

Resident Education and Wellness: A Strategy for Future Pandemics

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Abstract

Background: The Coronavirus Disease 2019 (COVID-19) pandemic presents a novel challenge to modern healthcare systems and medical training. Resource allocation and risk mitigation has dramatically affected resident training with the subsequent cancellation of elective procedures, 14-day isolation recommendations, and social distancing requirements. To combat the unique challenges to resident education and wellness, academic leaders must develop new strategies to maintain a healthy, competent residency program.

Methods: Our institution implemented a revolving 3-Team system. While the “Inpatient-Team” delivered direct care to orthopaedic patients, the “Back-up Team” and “Quarantine-Team” managed the telemedicine virtual clinic and education-wellness strategy, respectively. The education strategy included active learning methods on virtual platforms, junior resident-specific sessions, and subspecialty-interest panels. Research teams were built and rapidly deployed virtually for large scale retrospective studies. For the wellness strategy plan, our prior resident “family” organization (peer support group) was supplemented by friendly interdepartmental competitions and virtual faculty social hours. In order to evaluate the effectiveness of our implemented strategies a blinded survey was completed by the residents affected by the pandemic.

Results: Our 3-Team system allowed for the delivery of safe, high-quality patient care while optimizing resident education, research, and wellness. One hundred percent of residents felt they had the tools necessary to protect themselves throughout the pandemic and 94% felt that program leadership cared about their wellness and safety. In terms of our education and wellness strategy plan, the efficient use of technology led to both improved virtual education outside of the hospital and intentional wellness opportunities despite social distancing restrictions. Eighty-eight percent of residents felt the program was able to offer valuable educational opportunities despite the pandemic. Overall, 76% of residents did not feel the COVID-19 pandemic negatively impacted their training or preparedness for their career, however 75% of PGY4’s felt they missed important subspecialty exposure and 50% felt that it negatively impacted their training.

Conclusions: The COVID-19 pandemic is unlikely to be the last challenge the medical training community faces. Utilization of virtual platforms for patient care, education, research, and wellness grew out of necessity in this pandemic, yet represents an opportunity for lasting improvement with re-entry.

Background

The COVID-19 pandemic created unprecedented challenges to resident education, wellness, and training. While safety and high-quality patient care remain the primary mission, the cancellation of elective procedures¹, redeployment of healthcare professionals², and social distancing restrictions³ created potential barriers to the education of trainees at all levels. Nonetheless, obstacles breed ingenuity. To adapt to this novel situation, several training programs implemented a rotating, two-team system

(“Home” and “Hospital”) with the addition of virtual learning platforms, independent study, and faculty mentorship^{4,5}. Providing continuous patient care in addition to remote resident education, this system allows for preservation and protection of the workforce.

Although the COVID-19 pandemic is at the forefront of many leaders’ minds, it is not the first, nor the last, infectious pandemic to challenge our healthcare training system⁶. “Declare the past, diagnose the present, foretell the future,” is an apt quote from Hippocrates that highlights what we learn from this experience can influence future responses to similar situations⁷. As such, flexible leadership at all levels of training are required to develop an adaptive plan to both care for patients and train future leaders of healthcare⁸. Education and wellness of residents remains a cornerstone for our healthcare system⁹. The purpose of this paper was to share one institution’s resident education and wellness strategy while providing continuous care at a Level-1 trauma center.

3 Teams, 1 Mission

Providing safe, high-quality patient care with optimization of resident education and wellness remains the mission of our program, regardless of a pandemic. Accomplishing this task in the setting of the Centers for Disease Control and Prevention’s (CDC) recommendations for social distancing and a two-week self-quarantine¹⁰, however, required restructuring for risk mitigation as well as the implementation of protocols to ensure the safety of physicians and patients alike. While similar residency programs adapted a 2-team system^{4,5}, it was felt that a 3-team strategy provided an option that led to even less exposure risk for residents and faculty. This system gave all members a 14-day period away from patient care for symptom surveillance which is beyond the estimated range for symptom presentation¹¹. Countries affected early by COVID-19 demonstrated a nearly 20% infection rate in healthcare workers¹². Since widespread testing remains in short supply, the safest way to ensure a healthy workforce is an appropriate quarantine period. Therefore, three physically separate teams composed of faculty and residents were formed to function as independent pods with all levels of training present. To accomplish the mission, these teams would rotate weekly between three different roles: Inpatient-Team, Back-up Team, and Quarantine-Team (Fig. 1).

The Inpatient-Team was tasked with managing all acute inpatient care. We continued our night float call system with one junior resident covering all overnight consults. To ensure the safety of both the Inpatient-Team and patients, residency leadership seamlessly implemented a virtual checkout which occurs each morning in accordance with Accreditation Council for Graduate Medical Education (ACGME) standards¹³. Virtual checkout utilized a Health Insurance Portability and Accountability Act of 1996 (HIPAA) compliant platform (Microsoft Teams, Microsoft, Redmond, WA) to share radiographs, advanced imaging, and relevant clinical photographs with members of the care team to include Attending orthopaedic trauma faculty, subspecialty faculty members, trainees of all levels, advanced practice providers, and nurse leaders. In addition to the clinical utility of a virtual checkout, the process allowed us to continue to provide consistent feedback and resident education, while adhering to physical distancing rules.

Including the operating room orthopaedic nurse manager allowed this to further serve as the daily TeamSTEPPS¹⁴ huddle with review of case priority, special concerns, surgical plan, equipment needs, and case duration. Inclusion of subspecialty faculty members in virtual checkout allowed efficient triage and transfer of care for isolated injuries to Ambulatory Surgery Centers (ASCs) thereby limiting the impact on our tertiary/quaternary center. Further, technology was leveraged to conduct virtual Emergency Department (ED) consults to limit exposure to residents performing consults on straightforward musculoskeletal injuries. In addition, program leaders worked directly with the ED to streamline the process for direct admission of certain operative injuries like hip fractures.

While system leadership launched several initiatives to prevent shortages of personal protective equipment (PPE) like respirators and gowns, face shields for orthopaedic procedures were difficult to obtain and maintain. These are of particular importance in orthopaedic surgery due to the splash and aerosol created by common musculoskeletal techniques and tools¹¹. Additionally, this was a major concern for our junior residents managing consults in the ED and trauma bay. To fill this gap, program leadership partnered with engineers from Hendrick Motorsports (one of the top NASCAR racing teams) to repurpose 3D printers and laser cutters to create high-quality, improvised PPE in the form of face shields¹⁵. Approval for the use of these shields was obtained through the appropriate channels to ensure safety and consistency. Within days, prototypes were given to the operative room (OR) team and residents working in the ED; thereafter, shields were available to all orthopaedic staff and offered to other surgical services. Open communication and rapid response helped to not only provide safety to our teams, but also keep the focus on patient care. An anonymous survey (Supplementary File 1) revealed that 100% of residents felt that these strategies gave them the tools necessary to ensure their safety while delivering high quality patient care; moreover, 94% felt that it demonstrated program leadership's care for their safety and well-being.

While the Inpatient-Team managed all acute inpatient care for the orthopaedic service, the Back-up Team served as a ready force to replace infected team members if necessary. In addition, the Back-up Team ran the virtual clinic. The current COVID-19 pandemic has served as a catalyst for integration of telemedicine for outpatient virtual clinics, and telemedicine will likely be incorporated into more practices in the future¹⁶. This 3-team system not only ensured education on telemedicine logistics, but limited exposure and risk for practitioners, staff, patients and their families while still providing quality care. While the Quarantine-Team remained out of patient contact, they took the lead on virtual education and wellness initiatives. Taken together, after spending one week as the Inpatient-Team delivering high-quality patient care, residents and faculty alike spent a total of two weeks outside of the hospital to focus on education, research, wellness, and virtual clinic.

Overall, 76% of residents surveyed felt that the forced adaptations brought on by the Covid-19 pandemic including cancellation of elective surgery and subspecialty rotations due to the COVID-19 pandemic did not negatively impact their training or preparedness for their career. While most felt it did not negatively impact their career, 53% of surveyed residents did feel that they missed important subspecialty exposure. Interestingly, of PGY4's surveyed, 75% felt that they missed important subspecialty exposure and 50% felt

that the COVID-19 pandemic did negatively impact their training, indicating that those in the midst of deciding upon career and fellowship opportunities felt more negatively affected than junior residents or those already matched into fellowship.

Virtual Learning: Quality Over Quantity

To abide by the need for social distancing while maintaining connection for clinical care and education, many training programs have adapted to using a variety of virtual learning platforms^{4,5,17}. Before the pandemic, our institution utilized a 45-minute lecture each morning taught by faculty, with active audience participation. Aligning with the theory of spaced repetition¹⁸, this lecture series changed subspecialty topics daily. Moreover, the literature has shown that a majority of residents perform better on their in-training exam with self-directed, practice questions and web-based learning^{19,20}. Previously, lectures and educational sessions were primarily directed and facilitated by faculty members. While many of the primary pandemic changes required for our academic curriculum were logistical in nature, this shift also provided opportunity for residents to step into leadership roles to drive our education mission. Critical elements of the virtual lecture series were resident involvement in topic selection and having a resident moderator assigned to each lecture. The resident moderator introduced the speaker and facilitated the discussion following the lecture, including managing the questions submitted by the group. Our institution implemented the regular use of Microsoft Teams²¹ and Zoom²² for daily lectures and social meetings, respectively (Fig. 2). This presented some challenges to ensure that all faculty were facile with this technology; however, the virtual platform quickly enhanced learning as morning lecture times naturally increased from 45 minutes to 1 hour to accommodate the increase in audience participation. Part of the moderator's responsibility was to troubleshoot connectivity issues for speakers and participants while maintaining the "chat" which was utilized to submit questions to the presenter throughout the lecture. Moreover, the ability for independent study with practice questions naturally increased with two weeks outside of the hospital. The team system also created a platform for small, team-based learning which was integrated into the weekly schedule and included journal clubs, team-based quizzes, and "check-ins" (Fig. 3). Meanwhile, sharing of literature resources and questions via the chatroom enhanced the learning on the virtual platform. These lectures were also easily recorded and stored in a central location available for later review. While the quantity of mandatory lectures remained the same for residents, the quality of the education was enhanced due to the added value of more faculty "tuning-in", presumably due to less busy clinical schedules and ease of access to the virtual platform. Anonymous survey demonstrated that 94% of residents felt that mentors were as or more accessible due to the electronic platform.

In addition to the "virtual" lecture series, residents worked in conjunction with faculty and fellows to develop sub-specialty learning opportunities on a Zoom platform. These voluntary virtual meetings provided low-stress settings for active learning that supplemented education being lost by the abrupt decrease in elective operations. Using "flipped classroom"²³ and "debate" techniques, many of these weekly meetings were more high yield to residents in addition to fostering relationships with subspecialty

fellows and faculty²⁴. The foundation of a “flipped classroom” style rests upon the resident doing most of the preparation for a topic in a self-directed learning style with a first pass through the material before meeting with a faculty member to discuss the topic. For example, one evening a week became the “Hand Topic Debate Night” with the most recent debate being treatment of a patient with distal radioulnar joint (DRUJ) arthritis. After the winning fellow and resident from the previous week’s debate present background information on DRUJ arthritis, each fellow and resident delivered a 5-minute argument with literature to support their stance. Faculty on the conference call act as judges of the friendly competition in addition to providing their clinical knowledge with the various arguments.

One of the most notable evolutions developing from social distancing, halting of elective surgery, and implementation of our 3-Team strategy was the robust response from faculty to participate in education and mentoring. In an era where orthopaedic mentoring has its challenges due to clinical restraints²⁵, both the additional time afforded by changes to clinical care and the use of virtual platforms have allowed faculty to participate in ways that busy clinical practices often prohibit. One example is a panel of over twenty of our faculty on “Choosing a Subspecialty” for junior residents (Fig. 2). Group panels are not a novelty by any means. To be able to see a panel of distinguished faculty in every specialty in “one place” and for the sole benefit of the learners, however, was not something that was originally thought to be logistically possible. Between the lighthearted banter and pearls of wisdom across generations of experience, many residents found it to be incredibly helpful for both education and wellness. Faculty also noted that the panel was refreshing and allowed people to interact who typically do not. These opportunities are impossible with the normal clinical volume experienced at our institution; nonetheless, it highlights the ability for a virtual platform to accommodate such an event in the future and has led to more discussions between faculty and residents on how to integrate more mentorship and career education.

While many online learning webinars have been made available to trainees by subspecialty societies^{26,27}, they tend to use didactic lecture methods due to larger audiences; moreover, these education sessions tend to cover more advanced topics. To provide a more level-appropriate and active learning session, residents on our Quarantine-Team organized a weekly “Junior Resident Learning Conference” series for one evening a week (Fig. 3). Using a flipped classroom technique²³, these voluntary sessions on a Zoom platform are moderated by one of the chief-residents and one faculty member. Social beverages are recommended. Topics are submitted by the junior residents with an objective to discuss basic concepts of orthopaedics or demystify more advanced topics. In coming weeks, topics include discussions on distal radius reductions/fixation, intra-operative imaging, and pelvic osteotomies.

We also took advantage of this time to augment our residents’ research experience and productivity by launching several retrospective studies utilizing what we call the “tiered-team research” approach. This approach allows multiple residents to collaborate on retrospective studies with another resident leader. Data collection occurs more rapidly while facilitating near-peer mentorship in research. This amplification of data collection power allows the building of databases that are the foundation for multiple papers that will include all the collaborating resident members of the tiered-team.

With the newfound time available to residents and faculty during the COVID-19 pandemic, the ability to educate residents in the operating room or clinical setting has been diminished, but technology has expanded the type of education available to residents. To keep these educational experiences efficient and not infringe upon independent work, we recommend focusing on quality of the content over quantity. Continuing our daily lecture series on a virtual platform not only brought the entire residency together each morning, but also fostered an environment for working on collaborative research and subspecialty interests. Despite the educational challenges presented by the Covid-19 pandemic, 88% percent of our residents felt that the strategies implemented provided valuable educational opportunities and 88% did not disagree that these were as or more valuable as “in person” education present prior to the pandemic.

Family And Wellness: Competition Breeds Resilience

In his leadership book, *Good to Great: Why Some Companies Make the Leap...and Others Don't*, Jim Collins' research showed the link between a great company and a great life rests upon spending “the vast majority of our time with people we love and respect – people we really enjoy being on the bus with and who will never disappoint us – then we will almost certainly have a great life, no matter where the bus goes.”²⁸ The nature of medical and surgical training requires residents to spend more waking hours with their co-residents and faculty than anyone else, and the literature has shown that strategies incorporating wellness improve mental health and quality of life^{9,29,30}.

To support an environment conducive for respect and camaraderie, our training program organizes residents into “families” that consist of one member from each training level when starting as an intern. These families are randomly based on last name but provide an established support system for residents throughout their time in training. The families are the same throughout the 5 years, with a new intern replacing the graduating chief each year. These families have been great sources for peer-mentorship and wellness outside of the hospital setting. More importantly, these families have withstood the test of the COVID-19 pandemic as many continue to have virtual check-ins, provide homes for those not wanting to expose family members, and coordination of outdoor activities that abide by social distancing recommendations. With the mental health strain placed on residents during this pandemic³¹, we suggest incorporation of a wellness strategy that provides a sense of belonging to counter the physical isolation that can be experienced in pandemics in addition to creating an environment of responsibility and accountability amongst your teams.

Orthopaedic surgeons carry a stereotype of brute strength and quick wit³². To put this claim to the test, our general surgery colleagues proposed a two-week “Wellness Competition” consisting of both fitness, social, and nutrition components (Fig. 4). Using a public Instagram account platform³³, each residency team was able to share their various members' activities. In terms of logistics, a member of the current Quarantine-Team was delegated the job of tracking points and sharing stories of various accomplishments by their co-residents. Comedic posts were encouraged. Attendings also made it their joint mission with the residents to dominate the Wellness Competition by completing various wellness

activities and sharing photo evidence. Feedback showed this wellness competition to be a morale boost for both residents and faculty. Despite being outnumbered by seven residents, the orthopaedic surgery residency dominated the competition by over one thousand points. More significantly, this wellness competition can be adapted by other departments to be used regardless of pandemic restrictions in the future.

Before the impact of COVID-19 on healthcare, physician burnout was a public health crisis attributed to issues affecting their work lives, organizational support structures, and leadership cultures³⁴. Residents are not immune to this burnout³⁵. As such, the uncertainty and changes imposed by the COVID-19 pandemic implore leaders to consider drafting a wellness strategy. In addition to increased availability of mentors for individual calls/virtual meetings, scheduled “Adult Learning Sessions” with faculty quickly became popular at our institution. Topics ranged from “Tips for Cooking Biscuits and Gravy” to “Which Colleague would you want to be stranded on an Island with?” Having approachable leadership that provides this sort of social support can be reproduced by other training programs, and it speaks to the strengths of a wellness strategy that cultivates the resilience to enjoy residency “no matter where the bus goes.”

Conclusions

The situation and challenges met by the medical training community are dynamic, but history has a way of repeating itself. In the face of the COVID-19 pandemic, utilization of virtual platforms for patient care, education, research, and wellness grew out of necessity, yet represents an opportunity for lasting improvement with re-entry to promote safe, high-quality patient care with optimization of resident education and wellness.

List Of Abbreviations

COVID-19 – Coronavirus Disease 2019

CDC - Centers for Disease Control and Prevention

Accreditation Council for Graduate Medical Education – ACGME

HIPAA – Health Insurance Portability and Accountability Act

PPE – Personal Protective Equipment

OR – Operating Room

DRUJ – Distal Radioulnar Joint

Declarations

Ethics approval and consent to participate

Institutional Review Board approval was obtained for this study and a waiver of consent was obtained. The IRB file number is 04-20-30E. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

JRH reports personal fees from Smith & Nephew (speaker's bureau) and Globus Medical (consulting). All other authors declare that they have no competing interests.

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Author's contributions

SLP, JEJ, and AMB, led efforts to implement educational programming as well as captured and interpreted data, reviewed the literature, and wrote and revised the manuscript. RBS, JRH, and SHS are responsible for conceptualizing the plan to capture and disseminate information about our education strategy during COVID-19 and drafted and critically revised the manuscript. JCP and BPS made significant and critical contributions to the development and implementation of the topic of the paper, and participated in the interpretation of data as well as critical review of the manuscript.

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Figures

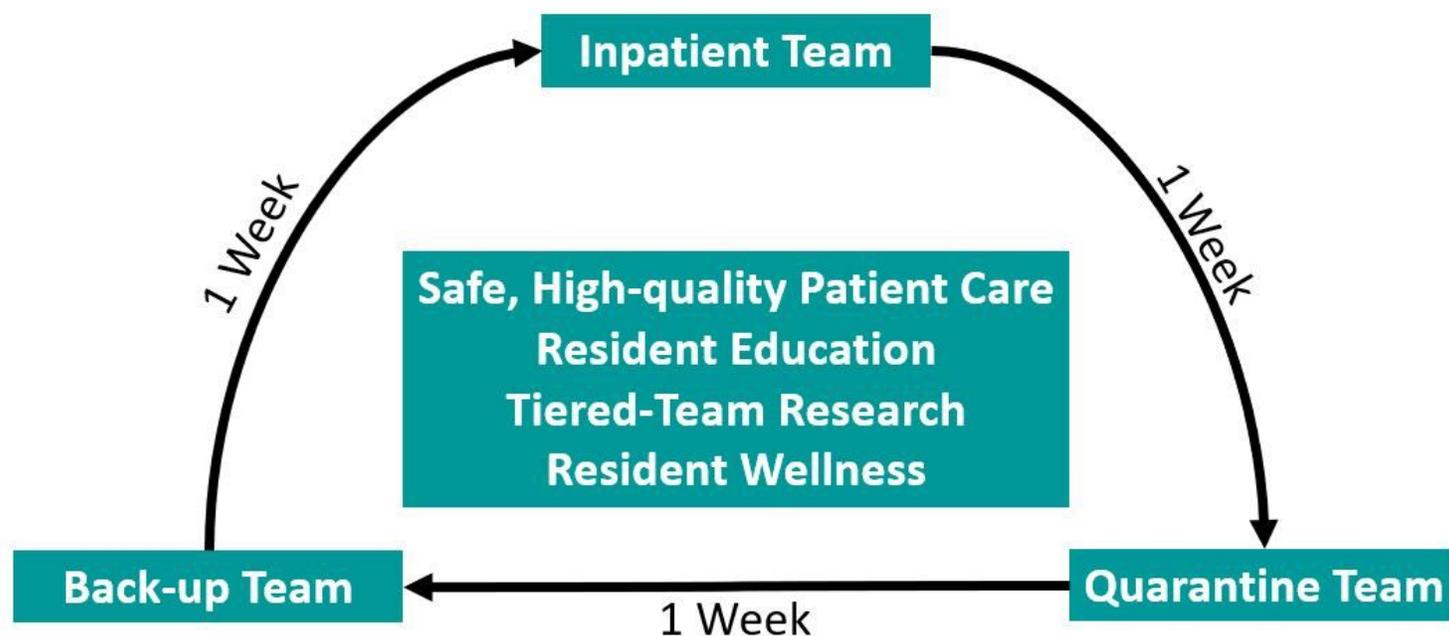


Figure 1

3-Team but 1 Mission Risk Mitigation Strategy. Having both residents and faculty assigned to one of three teams allows for excellent patient care for 1 week while adhering to an appropriate 2-week quarantine observation.

A



B



Figure 2

Orthopaedic Family. Picture of zoom meetings for an ortho family check-in (A) and a subspecialty faculty panel (B).

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0700-0800	*40-year History of <u>Cementless</u> Stem Fixation (Dr. Mason)	*Trauma Conference: Team 2 Case Review	*Posterolateral Corner Management (Dr. Moorman)	*Pediatric Femur Fractures (Dr. Brighton)	*Team-based learning		
0800-1200	Run/Workout	Independent Study	Run/Workout	Independent Study	Run/Workout	Cook/Family Brunch on Zoom	Rest/Virtual Church Service/ Meditation
1200-1300	Lunch	Tiger King on Netflix	Lunch	Tiger King on Netflix	Lunch		
1300-1400	Sports Fellow Lecture	Lunch	Independent Study	Lunch	Independent Study		
1400-2000	Independent Study	Run/Workout	Research Meeting	Mentor Meeting	Ortho Family Meeting		
2000-2200		Hand Topic Debate	“Choosing a Subspecialty Panel”	Resident Check-in	Adult Learning Session	Junior Learning on TKA: “Basics and Bourbon”	

* = Indicates Mandatory

Figure 3

Example Week of Wellness and Education.



I wonder what the RULES are...

BEGINS: 4/06/2020
ENDS: 4/20/2020

All residents should follow:
CMC_Surg_ResidentWellness
AND
CMC_Ortho_ResidentWellness

1. Take selfie of your wellness activity, or it doesn't count
2. Tag your respective insta acct in your post OR direct message
3. It will get posted to our PUBLIC account so that both groups can follow (aka humorous posts appreciated)
4. Final tally to be posted daily by respective accounts

Exercise Class: 2pt/30min
Walk: 1pt/mile
Run: 1pt/mile
Bike: 1pt/4mile
Home cooked meal: 2pts (1 meal/day max)
Practice Questions: 1pt/5Q
Rekindle w family/friends: 1pt/session

LOSERS - the entire team will have to wear AND PAY FOR personally designed pins in promotion of the winning team

Figure 4

Interdepartmental Wellness Competition. Orthopaedic surgery vs. General Surgery Wellness Competition Rules on public orthopaedic residency program Instagram account.

Supplementary Files

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