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Building Qatar severe respiratory failure ECMO program

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Introduction: The aim of the program was to establish a severe respiratory failure (SRF) service with mobile extracorporeal membrane oxygenation (ECMO) retrieval capability throughout Qatar. This was achieved through the collaboration of various Hamad Medical Corporation (HMC) entities (critical care, cardiothoracic surgery, vascular surgery, and ambulance services). The service was commissioned by the Ministry of Public Health in October 2013 in response to the emerging MERS-Corona outbreak and its associated high mortality. After extensive team building and training, the service treated its first patient in June 2014. The key result has been an improvement in survival rate from 19 to 68%. The service is ranked among the best in the Extracorporeal Life Support Organization (ELSO) outcomes benchmark of worldwide SRF services. The provision of the highest quality care to patients with high predicted mortality has given a new hope in improving clinical outcomes and their reintegration into community.

Background: In 2013, a novel virus (MERS Corona virus) was identified in Saudi Arabia, with subsequent cases in other gulf states including Qatar.¹ The MERS virus was associated with rapid onset of severe respiratory and renal failure, resulting in a very high mortality rate (> 50%) in the early days of the infection.² The need to establish a SRF center with mobile ECMO retrieval capabilities was identified by the HMC senior leadership in order to anticipate and proactively deal with the situation. The program became a matter of utmost importance due to the inevitable social, political, and geographical factors, which united the people of the GCC. Strategically speaking, regulating the travel norms or bringing in a quarantine on travelers arriving from the countries affected by the MERS Corona virus were not a feasible alternative.³ Furthermore, the high mortality rate, failure of conventional ICU care, and the high cost of

transporting and hospitalizing these patients in other countries with advanced respiratory support capability highlighted the need for the development of a severe respiratory failure and extracorporeal membrane oxygenation (SRF-ECMO) service program in Qatar.

Evidence: The value of a SRF-ECMO service had previously been demonstrated during the international outbreak of H1N1 virus, when survival of patients with significant respiratory failure would have been left to chance or luck if no such advanced program had been in place. The SRF-ECMO services were achieving global survival rates of 60–70% in patients with otherwise very high mortality rates.⁴ Additionally, treatment of SRF in the SRF-ECMO Center decreased mortality rates.⁵ The vision of the leadership in promoting interdepartmental collaboration along with the support from the management at various levels was the highlight in the development of this program which now is recognized internationally for its clinical excellence and well known for its best practices, teaching, and mentorship programs.

Program implementation and team training: The idea of a SRF-ECMO service in the State of Qatar had to be planned immaculately due to the fact that this was the first project of its kind in the country and there is always a sense of anticipation and enigma surrounding such a cutting-edge technology being made available with the help of the government itself. As a result of various fruitful deliberations, a steering committee was created which identified all the potential services that would be involved in the program along with the identification of the potential stakeholders in its successful implementation. The Guys and St Thomas (GSTT) Hospital team in London (UK) was identified as the potential partner for the implementation of the SRF-ECMO in Qatar and hence an official mission consisting of leaders from various services involved went on a field visit to get a firsthand experience about the program. Various discussions with the GSTT team took place in order to understand the processes and the actual difficulties they faced when they started their own SRF-ECMO service.

The clinical leaders realized that the only way this project could succeed – taking into consideration the relative inexperience of the team involved with regards to ECMO – was to provide hands-on experience to all HMC staff involved so they could

become a fully functional and highly efficient team, which worked according to the best current evidence-based practices. The HMC senior leadership left no page unturned in the training of the team members, which is exemplified by the various international courses and workshops they were supported to attend to master the art of ECMO. Members of the team attended:

- ECMO simulation course at GSTT
- Cadaveric ECMO course in Charité Hospital (Berlin)
- Residential hands-on training in London

In addition, selected stakeholders spent a short period of time at GSTT to observe their service and obtain more technical information to effectively set up the program. This investment was highly fruitful in the sense that various members of the team which included physicians, nurses, perfusionists, respiratory therapists, pharmacists, physiotherapist, nutritionists, critical care paramedics, and educators were able to take part and bring the knowledge and skills back in Qatar for the benefit of a whole region.

The training was intended to provide each member with the whole repertoire of knowledge so as to help in the smooth gelling and functioning of the team, which could produce optimum results within the minimal timeframe and with the resources then available.

The physicians were provided with all the resources to master the relevant knowledge in quality and research, and were given the best training for cannulation. They were also provided with the knowledge of the anticipated problems that could arise during the procedure and during the retrieval and transport of ECMO patients. The most important part of the documentation and guidelines were mastered by the very skillful team that included consultants, specialists, and fellows from the MICU.

The nurses in the team, who form an integral part in the success of the procedure and process, were trained as ECMO specialist nurses with the responsibility of ensuring that all were functioning well with the help of checklists, protocols, and guidelines. They also have an important role in training other nurses in the MICU about the techniques and processes involved in this complex lifesaving procedure. They were also provided with the Sheikh Khalifa Medical City (SKMC, Abu Dhabi) nurses training program to further enhance their clinical skills.

The respiratory specialists in the team were given training in pre-ECMO management and positive end expiratory pressure (PEEP) optimization along with the other important procedures like positioning in ECMO, recruitment maneuvers, and ventilation in ECMO.

The perfusionists were given training in all the technical aspects of the circuit and its interaction with the patient throughout the various phases of ECMO. The pharmacists were trained with all the potential drug interactions in the ECMO patient interface and were given the responsibility of reviewing all the protocols for the drugs used by the GSTT team. The physiotherapists were given training in the positioning of the patient (which can be tricky especially when they are prone) and were given the all-important jobs of resuming mobilization and exercise training of the patients while still on ECMO. Further, they were given special training in chest physiotherapy in patients who were on ECMO, which can be very challenging, given the technology involved.

The nutritionists in the team were responsible for the total parenteral nutrition (TPN) and the interactions with the circuits. They further were given training in enteral feeding in ECMO, which reduces the complications and the morbidity in patients who undergo successful decannulation.

The Critical Care Paramedics play an essential role in the mobile retrieval capabilities of the program, including the road map plan for activation and deployment of the team. In our case, they had crucial input into the design of the ECMO and ambulance trolley.

The educator integrated all the knowledge and skills to maintain the competency of the team, from simple water drills all the way to advanced simulation-based competency assessment.

Up-to-date cases: The first patient was admitted to the SRF-ECMO service in May 2014 with H1N1 pneumonia and successfully discharged from the hospital after 3 weeks of ECMO therapy. Since then, the SRF-ECMO service has treated 50 patients with a survival rate of 66% in total. Of these patients, 25% were trauma cases. Additionally, the SRF-ECMO

service has also started its retrieval arm, moving patients from other hospitals in Qatar to the SRF-ECMO Center following cannulation and placing the patient on ECMO, 11 retrievals have been undertaken with one patient dying before transport. Additionally, two patients have been transferred with ECMO to the Heart Hospital for Cardiothoracic Surgery (severe PE and thoracic trauma with bronchial tear) and one patient has been successfully repatriated on ECMO to India using our own aeromedical ECMO transfer team.

Summary: The Qatar SRF-ECMO program is one of the few programs worldwide that operates to the highest level and has been developed in less than 6 months. This has only been possible thanks to the enormous support of the leadership, dedication of the multidisciplinary team, and the partnership with an experienced center such as Guy's and St Thomas' NHS Foundation Trust.

Keywords: SRF: severe respiratory failure, extracorporeal membrane oxygenation (ECMO), SRF-ECMO program, Qatar

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REFERENCES

1. Milne-Price S, Miazgowicz KL, Munster VJ. The emergence of the Middle East respiratory syndrome coronavirus. *Pathog Dis*. 2014;71(2):121 – 136. DOI: 10.1111/2049-632X.12166.
2. Hocke AC, Becher A, Knepper J, Peter A, Holland G, Tönnies M, Bauer TT, Schneider P, Neudecker J, Muth D, Wendtner CM, Rückert JC, Drosten C, Gruber AD, Laue M, Suttorp N, Hippenstiel S, Wolff T. Emerging human Middle East respiratory syndrome coronavirus causes widespread infection and alveolar damage in human lungs. *Am J Respir Crit Care Med*. 2013;188(7):882 – 886. DOI:10.1164/rccm.201305-0954LE.
3. Bermingham A, Chand MA, Brown CS, Aarons E, Tong C, Langrish C, Hoschler K, Brown K, Galiano M, Myers R, Pebody RG, Green HK, Boddington NL, Gopal R, Price N, Newsholme W, Drosten C, Fouchier RA, Zambon M. Severe respiratory illness caused by a novel coronavirus, in a patient transferred to the United Kingdom from the Middle East, September 2012. *Euro Surveill*. 2012;17(40):20290.
4. Australia and New Zealand Extracorporeal Membrane Oxygenation (ANZ ECMO) Influenza Investigators, Davies A, Jones D, Bailey M, Beca J, Bellomo R, Blackwell N, Forrest P, Gattas D, Granger E, Herkes R, Jackson A, McGuinness S, Nair P, Pellegrino V, Pettilä V, Plunkett B, Pye R, Torzillo P, Webb S, Wilson M, Ziegenfuss M. Extracorporeal membrane oxygenation for 2009 influenza A(H1N1) acute respiratory distress syndrome. *JAMA*. 2009;302(17):1888 – 1895. DOI: 10.1001/jama.2009.1535.
5. Peek GJ, Mugford M, Tiruvoipati R, Wilson A, Allen E, Thalanany MM, Hibbert CL, Truesdale A, Clemens F, Cooper N, Firmin RK, Elbourne D, CESAR Trial Collaboration. Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): A multicentre randomised controlled trial. *Lancet*. 2009;374(9698):1351 – 1363. DOI:10.1016/S0140-6736(09)61069-2.