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Transportation of children on extracorporeal membrane oxygenation: one-year experience of the first neonatal and paediatric mobile ECMO team in the north of France

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Dear Editor,
Jones et al. described their experience of transportation of children with refractory failure using high-frequency oscillatory ventilation [1]. This kind of transport had been developed to allow children with respiratory or haemodynamic refractory failure who are considered

candidates for ECMO (extra-corporeal membrane oxygenation) [2] to be transferred in a regional ECMO centre [3]. ECMO transport teams are already widely developed [4] but no neonatal and paediatric ECMO transport team was available until recently in the north of France. Considering the risk of this transportation, the paediatric intensive care unit of Armand-Trousseau hospital decided in November 2014 to start a neonatal and paediatric mobile ECMO program. This mobile team has been developed in collaboration with the Robert Debré emergency transport unit and the airborne units of Ministry of the Interior. During the first year of activity, 22 requests for intervention of the mobile team were received. In eight cases, the patients did not meet ECMO criteria (two patients) or were considered unsalvageable (six patients). In 14 cases, the mobile team travelled to the referring centre. In one case, the child was transported on conventional ventilation and in two patients ECMO cannulation was not possible because of vascular problems. Eleven patients, including four neonates and seven children, were transported on ECMO support. Ages ranged from 1 day to 18 years and weights from 2.7 to 38 kg. One patient was cannulated in our PICU and then transported to a pulmonary transplantation centre. The median (range) run distance and round-trip

duration were 117 km (4–392 km) and 8 h (2–13 h), respectively. Nine (81 %) transports were on venous–arterial ECMO and two (19 %) on venous–venous ECMO. Medium (range) pre-implantation PELOD, PIM II and PaO₂/FiO₂ were, respectively, 52 % (2–84), 65 (8.2–98.1) and 37.5 kPa (3.2–16.9). Inotrope score [5] and laboratory tests before and after ECMO transport are reported in Table 1. Start blood flow rates were 80 ml/kg/min and all patients were transported with apnoea ventilation. The mobile ECMO pump was always a Maquet Rotaflow pump[®] with a Maquet Quadrox LP oxygenator[®]. No deaths or adverse events during ECMO transport were observed. Considering the severity score, expected mortality without ECMO was around 60 %. Our survival rate was 60 %. In conclusion, this first-year experience suggests that the development of the first neonatal and paediatric mobile ECMO team in the north of France was safe, feasible and potentially useful. This rapidly increased activity meets a significant need for ECMO support in children too critically ill to be moved on conventional therapy. The ECMO rapidly improved respiratory and haemodynamic parameters allowing transportation in good conditions to our ECMO centre. It allows children hospitalised in non-ECMO centres to benefit from this rescue treatment. It

Table 1 Severity score and laboratory tests

Severity score and laboratory tests	Pre-ECMO transport	Post-ECMO transport
Inotrope score (μ/kg/min)	180 (50–890)	60 (0–310)
pH	7.03 (6.67–7.27)	7.33 (7.17–7.43)
Lactate (mMol/l)	5.5 (0.6–13.8)	2.8 (1–12.6)
PaCO ₂ (KPa) [mmHg]	10.3 (4.5–29.3) [77: 33–220]	5.5 (2.9–10.4) [41: 22–78]
PaO ₂ (KPa) [mmHg]	4.8 (3.4–11.3) [36: 25–84]	–

contributes to the improvement of the access to the continuity of healthcare in France.

Compliance with ethical standards

Conflicts of interest All authors have no conflict of interest to declare.

References

1. Jones P, Dager S, Leger P-L et al (2015) Mortality in children with respiratory failure transported using high-frequency oscillatory ventilation. *Intensive Care Med* 41:1363–1364. doi: [10.1007/s00134-015-3808-z](https://doi.org/10.1007/s00134-015-3808-z)
2. Antonelli M, Bonten M, Chastre J et al (2012) Year in review in *Intensive Care Medicine* 2011: III. ARDS and ECMO, weaning, mechanical ventilation, noninvasive ventilation, pediatrics and miscellanea. *Intensive Care Med* 38:542–556
3. Clement KC, Fiser RT, Fiser WP et al (2010) Single-institution experience with interhospital extracorporeal membrane oxygenation transport: a descriptive study. *Pediatr Crit Care Med* 11:509–513

4. Vaja R, Chauhan I, Joshi V et al (2015) Five-year experience with mobile adult extracorporeal membrane oxygenation in a tertiary referral center. *J Crit Care*. doi: [10.1016/j.jcrc.2015.07.032](https://doi.org/10.1016/j.jcrc.2015.07.032)
5. Gaies MG, Gurney JG, Yen AH et al (2010) Vasoactive-inotropic score as a predictor of morbidity and mortality in infants after cardiopulmonary bypass. *Pediatr Crit Care Med* 11:234–238

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