient care, whether it be in the inpatient, operating, or clinic settings. The larger size of these new teams also allows a buffer for the temporary loss of residents to infection, while maintaining overall functionality and self-sufficiency of the teams. Another important point to note is that as our outpatient clinic and elective operations workloads decrease, the clinic care team has been set up to functionally support the inpatient care team from home. This allows for a system that supports physical distancing while using the resident workforce that is not in house.

In the case of residents requiring self-isolation, we do not yet have adequate experience to know the outcome this will have on the clinical care teams. Since these teams are larger than the typical subspecialty teams at our institution, we anticipate that the workflow will be minimally affected, in that each larger team can better absorb the temporary loss of residents. We estimate each of these larger teams can function with a minimum of 4 residents. In the scenario in which an entire team is lost, our plan is to create 3 new teams from the residents on the remaining 2 teams and fortify them with research residents. Once the self-isolation period is over, a new cohort of residents would be ready to rejoin the workforce. We used the framework described herein to restructure the general surgery resident teams at the other hospitals within our system, customized for their specific needs.

It is important to note that although we went through several iterations and edits to these plans, we implemented this model within 48 hours of conception. Given the time sensitivity of the current state of emergency, we were forced to act quickly and decisively. Our plan is not perfect or a one-size-fits-all solution to the current crisis. However, we felt it wiser to implement *a* plan and make revisions on an as-needed basis rather than deliberate too long and risk compromising our surgical resident workforce.

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