

Cardiothoracic intensive care in the time of COVID-19

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'Pandemics are not unknown events *and the Corona virus is no Black Swan*'. Per Morten Schiefloe¹

'Some people don't like change, *but you need to embrace change* if the alternative is disaster'.

Elon Musk

In March 2020, the WHO declared the novel coronavirus (COVID-19) outbreak a pandemic. The global response was extraordinary, mandating major changes to almost every aspect of life. As a specialist cardiothoracic hospital, the response of Royal Brompton Hospital (RBH) epitomises the role many such centres played in the pandemic.² Our preparedness strategy started in January 2020, informed by critical care colleagues in China and Italy. RBH intensive care unit (ICU) ventilated



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bed numbers increased from 18 to 56 mid-wave 1 and as the demand for veno-venous extracorporeal membrane oxygenation (VV-ECMO) rose across the country RBH provided VV-ECMO for up to 27 patients simultaneously.

Despite initial discussions amongst the global ECMO community concerning the use of VV-ECMO in COVID-19,³ with uncertain efficacy and high resource utilization, outcomes were excellent. Indeed, at 6 months, using standardized referral/acceptance criteria,⁴ RBH survival was significantly higher in COVID-19 VV-ECMO patients than non-COVID-19 patients (84.9% vs. 66.0%), but at the cost of significantly longer VV-ECMO runs (19 vs. 11 days).⁵ Early reports from China suggested a high incidence of acute myocarditis. Globally, however, there was little requirement for VA-ECMO (3%).⁶ When seen, left ventricular dysfunction resolved rapidly using VA-ECMO with zero mortality.

These outcomes were only achieved by respecting the National chain of command for pandemic response, implementation of a local command-control structure and wholesale redeployment of our highly specialist cardiothoracic teams to deliver critical care under the guidance of our ICUs. Rapid implementation of remote technology facilitated flow of communication between clinicians, patients, and families.⁷ This included establishing virtual ICU support for front-line workers (often redeployed), real-time video feeds of ventilator waveforms/patient monitors and webcam-enabled workstations providing live, hands-free video communication with staff working in personal protective equipment (PPE). A multidisciplinary ethics committee afforded advice/guidance, and a family liaison team provided daily remote communication with relatives. COVID-19 research continued as part of local, national, and international collaborations.

The reallocation of ICU beds and staff meant cardiac surgery in London was entirely restructured, forming a Pan-London Emergency Cardiac Surgery service, providing urgent/emergency surgery for the whole of London, co-ordinated across just two centres.⁸ Following wave 1, RBH was mandated to continue with double the ICU bed capacity in order to now provide both 'green pathways' for patients requiring specialist cardiac interventions (to at least 90% of pre-pandemic levels) as well as continued provision of VV-ECMO. Restarting cardiac services with a guarantee that our patients would have totally separate, secure pathways proved almost more challenging than the initial emergency response but was equally vital.

As we move to a more endemic phase, several lessons emerge. First, the adaptability of specialist cardiothoracic centres with their highly skilled staff familiar with using complex technology, is an extraordinary and uniquely flexible resource. Second, in-depth discussions regarding social justice, ethical decision-making and research in a time of pandemic are only just beginning and must inform future practice.^{3,9,10} Third, hierarchy-based models of training in ICU can be readily and successfully exchanged for task-based models. Finally, this pandemic was no black swan event¹; it was predictable, and indeed predicted. As we continue to learn about COVID-19 and each new variant, many uncertainties persist, but our role to advocate for our critically ill cardiac patients remains.¹¹

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References

- Schieffloe PM. The Corona crisis: a wicked problem. *Scand J Public Health* 2021; **49**:5–8.
- Katz JN, Sinha SS, Alviar CL, Dudzinski DM, Gage A, Brusca SB, Flanagan MC, Welch T, Geller BJ, Miller PE, Leonardi S, Bohula EA, Price S, Chaudhry S-P, Metkus TS, O'Brien CG, Sionis A, Barnett CF, Jentzer JC, Solomon MA, Morrow DA, van Diepen S. COVID-19 and disruptive modifications to cardiac critical care delivery: JACC Review Topic of the Week. *J Am Coll Cardiol* 2020; **76**:72–84.
- Supady A, Badulak J, Evans L, Curtis JR, Brodie D. Should we ration extracorporeal membrane oxygenation during the COVID-19 pandemic? *Lancet Resp Med* 2021; **4**: 326–328.
- Royal Brompton VV-ECMO referral criteria. https://www.rbht.nhs.uk/our-services/clinical_support/critical-care-and-anaesthesia/ecmo-and-severe-respiratory-failure/ecmo-referrals-and-transfer-pathway.
- Garfield B, Bianchi P, Arachchillage D, Hartley P, Naruka V, Shroff D, Law A, Passariello M, Patel B, Price S, Rosenberg A, Singh S, Trimlett R, Xu T, Doyle J, Ledot S. Six-month mortality in patients with COVID-19 and non-COVID-19 viral pneumonitis managed with veno-venous extracorporeal membrane oxygenation. *ASAIO J* 2021;doi:10.1097/MAT.0000000000001527.
- Barbaro RP, MacLaren G, Boonstra PS, Iwashyna TJ, Slutsky AS, Fan E, Bartlett RH, Tonna JE, Hyslop R, Fanning JJ, Rycus PT, Hyer SJ, Anders MM, Agerstrand CL, Hryniewicz K, Diaz R, Lorusso R, Combes A, Brodie D. Extracorporeal membrane oxygenation support in COVID-19: an international cohort study of the Extracorporeal Life Support Organization registry. *Lancet* 2020; **396**: 1071–1078.
- Igra A, McGuire H, Naldrett I, Cervera-Jackson R, Lewis R, Morgan C, Thakuria L. Rapid deployment of virtual ICU support during the COVID-19 pandemic. *Future Healthc J* 2020; **7**:181–184.
- Hussain A, Balmforth D, Yates M, Lopez-Marco A, Rathwell C, Lambourne J, Roberts N, Lall K, Edmondson S. The Pan London Emergency Cardiac Surgery service: Coordinating a response to the COVID-19 pandemic. *J Card Surg* 2020; **35**:1563–1569.
- Guidolin K, Catton J, Rubin B, Bell J, Marangos J, Munro-Heesters A, Stuart-McEwan T, Quereshey F. Ethical decision making during a healthcare crisis: a

- resource allocation framework and tool. *J Med Ethics* 2021;doi:10.1136/medethics-2021-107255.
10. Supady A, Curtis JR, Abrams D, Lorusso R, Bein T, Boldt J, Brown CE, Duerschmied D, Metaxa V, Brodie D. Allocating scarce intensive care resources during the COVID-19 pandemic: practical challenges to theoretical frameworks. *Lancet Resp Med* 2021;**9**:430–434.
11. Pietro RD, Calcagno S, Biondi-Zoccai G, Versaci F. Is COVID-19 the deadliest event of the last century? *Eur Heart J* 2021;**42**:2876–2879.