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Using simulation to create a unique regional ECMO program for the Greater Poland region

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Background: "ECMO for Greater Poland" is a program being developed to serve the 3.5 million inhabitants of the Greater Poland region (Wielkopolska) based on an approach already implemented in the USA[1] or Qatar.[2,3]

Method: The program is complex and takes full advantage of the ECMO perfusion therapy opportunities to save the life of patients in the Greater Poland region.

The main implementation areas are:
- treatment of patients with hypothermia;[4]
- treatment of reversible severe respiratory failure;[5]
- treatment of acute intoxication resulting in cardiorespiratory failure[6] or other critical conditions resulting in heart failure;
- in the absence of response to treatment and eventual death, and with donor authorization, there is possible organ transplantation from a non-heart beating donor (NHBD) to another patient.[7] This led to the development of a program for donation after circulatory death (DCD).

Study: The program will help to put in place a Medical Rescue System including ECMO (Figure 1). It requires training in specialized resuscitation, perfusion, and transplantation teams in the implementation of this "ECMO rescue chain". The main strength of the program is the widespread use of extracorporeal perfusion. All program arms in the use of ECMO should be implemented in parallel to maximize its positive impact.

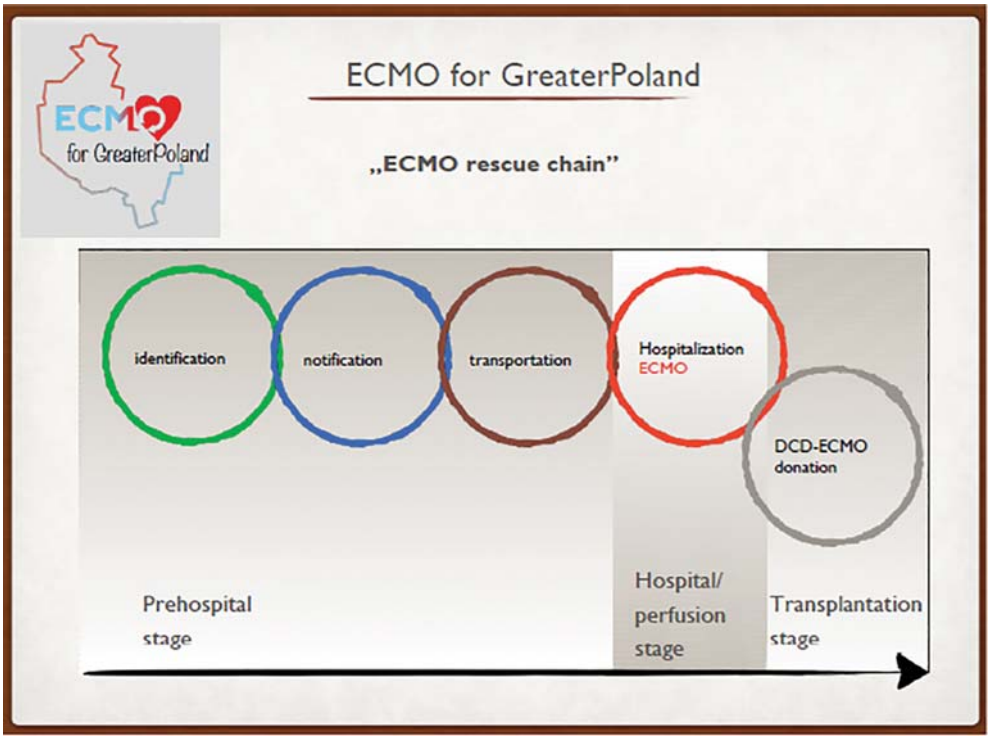

Figure 1. Organizational model of "ECMO for Greater Poland" – "ECMO rescue chain" scheme divided into three stages: prehospital, hospital/perfusion, and transplantation.

As this organizational model is complex and expensive, we used high-fidelity medical simulation to prepare for the real-life implementation of our ECMO program. During 4 months, we performed scenarios including:

- "ECMO for DCD" which includes: prehospital identification, CPR ALS (cardiopulmonary resuscitation advanced life support), perfusion therapy (CPR-ECMO or DCD-ECMO), inclusion and exclusion criteria matching, mechanical chest compression, transport, DCD confirmation, and donor authorization, the veno-arterial (VA) cannulation of a mannequin's artificial vessels, and starting on-scene organ perfusion.[7]
- "ECMO for INTOXICATION" which includes: hospital identification (Department of Toxicology), poisoning treatment, CPR ALS, mechanical chest compression, VA cannulation, for the implementation of ECMO therapy and transport to another hospital (Department of Cardiac Surgery).[6]
- "ECMO for RRF" (reversible respiratory failure) which includes: hospital identification (Regional Department of Intensive Care) – inclusion and exclusion criteria matching, ECMO team transport (80 km), therapy confirmation, veno-venous cannulation for the implementation of perfusion therapy, and return transport (80 km) with ECMO to another hospital in a provincial city (Clinical Department of Intensive Care), where the veno-venous (VV) ECMO therapy was continued for the next 48 hours.[5]

The training programs, in a short time, resulted in a team being appropriately trained to successfully undertake the complex procedures. Soon after these simulations, Maastricht category II DCD procedures were performed involving real patients and resulting in two double successful kidney transplantations, for the first time in Poland. One month later, we treated two hypothermia patients and, for the first time in the region, also treated on ECMO an adult patient with reversible respiratory failure.

Conclusions: The "ECMO for Greater Poland" program will allow the use of perfusion therapy for the inhabitants of Wielkopolska in a comprehensive manner, covering all critical disease states, by what appears to be a unique regional program in Poland. The full-scale, high-fidelity simulation enabled standardized training and testing of new, commonly,

and rarely used procedures, and facilitated clinicians' skills development.

Keywords: ECMO, simulation, scenarios, program implementation, system testing

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