

COMMENTARY

The challenge of designing a post-critical illness rehabilitation intervention

Margaret S Herridge*^{1,2}

See related research by Elliott *et al.*, <http://ccforum.com/content/15/3/R142>

Abstract

Post-ICU morbidity is an important issue for patients, families, and the health-care system. Elliott and colleagues outlined the results from their novel report of the very first home-based physiotherapy program to be tested in survivors of critical illness. The authors described an explicit intervention, which included a self-instruction exercise manual, trainer visits, and telephone follow-up, with excellent internal validity and yet no difference in outcome measures at 26-week follow-up. These results are discussed in the context of risk stratification/individual tailoring of post-ICU programs to patient and family needs and suggest that the collection of multiple simultaneous outcome measures across functional, neuropsychological, caregiver, and health-care utilization domains may offer additional insight into the benefits of post-rehabilitation programs.

In a recent issue of *Critical Care*, Elliott and colleagues [1] reported important results from the very first evaluation of a post-ICU home-based rehabilitation program. This very rigorous study of an explicit intervention that included a self-instruction exercise manual, trainer visits, and telephone follow-up had minimal loss to follow-up and excellent internal validity. The authors demonstrated successful random assignment of their study sample at 1 week post-hospital discharge and successful application of their 8-week home-based rehabilitation program. Both control and intervention groups had important reductions in functional status prior to the institution of the rehabilitation program, and both groups had meaningful improvements in functional

and quality-of-life measures at the end of the study. However, there was no statistically significant improvement in functional outcome associated with the study intervention at 26 weeks of follow-up [1].

Over the past decade, a rich literature cataloguing the diversity of physical and neuropsychological disabilities sustained by patients and families after critical illness has emerged [2-8]. The findings of ICU-acquired weakness and cognitive and mood disorders are prevalent and robust across different study samples.

There has been enormous enthusiasm about the potential to intervene in and ameliorate aspects of this documented spectrum of disability both during and after the ICU stay. Interventions to date have included ICU rehabilitation programs [9,10], early mobility interventions such as daily awakening and recognition and treatment for delirium [11-14], an ICU diary intervention [15], a nurse-led follow-up program [16], and a self-directed manual for rehabilitation [17]. Only the ICU diary intervention and self-directed rehabilitation manual intervention have demonstrated a longer-term benefit. There has been no evaluation of the impact of a home-based post-ICU rehabilitation program to date. Current impediments to the progress of designing rehabilitation programs after ICU discharge include uncertainties about which patients require specific intervention or have rehabilitation potential; the timing, intensity, duration, and nature of the application of an intervention; and which specific outcome measures should be used to capture benefit.

The study by Elliott and colleagues was a very well-designed and well-executed intervention. So why was there no incremental benefit observed from this home-based rehabilitation program? Perhaps some insight resides in a better understanding of who was recruited to this post-ICU intervention, their risk for disability, and the outcome metrics used in this trial.

As a start, the nature of the study sample may help shed some light on these results. Study inclusion and exclusion criteria may have played an important part here since only patients discharged home with or without a carer were included in this intervention. It is possible that this

*Correspondence: dr.margaret.herridge@uhn.ca

¹Interdepartmental Division of Critical Care, University of Toronto, University Health Network, 585 University Avenue, 11C-1180, Toronto, ON M5G 2C4, Canada

Full list of author information is available at the end of the article

selected for those who had less perceived limitation at the time of hospital discharge or more functional reserve and those who may have had less need for formal rehabilitation or programmed assistance. Perhaps there is a band of patients within the group typically referred for inpatient rehabilitation who would significantly benefit from outpatient, home-based intervention such as the exercise program in this study. Currently, however, we need to better understand the clinical criteria and decision making surrounding stratification for inpatient versus outpatient rehabilitation, work on making those criteria explicit, understand different tiers of function, and evaluate these in the context of early rehabilitation programs. Through the selection for a more debilitated sample or at least a broader spectrum of disability in post-ICU patients, it is possible that benefit may be realized with home-based programs and inpatient care resources may be unburdened.

In addition, the patients in this study were mechanically ventilated for a relatively brief period of time and may not have had well-established and clinically important ICU-acquired weakness [18]. Also, data on premorbid functional status, burden of comorbid illness, and the presence/nature of early mobility or ICU-based rehabilitation programs or other relevant ICU-based practice patterns, including exposure to corticosteroids [19] and paralytics [20], in this study sample would have been very helpful to further inform risk, risk modifiers, and rehabilitation potential.

We are still in the process of refining what the appropriate outcome measures should be for rehabilitation studies, their responsiveness over time, and ability to capture specific morbidities. Although 6-minute walk distance and Physical Component Summary (PCS) of the 36-Item Short-Form Health Survey (SF-36) were clearly compromised in this study and improved over time, these may not have been sensitive or specific metrics to capture the subtlety of improvement in muscle weakness in this more resilient patient sample. The predominant questions for the PCS subscore relate to the extent to which health limits physical activity or work, the perceived intensity of pain, and a personal evaluation of health. It is possible that the patients did not perceive these things to be that different between groups. However, there are many other morbidities of critical illness that are well documented in other studies – not measured as part of this protocol – that may have been responsive to this intervention. It is possible that early vigorous exercise may have altered the prevalence of mood or cognitive disorders, the nature of health-care utilization, and its cost over the study period or beyond and possibly even had an indirect benefit to the caregiver. It is also plausible that the patients and caregivers may have been able to articulate specific improvements from the intervention

within the context of a qualitative interview. Elliott and colleagues should be commended on this outstanding effort, and perhaps their protocol did make an important difference in the lives of these patients and their carers. Before we discard this work as another negative study, we need to reevaluate how we select our study samples in terms of who may benefit most from this intervention and perhaps embrace the notion of measuring multiple outcomes across physical, neuropsychological, and caregiver domains to understand more fully the complex impact of a single rehabilitation intervention.

Abbreviations

ICU, intensive care unit; PCS, Physical Component Summary.

Competing interests

The author declares that she has no competing interests.

Author details

¹Interdepartmental Division of Critical Care, University of Toronto, University Health Network, 585 University Avenue, 11C-1180, Toronto, ON M5G 2C4, Canada. ²Department of Medicine, Division of Respiratory Medicine, University Health Network, University of Toronto, University Health Network, 585 University Avenue, 11C-1180, Toronto, ON M5G 2C4, Canada.

Published: 25 October 2011

References

1. Elliott D, McKinley S, Alison J, Aitken LM, King M, Leslie GD, Kenny P, Taylor P, Foley R, Burmeister E: **Health-related quality of life and physical recovery after a critical illness: a multi-centre randomised controlled trial of a home-based physical rehabilitation program.** *Crit Care* 2011, **15**:R142.
2. Griffiths RD, Jones C: **Recovery from intensive care.** *BMJ* 1999, **319**:427-429.
3. Hopkins RO, Weaver LK, Pope D, Orme JF, Bigler ED, Larson-LOHRV: **Neuropsychological sequelae and impaired health status in survivors of severe acute respiratory distress syndrome.** *Am J Respir Crit Care Med* 1999, **160**:50-56.
4. Hopkins RO, Weaver LK, Collingridge D, Parkinson RB, Chan KJ, Orme JF Jr: **Two-year cognitive, emotional, and quality-of-life outcomes in acute respiratory distress syndrome.** *Am J Respir Crit Care Med* 2005, **171**:340-347.
5. Herridge MS, Tansey CM, Matté A, Tomlinson G, Diaz-Granados N, Cooper A, Guest CB, Mazer CD, Mehta S, Stewart TE, Kudlow P, Cook D, Slutsky AS, Cheung AM; Canadian Critical Care Trials Group: **Functional disability 5 years after acute respiratory distress syndrome.** *N Engl J Med* 2011, **364**:1293-1304.
6. Stevens RD, Dowdy DW, Michaels RK, Mendez-Tellez PA, Pronovost PJ, Needham DM: **Neuromuscular dysfunction acquired in critical illness: a systematic review.** *Intensive Care Med* 2007, **33**:1876-1891.
7. Griffiths RD, Hall JB: **Intensive care unit-acquired weakness.** *Crit Care Med* 2010, **38**:779-787.
8. Angus DC, Carlet J: **Surviving intensive care: a report from the 2002 Brussels Roundtable.** *Intensive Care Med* 2003, **29**:368-377.
9. Gosselink R, Bott J, Johnson M, Dean E, Nava S, Norrenberg M, Schönhofer B, Stiller K, van de Leur H, Vincent JL: **Physiotherapy for adult patients with critical illness: recommendations of the European Respiratory Society and European Society of Intensive Care Medicine Task Force on Physiotherapy for Critically Ill Patients.** *Intensive Care Med* 2008, **34**:1188-1199.
10. Burtin C, Clerckx B, Robbeets C, Ferdinande P, Langer D, Troosters T, Hermans G, Decramer M, Gosselink R: **Early exercise in critically ill patients enhances short-term functional recovery.** *Crit Care Med* 2009, **37**:2499-2505.
11. Morris PE, Goad A, Thompson C, Taylor K, Harry B, Passmore L, Ross A, Anderson L, Baker S, Sanchez M, Penley L, Howard A, Dixon L, Leach S, Small R, Hite RD, Haponik E: **Early intensive care unit mobility therapy in the treatment of acute respiratory failure.** *Crit Care Med* 2008, **36**:2238-2243.
12. Bailey P, Thomsen GE, Spuhler VJ, Blair R, Jewkes J, Bezdzian L, Veale K, Rodriguez L, Hopkins RO: **Early activity is feasible and safe in respiratory failure patients.** *Crit Care Med* 2007, **35**:139-145.
13. Needham DM: **Mobilizing patients in the intensive care unit: improving**

- neuromuscular weakness and physical function. *JAMA* 2008, **300**:1685-1690.
14. Schweickert WD, Pohlman MC, Pohlman AS, Nigos C, Pawlik AJ, Esbrook CL, Spears L, Miller M, Franczyk M, Deprizio D, Schmidt GA, Bowman A, Barr R, McCallister KE, Hall JB, Kress JP: **Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial.** *Lancet* 2009, **373**:1874-1882.
 15. Jones C, Bäckman C, Capuzzo M, Egerod I, Flaatten H, Granja C, Rylander C, Griffiths RD; RACHEL group: **Intensive care diaries reduce new onset post traumatic stress disorder following critical illness: a randomised, controlled trial.** *Crit Care* 2010, **14**:R168.
 16. Cuthbertson BH, Rattray J, Johnston M, Wildsmith JA, Wilson E, Hernandez R, Ramsey C, Hull AM, Norrie J, Campbell M: **A pragmatic randomised, controlled trial of intensive care follow up programmes in improving longer-term outcomes from critical illness. The PRACTICAL study.** *BMC Health Serv Res* 2007, **7**:116.
 17. Jones C, Skirrow P, Griffiths RD, Humphris GH, Ingleby S, Eddleston J, Waldmann C, Gager M: **Rehabilitation after critical illness: a randomized, controlled trial.** *Crit Care Med* 2003, **31**:2456-2461.
 18. De Jonghe B, Sharshar T, Lefaucheur JP, Authier FJ, Durand-Zaleski I, Boussarsar M, Cerf C, Renaud E, Mesrati F, Carlet J, Raphaël JC, Outin H, Bastuji-Garin S; Groupe de Réflexion et d'Etude des Neuromyopathies en Réanimation: **Paresis acquired in the intensive care unit: a prospective multicenter study.** *JAMA* 2002, **288**:2859-2867.
 19. Hough CL, Steinberg KP, Taylor TB, Rubenfeld GD, Hudson LD: **Intensive care unit-acquired neuromyopathy and corticosteroids in survivors of persistent ARDS.** *Intensive Care Med* 2009, **35**:63-68.
 20. Papazian L, Forel JM, Gacouin A, Penot-Ragon C, Perrin G, Loundou A, Jaber S, Arnal JM, Perez D, Seghboyan JM, Constantin JM, Courant P, Lefrant JY, Guérin C, Prat G, Morange S, Roch A; ACURASYS Study Investigators: **Neuromuscular blockers in early acute respiratory distress syndrome.** *N Engl J Med* 2010, **363**:1107-1116.

doi:10.1186/cc10362

Cite this article as: Herridge MS: **The challenge of designing a post-critical illness rehabilitation intervention.** *Critical Care* 2011, **15**:1002.