Commentary

Disability after prolonged mechanical ventilation in the intensive care unit: tracking the fate of our patients

Lorenzo Ball, Paolo Pelosi

IRCCS AOU San Martino-IST, Department of Surgical Sciences and Integrated Diagnostics, University of Genoa, Genoa, Italy
Correspondence to: Professor Paolo Pelosi, MD, FERS. IRCCS AOU San Martino-IST, Department of Surgical Sciences and Integrated Diagnostics, University of Genoa, Largo Rosanna Benzi 8, 16131 Genova, Italy. Email: ppelosi@hotmail.com.

Submitted Jun 10, 2016. Accepted for publication Jun 15, 2016.
doi: 10.21037/jtd.2016.07.48
View this article at: http://dx.doi.org/10.21037/jtd.2016.07.48

The occurrence of a critical illness initiates a complex chain of pathophysiologic, psychological and social mechanisms, contributing to a relevant burden of care and affecting long-term outcome. Clinical routine offers a partial perspective on this issue to the intensive care unit (ICU) caregivers: often seen as the last relevant event in patients' history, ICU discharge is actually the beginning of a long path towards recovery, requiring efforts from the patients, their families and healthcare systems.

Little is known about long-term outcomes of the general ICU population, and even less evidence is available concerning factors influencing, and potentially predicting, post-ICU discharge recover trajectory. Over the last decades, efforts were made to investigate long-term physical, psychological and social disability in specific sub-populations of ICU patients: this is the case, for instance, of acute respiratory distress syndrome (ARDS) (1,2), or out-of-hospital cardiac arrest survivors (3). However, these findings cannot be directly translated to the general ICU population, which is often older and affected by more comorbidities than these subgroups. An improvement in knowledge in this field is warranted, as it might influence clinicians' decisions in a dynamically evolving scenario where, especially in high-income countries, population is getting older, and ICU patients consequently sicker.

In a recent paper published on the *American Journal of Respiratory and Critical Care Medicine* (4), Herridge and co-workers investigated long-term outcomes of a mixed surgical and medical ICU population of 391 patients from 10 centres in Canada, as part of the larger RECOVER study. Patients requiring at least seven days of mechanical ventilation were enrolled, and a patient-centred primary outcome measure was chosen: the functional independence measure (FIM) (5). This score investigates motor and cognitive function, ranging from 18 (totally dependent) to 126 (totally independent). Several other scores were tested, including six minute walking test, medical research council score, medical outcomes study short form-36 questionnaire, impact of event scale and Beck depression inventory-II. Patients were offered a comprehensive follow-up program, including a visit 7 days after ICU discharge and at 3, 6 and 12 months, both in an ambulatory clinic, in-hospital or at home.

Instead of pre-determined thresholds, the authors used a novel statistical method, the recursive partitioning model, to stratify patients according to the two only factors independently associated with the FIM score at 7 days after ICU discharge: length of ICU stay (LOS) and age. As expected, younger patients with a short LOS had a faster and more complete recovery, while people aged more than 66 admitted to the ICU for more than 2 weeks had the poorest outcome. FIM assessed 7 days after ICU discharge was able to predict the recovery trajectory of these patients. For robustness, the authors performed a retrospective external validation of these findings on the population of ARDS survivors of a previous study (2), observing that, despite the intrinsic differences in population baseline characteristics, outcome prediction based on LOS and age was feasible, independent of the illness severity. In-ICU mortality was rather low (around 15%) and independently associated with the illness severity at admission, progression of organ failure during the ICU stay and admission from the hospital ward, but not with age. One-year mortality varied according to the age and LOS classification, reaching 40% in oldest patients admitted to the ICU for more than 2 weeks. Recovery kinetics was also affected by ICU

LOS and age, resulting in a complete recovery in most of the youngest patients requiring less than 2 weeks of ICU admission, while the highest risk group had a slower and less complete recovery. Most of the differences between groups in disability were observed in the first six months, and affected more the motor compared to the cognitive FIM subscale. Depression and post-traumatic stress disorder affected one fifth of the cohort, and persisted at the 1-year follow-up visit.

While no clinician will be surprised by the fact that age and ICU LOS are associated with worse outcome, the observed long-term mortality and relevance of the disability might be higher than expected. The results of this study should be the starting point to develop patient-centred measures to improve long-term outcomes: so far, while several interventions have been tested to improve the post-ICU discharge management of these patients, few resulted in improved outcome (6) and none is widely accepted and applied. Moreover, a recent study from the same research group found that, among home caregivers of patients discharged from the ICU, as much as two thirds develops relevant and persistent depressive symptoms (7).

This is the first research programme addressing a complete assessment of long-term quality of life of mixed ICU patients. There is rising interest concerning interventions, such as early in-ICU goal-directed mobilization (8), able to improve recovery of critically ill patients. The results of the RECOVER study should encourage widening the field of research to the post-discharge period. The completeness of the descriptive data reporting in this paper will help to better design future research, and to identify the most suitable outcome measures. Nonetheless, long-term outcomes should be considered also in studies mainly focused on earlier endpoints.

The greatest limit of the RECOVER study is the generalizability of its findings, mainly due to the fact that the study was conducted in a single country. It is reasonable to assume that nation-specific aspects of patients' care, in particular public healthcare expenditure, availability of post-discharge rehabilitation plans as well as the legal framework concerning the end-of-life treatment could affect significantly both long-term mortality and quality of life. It is of interest that, among 2,603 patients screened for the RECOVER study, 10% were excluded because of anticipated death or withdrawal of life-sustaining treatments within 48 hours from the enrolment. There could be differences between countries where withdrawal of care is a common, clearly regulated practice (9), from those where individual physician's decision and responsibility plays a central role (10). The availability of post-discharge homecare is likely to be influenced by the country's wealth and public healthcare investments, as well as patients' income and insurance coverage. Further studies are needed to identify the peculiarities of different national and regional contexts.

This type of research is time and money consuming, but give precious information that can help decision making, guide future research and improve the clinicians' awareness of the long-term results of their daily activity.

Acknowledgements

None.

Footnote

Provenance: This is an invited Commentary commissioned by the Section Editor Zhiheng Xu (State Key Laboratory of Respiratory Disease, Guangzhou Institute of Respiratory Disease, Department of Intensive Care, The First Affiliated Hospital of Guangzhou Medical University, Guangzhou, China).
Conflicts of Interest: The authors have no conflicts of interest to declare.

Comment on: Herridge MS, Chu LM, Matte A, *et al*. The RECOVER Program: Disability Risk Groups & One Year Outcome after ≥ 7 Days of Mechanical Ventilation. Am J Respir Crit Care Med 2016. [Epub ahead of print].

References

1. Chiumello D, Coppola S, Froio S, et al. What's Next After ARDS: Long-Term Outcomes. Respir Care 2016;61:689-99.
2. Herridge MS, Cheung AM, Tansey CM, et al. One-year outcomes in survivors of the acute respiratory distress syndrome. N Engl J Med 2003;348:683-93.
3. Ørbo M, Aslaksen PM, Larsby K, et al. Alterations in cognitive outcome between 3 and 12 months in survivors of out-of-hospital cardiac arrest. Resuscitation 2016;105:92-99.
4. Herridge MS, Chu LM, Matte A, et al. The RECOVER Program: Disability Risk Groups & One Year Outcome after ≥ 7 Days of Mechanical Ventilation. Am J Respir Crit

Care Med 2016. [Epub ahead of print].
5. Oczkowski WJ, Barreca S. The functional independence measure: its use to identify rehabilitation needs in stroke survivors. Arch Phys Med Rehabil 1993;74:1291-4.
6. Schweickert WD, Pohlman MC, Pohlman AS, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet 2009;373:1874-82.
7. Cameron JI, Chu LM, Matte A, et al. One-Year Outcomes in Caregivers of Critically Ill Patients. N Engl J Med 2016;374:1831-41.
8. Hodgson CL, Bailey M, Bellomo R, et al. A Binational Multicenter Pilot Feasibility Randomized Controlled Trial of Early Goal-Directed Mobilization in the ICU. Crit Care Med 2016;44:1145-52.
9. Beydon L, Pelluchon C, Beloucif S, et al. Euthanasia, assisted suicide and palliative care: a review by the Ethics Committee of the French Society of Anaesthesia and Intensive Care. Ann Fr Anesth Reanim 2012;31:694-703.
10. Bertolini G, Boffelli S, Malacarne P, et al. End-of-life decision-making and quality of ICU performance: an observational study in 84 Italian units. Intensive Care Med 2010;36:1495-504.

Cite this article as: Ball L, Pelosi P. Disability after prolonged mechanical ventilation in the intensive care unit: tracking the fate of our patients. J Thorac Dis 2016;8(8):E819-E821. doi: 10.21037/jtd.2016.07.48

