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significant associations with psychological distress were found for the presence of multiple co-morbidities in staff, direct involvement in COVID-19 patient care, receiving a quarantine order, and redeployment outside normal professional boundaries (Table 1). Insomnia, based on the first item of the GHQ-12, was reported by 45 participants (16.7%). Redeployment to work outside areas of usual clinical practice was reported by 41.9% of participants. The majority (59.3%) perceived their workload to be similar to pre-pandemic levels. Just 12.2% of participants had family, friends, or colleagues diagnosed with COVID-19. Formal PPE training was received by 256 (94.8%) participants with 149 (55.2%) being confident in correct usage and their ability to protect from infection. Situations where recommended PPE was unavailable were encountered by 46 (17.0%). Risks of getting infected (83.6%) and infecting family members (78.0%) were the top two concerns (Supplementary Appendix 2).

This study shows significant psychological distress amongst anaesthesiologists and nurses working in ICUs in the context of the COVID-19 pandemic. While lower than reported in the outbreak epicentre in China, which reported depression in 50.4% and anxiety in 44.6% of healthcare workers, we found a two-fold higher prevalence of anxiety and up to three-fold higher prevalence of depression than reported amongst general healthcare workers in Singapore and Italy during this pandemic.^{3,4,7} Many would regard even pre-pandemic work in such high-acuity environments as stressful and emotionally exhausting, thus potentially accounting for the differences compared with general healthcare workers. Indeed, pre-pandemic studies of occupational stress identified similar levels of anxiety and stress (29.0–35.7%) in ICU physicians and nurses using the GHQ-12.^{5,8} Thus, the contention that COVID-19 has provoked all the elements of psychological distress in respondents still requires testing.

Our study has limitations. Socio-economic status, which may influence outcomes and intervention planning, was not assessed. Neither a pre-crisis baseline nor follow-up to assess the temporal changes in psychological distress was available. Being a single-centre snapshot, further studies in other populations are necessary for generalisability. Lastly, clinical interviews by a psychiatrist would have been ideal. Nonetheless, we identified risk factors for psychological distress that may be useful for identifying at-risk individuals, and respondent concerns of the infection risk, adequacy of PPE, and redeployment outside normal professional boundaries are still issues that need to be addressed.

The psychological distress prevalent amongst providing anaesthesia and intensive care providers during this pandemic necessitates policies for screening of at-risk

individuals and adoption of early psychological support interventions for affected staff.^{9,10}

Declarations of interest

The authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bja.2020.07.005>.

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Trial under fire: one New York City anaesthesiology residency programme's redesign for the COVID-19 surge

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Editor—During the coronavirus disease 2019 (COVID-19) pandemic, New York City hospitals witnessed an unprecedented demand for critical care medicine services.¹ Academic medical centres including NewYork-Presbyterian Hospital/Weill Cornell Medical Center (NYP/WCMC) significantly restructured their residencies to meet this need. The anaesthesiology residency at NYP/WCMC, consisting of 78 residents across a 4-yr training programme in one of the largest hospital systems in the USA, is an example of successful reorganisation of trainees to serve in a public health emergency. Its trainees were particularly well suited to lead during the pandemic; residents receive an average of 7 months of critical care training across various units including medical, surgical, cardiothoracic, burn, paediatric, neonatal, and neurointensive care settings. In 2 weeks, an anaesthesiology residency with intermittent critical care experiences was transformed into a critical care residency with intermittent anaesthesiology experiences. This was achieved by implementing four specific strategies: redesigning resident roles, creating a novel ‘resident-fellow’ position, initiating a COVID-specific education program, and opening access to mental health resources.

Redesigning resident roles

Over 3 weeks in March 2020, the NYP hospital system expanded its ICU capacity by 130% – to 970 beds (about 25% of which were located at the NYP/WCMC campus), which was matched with a dramatic increase in junior physician ICU coverage. Two institutional events allowed for this flexibility in redeploying residents beyond their scope of practice²: the cancellation of elective surgery on March 13, 2020, and the granting of pandemic emergency status by the Accreditation Council for Graduate Medical Education (the US accreditation body for graduate medical training) on March 25, 2020. Resident schedules across all specialties were redesigned from a call/late system into a 12-h shift work paradigm. This

simplified staffing across ICUs based on patient census allowed for predictable recovery time between shifts and eased integration of trainees from different specialties into critical care teams. During the peak surge period of the pandemic, 83% of NYP/WCM anaesthesiology residents were redeployed across nine ICUs at five tertiary-level hospitals across the NYP system and its affiliates. The remainder were assigned to emergency surgery and airway teams. In the post-surge phase, ICU shifts were reduced as the patient census dwindled, allowing for an opportunity for a relief/recovery period.

‘Resident-fellow’ role

A novel ‘resident-fellow’ position was created to leverage senior resident experience as critical care provisions were expanded necessitating the need for oversight over redeployed house-staff, attending, and nursing staff. This is an example of ‘battlefield promotion’ in military medicine as applied to the civilian healthcare setting.³ Resident-fellows were particularly valuable in the novel ICUs created in operating rooms and PACUs, where anaesthesia machines were used as ICU ventilators, ICU-trained nursing and respiratory therapists were in short supply, and the physical layout of beds was non-traditional.⁴ Further, as many of the attendings assigned to these operating room-ICU units were non-intensivist anaesthesiology consultants operating outside of their normal sphere of practice, resident-fellows with more recent critical care experiences were tasked with an additional role to help bridge appropriate workflows in these environments, such as to help guide bedside rounds. Finally, resident-fellows oversaw junior and non-anaesthesiology residents with limited experience in critical care, managed anaesthetic ventilators, and were immediately available to stabilise bedside emergencies. This dynamic role provided a unique opportunity for senior residents to transition into the role of consultant anaesthesiologists and perioperative leaders.

Table 1 Selected topics from the COVID-19 education series.

Topics in medical knowledge	Topics in patient care/interpersonal and communications skills/professionalism/systems-based practice
Pathophysiology and management of ARDS	Perspectives of healthcare workers from the HIV/AIDS epidemic
Utilisation of paralysis and proning for ARDS	Ethics during pandemics
Pathophysiology, diagnosis, and management of COVID-19 associated thromboses	Difficult conversations for families of critically ill patients
Point-of-care ultrasound for COVID-19 associated cardiac and pulmonary disease	Global health perspectives on COVID-19 and pandemics
Use of steroids in septic shock	Management of LTV™ ventilators (transport ventilators)
Review of extracorporeal membrane oxygenation (ECMO) and utilisation for COVID-19 patients	Healthcare disparities for COVID-19 patients

AIDS, acquired immune deficiency syndrome; ARDS, acute respiratory distress syndrome; COVID-19, coronavirus disease 2019; HIV, human immunodeficiency virus.

Critical care/COVID education curriculum

The frontline role of trainees in the management of a new disease, combined with the need to maintain social distancing, led to a rapid transformation of the existing education programme into a virtual one focused on emerging COVID-19 literature and relevant ICU topics (Table 1). These resident-led, faculty-moderated sessions ensured trainees were provided information that was of the greatest immediate value. Virtual education was also conducted via Slack (Slack Technologies, San Francisco, CA, USA), a communication platform that was already in use before the pandemic as a collaborative educational tool suitable for use in the clinical setting. The success of this model rested on three key factors: an agile response to rapidly-evolving scientific developments, flexibility to work around a shifting and saturated workforce schedule, and a close collaboration between residents and core education leadership. These resident-led sessions also represented a novel opportunity for the development of residents as educators.

Mental health resources

The residency leadership anticipated that the combination of clinical burdens and social isolation would create emotional hardship for trainees. This concern was drawn from existing evidence that anaesthesiology residents were at higher risk for substance abuse disorders, burnout, and suicide.^{5–8} It has also been supported by reports of a high rate of psychological distress amongst frontline COVID-19 physicians.⁹ Beginning weeks before the surge, a psychologist and psychiatrists were invited to conduct virtual weekly closed-group mental health sessions that utilised techniques such as talk therapy and debriefing to process the experiences of high-volume mortality and morbidity, iatrogenic errors, futility of care, fear for one's safety, burnout, social isolation, and healthcare disparities. These sessions allowed residents to become familiar with mental health providers and to develop resiliency. Trainees beset by illness were offered direct channels to mental health services for additional support. In addition to formal outreach by mental health professionals, daily video conferences with the residency program director and weekly forums with the department chair were held to streamline communication, provide transparency on institutional planning, and to discuss concerns.

Conclusion

Over the course of 2 weeks, the anaesthesiology residency at NYP/WCMC was systematically and effectively restructured to accommodate the surge in critically ill COVID-19 patients. An important lesson learned from this experience was how to

execute this restructuring rapidly while maintaining a core set of values: high-quality care at the frontlines, organisational simplicity, resident safety, and wellness. These strategies may provide guidance for other institutions tasked with emergent redeployment of their trainees in future public health crises.

Declarations of interest

KOP is a member of the associate editorial board of the *British Journal of Anaesthesia*. The other authors declare that they have no conflicts of interest.

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