



Research paper

Identification and prevalence of PTSD risk factors in ECMO patients: A single centre study



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ABSTRACT

Background: Extracorporeal membrane oxygenation (ECMO) is one of the most invasive rescue therapies for acute heart and/or lung failure. Survivors have high rates of adverse mental health outcomes, such as post-traumatic stress symptoms (PTSS) and manifest post-traumatic stress disorder (PTSD). Yet no study to date has identified and explored PTSD risk factors in these patients.

Objectives: The primary aim of this study was to determine and explore post-traumatic stress risk factors for patients treated with ECMO. It also aimed to provide a baseline profile for future hypothesis testing with respect to risk factor exposure, level of exposure and post-traumatic stress outcomes in these patients.

Methods design: Retrospective cohort study.

Setting: The study was conducted at the Alfred Hospital Melbourne, Australia.

Participants: Patients were selected in 2012 from an Intensive Care Unit (ICU) registry that prospectively included all patients admitted to ICU and treated with ECMO.

Data extraction and analysis: Data were extracted from the ICU ECMO registry, ICU and ward charts, progress notes, referrals, drug charts and discharge letters. Data were descriptively analysed.

Results: Patients treated with ECMO are exposed to almost all investigated PTSD risk factors. These included psychiatric history (psychiatric comorbidities), admission to ICU and treatment (prolonged ventilation during prolonged ICU stay), and drug therapy (all patients treated with PTSD risk related drugs).

Conclusion: ECMO patients are exposed to PTSD risk factors such as young age, mechanical ventilation, drug administration, delirium and agitation. Younger age, heterogeneous conditions, profound illness severity and prolonged ICU stay describe the case complexity of patients and may explain these findings. Patients in ICU are increasingly conscious during active treatment and this may have positive or negative psychological effects. "Awake" ECMO in which patients are conscious while on active life support may represent a unique PTSD risk factor in this perspective.

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1. Introduction

Extracorporeal membrane oxygenation (ECMO) is one of the most expensive, invasive and potentially life threatening rescue therapies for acute heart and/or lung failure.^{1–3} ECMO temporarily supports the lungs or the heart, or both, for hours, days

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or weeks using a modified heart–lung machine that provides gas exchange and blood circulation.⁴ Although mortality in selected ECMO cohorts is decreasing, ongoing research currently assesses the overall survival benefits of this rescue therapy for severely ill patients.^{5,6} Survivors of ECMO commonly have complex and prolonged ICU stays and frequently report adverse health outcomes that hinder recovery and rehabilitation.^{7–9}

Current evidence from observational studies suggests that ECMO survivors have high rates of adverse mental health outcomes, such as post-traumatic stress symptoms (PTSS) that may manifest as post-traumatic stress disorder (PTSD).^{10–12} PTSS are often measured with questionnaires that screen for PTSD.¹³ While validated PTSD questionnaires show good correlation between PTSS and PTSD, they may overestimate PTSD prevalence.^{14,15} PTSD in the critical care environment is common, as admission to the Intensive Care Unit (ICU) and subsequent treatment is associated with invasive and traumatising procedures and experiences.¹⁶ The PTSD symptom prevalence in general ICU survivors has been reported to be 22%,¹⁵ with reported prevalence ranging from 11 to 27% in ECMO cohorts.^{10–12} This is in contrast to the expected 12-month PTSD prevalence in the general Australian population which is 1.3% and the 7.3% global prevalence of all anxiety disorders together.^{17,18} Adverse mental health outcomes such as PTSD, anxiety and depression contribute to poorer patient physical health, social functioning and decreased quality of life post critical illness.^{8,15,19}

A systematic review of 68 studies on PTSD risk factor profiling identified seven general risk factors that may lead to PTSD: (1) prior trauma; (2) prior psychological adjustment; (3) family history of psychopathology; (4) perceived life threat during the trauma; (5) post-trauma social support; (6) peri-traumatic emotional responses and (7); peri-traumatic dissociation.²⁰ In the critical care setting, several potential PTSD risk factors have been hypothesised including younger age and female gender,^{15,21–23} admission to and length of ICU stay,^{15,16,21,22,24–27} In-ICU stress, fear and psychotic experiences/memories,^{15,27,28} or volume and dosage of various drugs administered in ICU.^{16,21,27,29–32} It is of note that memories of in-ICU distressing experiences also serve as longer term post-ICU PTSD risk factor.^{33–35} Table 1 categorises investigated PTSD risk factors directed to the ICU context into three PTSD risk factor clusters: (1) psychiatric history, (2) admission to ICU and treatment; and (3) drug therapy.

Table 1
Investigated PTSD risk factors in the ICU context.

PTSD risk factor cluster	Risk factor
Psychiatric history	<ul style="list-style-type: none"> • Family history of psychopathology • Personal factors (younger age, female gender) • Prior psychological adjustment • Prior trauma
Admission to ICU and treatment	<ul style="list-style-type: none"> • Admission to ICU • Agitation • Delirium • Frightening and psychotic experiences • Intubation • Increased number of traumatic memories • Longer duration of hospital stay • Longer duration of ICU stay • Longer duration of mechanical ventilation • Presence and recollections of delusional memories • Use of physical restraint
Drug therapy	<ul style="list-style-type: none"> • Anaesthetics • Antipsychotics • Catecholamine therapy • Corticosteroids • Neuromuscular blocking agents • Opioids • Sedatives

Despite these known general and ICU related PTSD risk factors, no study has explored to what extent ECMO patients are exposed to these and other potentially unique risk factors. The aim of this study was to determine and explore PTSD risk factors for ECMO patients and to provide a baseline profile for future hypothesis testing with respect to risk factor exposure, level of exposure and PTSD outcomes in ECMO patients.

2. Methods

2.1. Study design

A retrospective cohort study was conducted to assess the prevalence and level of exposure ECMO patients have to various PTSD risk factors investigated in the ICU literature.^{15,16,36,37} The PTSD risk assessment in this cohort is novel and utilised an open inclusive approach based on these PTSD risk factors (Table 1). No formal written protocol or restrictions on definitions were developed a priori. This study was approved by the institution's ethical review committee. Clinical data on all patients treated with ECMO at a major referral hospital in 2012 were retrospectively extracted from a prospectively updated ICU ECMO registry and from additional digital patient records.

2.2. Setting

The study was conducted at the Alfred Hospital Melbourne, Australia. The Alfred is a major referral teaching hospital with services that include heart and lung transplantation, hyperbaric medicine, elective surgery and ECMO.³⁸ Approximately 2500 patients per annum are admitted to The Alfred Intensive Care Unit (ICU), which provides 45 patient cubicles for the complex case mix found in The Alfred's large metropolitan catchment area.³⁹ The Alfred ICU is a ECMO referral centre for the states of Victoria and Tasmania and has provided ECMO care since 1990 for over 280 cases of severe cardiac and/or respiratory failure.⁴⁰

2.3. Recruitment process

Patients were selected from an ICU ECMO registry that prospectively included all patients admitted to ICU and treated with venous–venous (VV) or venous–arterial (VA) ECMO. All patients admitted during 2012 were included in this cohort study.

2.4. Data collection

A data form was developed and reviewed independently by two authors (RT, CH) before being piloted (RT, JS) in two patients. Data were extracted from the ICU ECMO registry, ICU and ward charts, progress notes, referrals, drug charts and discharge letters kept electronically at the hospital. All data were further cross-validated with other intra-hospital registries and services such as quality assurance in addition to validation across data collectors (RT, JS). Extracted data related to patient demographics, biometrics, medical history, APACHE (acute physiology and chronic health evaluation) II score, SAPS (Simplified Acute Physiology Score) II score, drug dosage, length of mechanical ventilation, length of stay (LOS) ICU and hospital, ECMO data and discharge information.

3. Results

During the 12-month period of 1st January to 31st December 2012, 47 adults received ECMO support for a variety of underlying conditions. Patients presented frequently with mixed conditions such as combined respiratory and cardiac failure (Table 2). The

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