

COMMENTARY

Critical care rehabilitation trials: the importance of 'usual care'

Ann Parker^{1,2*}, Kian M Tehranchi^{2,3} and Dale M Needham^{1,2,4}

See related research by Denehy et al., <http://ccforum.com/content/17/4/R156>

Abstract

Denehy and colleagues conducted a novel randomized controlled trial evaluating a rehabilitation intervention starting in the ICU and continuing through the outpatient setting, with 1 year longitudinal follow-up. While the intervention did not demonstrate improved patient outcomes, this study illustrates important issues regarding 'usual care' control groups in clinical trials.

Critical care is evolving beyond a focus on short-term survival to include interventions aimed at reducing survivors' longer term complications. In this context, ICU-based rehabilitation research and clinical practice is increasingly important. Denehy and colleagues [1] conducted a novel randomized controlled trial evaluating a rehabilitation intervention starting in the ICU and continuing through the outpatient setting, with longitudinal evaluations at ICU and hospital discharge, and 3, 6 and 12 month follow-up. This new study adds to existing prospective controlled trials [2-4] that have evaluated the effect of ICU-based rehabilitation on patient outcomes.

Denehy and colleagues evaluated 150 patients, with an ICU stay ≥ 5 days, recruited from a single 20-bed medical-surgical ICU in Australia. Patients were randomized to 'usual care' physical rehabilitation versus a rehabilitation intervention, prescribed based on physiological principles and standardized physical testing, which commenced in the ICU and continued in the ward and outpatient settings. The primary outcome was the 6 minute walk test (6MWT) at 12 month follow-up, with secondary

outcomes including physical function and quality of life measures at ICU and hospital discharge, and 3, 6 and 12 months follow-up. Both groups received sedation as per usual care.

Of the patients enrolled, 92% required intubation and mechanical ventilation, with 55% ventilated at recruitment (ICU day 5). There were no major adverse events and no significant differences in primary or secondary outcomes at 3, 6 and 12 months. The 6MWT was significantly lower in the intervention versus control group at ICU discharge, which may have been due to a higher acuity of illness in the intervention group. *Post hoc* analysis revealed that improvement in the 6MWT from ICU discharge to 12 months was significantly greater in the intervention versus control group (mean change 292 m versus 219 m; difference 73 m (95% confidence interval 9 to 136)).

To understand the trial results and their generalizability, it is important to examine how rehabilitation was provided in each group and the differences in rehabilitation between the two randomized groups. Denehy and colleagues' novel rehabilitation intervention has at least two important implications. First, the physiological-based approach to rehabilitation prescription may help enhance reproducibility of the intervention and consistently exercise patients at a higher level. Second, given survivors' frequent long-lasting neuromuscular and functional impairments [5-8], an intervention spanning the ICU and outpatient settings may be of value. However, notably with this latter point, Denehy and colleagues reported a low rate of participants completing outpatient rehabilitation sessions, with only 41% having at least 70% attendance.

In terms of understanding usual care, on ten occasions during the trial there was prospective measurement of rehabilitation interventions delivered to ICU patients who were not enrolled in the trial [9]. This sampling of usual care revealed that 52% of patients were mobilized

* Correspondence: aparke36@jh.u.edu

¹Division of Pulmonary and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, MD 21205, USA

²Outcomes After Critical Illness and Surgery (OACIS) Group, Johns Hopkins University, Baltimore, MD 21205, USA

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

in the ICU, including some mechanically ventilated patients sitting out of bed or marching in place [9]. This description of usual care represents substantially greater rehabilitation than delivered in two prior randomized trials (Table 1) [2,3]. For instance, in Schweickert and colleagues [3], usual care patients received a median of 0 (interquartile range 0 to 0) hours per day of physical and occupational therapy while mechanically ventilated. Moreover, the intensity of usual care rehabilitation in the Denehy and colleagues trial also may have been greater than in other Australian ICUs, based on a one-day, bi-national point prevalence study that demonstrated no mechanically ventilated patients were mobilized out of bed [10].

Potentially because of a smaller difference in the dose of rehabilitation between the intervention and control groups in the Denehy and colleagues trial compared to prior prospective controlled trials (Table 1), this new study did not demonstrate a benefit of the novel rehabilitation intervention. However, an important issue highlighted by this trial is the need for standardized measurement and reporting of usual care rehabilitation in clinical trials [11]. Such standardization would allow a better understanding of the difference in rehabilitation intensity between the trial's randomized groups, and between the trial and prior studies [12]. Moreover,

such standardization would allow readers to evaluate the generalizability of the trial's findings to their own ICUs, based on their local rehabilitation practice patterns [13]. To achieve this goal and help advance rehabilitation research, investigators must discuss this issue and achieve consensus [14].

This trial also highlights the issue of patients' trajectory of recovery. A *post hoc* analysis demonstrated that patients in the intervention versus control group had a greater improvement in their 6MWT from ICU discharge to 12 month follow-up. This difference may be important if it reflects a changed trajectory of recovery and translates into survivors reaching clinically meaningful outcomes sooner (for example, earlier return to work). Evaluating these issues may be important for future studies.

In summary, this trial provides a novel longitudinal evaluation of physical rehabilitation delivered across the continuum of patient recovery, highlighting the importance of understanding 'usual care' in interpreting trial results. In contrasting this trial with existing studies, we conclude that critically ill patients in both Australia and the US (and likely many other countries) may benefit from the exceptional 'usual care' received in the investigators' study site ICU in Melbourne, Australia.

Table 1 Comparison of in-ICU rehabilitation for intervention and usual care groups in prospective trials

Author	Rehabilitation protocol		Rehabilitation actually received	
	Usual care control	Intervention	Usual care control	Intervention
Denehy <i>et al.</i> [1] (Australia; n = 150)	Respiratory management and mobility with PT, available 12 hours/day × 7 days/week	Physiologically based PT 15 minutes/day and 2 × 15 minutes/day × 6 days/week for MV and non-MV patients, respectively [9]	52% of patients mobilized out of bed ^a	52% of PT sessions delivered and completed
Burtin <i>et al.</i> [2] (Belgium; n = 90)	Respiratory management and standardized mobility 5 days/week	Usual care PT + cycle ergometry 20 minutes/day × 5 days/week	Not reported	Cycle ergometry delivered 4 (4 to 5) sessions per week, for a total of 7 (4 to 11) sessions
Schweickert <i>et al.</i> [3] (USA; n = 104)	PT and OT, when ordered by ICU team	PT and OT beginning on day of study enrollment	PT and OT started 7.4 (6.0 to 10.9) days after MV, with 0 (0 to 0) minutes/day during MV and 11 (0 to 23) minutes/day after MV	PT and OT started 1.5 (1.0 to 2.1) days after MV, with 19 (10 to 29) minutes/day during MV and 13 (5 to 20) minutes/day after MV
Morris <i>et al.</i> [4] (USA; n = 330)	PT when ordered by a physician; PROM daily by ICU nurse	4-level, graduated mobility protocol delivered by a 7 day/week mobility team (including PT), with highest level in protocol including ≥20 minutes/day out-of-bed mobilization	6% of patients with ≥1 PT session	73% of patients with ≥1 PT session

Data are reported as median (inter-quartile range). ^aBased on prospective measurement of PT interventions delivered to patients who were mechanically ventilated for >48 hours at the study site ICU and were not enrolled in the trial [9]. MV mechanically ventilated, OT occupational therapy, PROM passive range of movement, PT physical therapy.

Abbreviation

6MWT: 6 minute walk test.

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

AP receives support from the National Institutes of Health (grant number T32HL007534-31).

Author details

¹Division of Pulmonary and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, MD 21205, USA. ²Outcomes After Critical Illness and Surgery (OACIS) Group, Johns Hopkins University, Baltimore, MD 21205, USA. ³Department of Physical Medicine and Rehabilitation, Johns Hopkins University School of Medicine, Baltimore, MD 21205, USA. ⁴Department of Chemistry, Tufts University, Medford, MA 02155, USA.

Published: 05 Sep 2013

References

1. Denehy L, Skinner EH, Edbrooke L, Haines K, Warrillow S, Hawthorne G, Gough K, Hoon SV, Morris ME, Berney S: **Exercise rehabilitation for patients with critical illness: a randomized controlled trial with 12 months follow up.** *Crit Care* 2013, **17**:R156.
2. 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.
3. 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.
4. 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.
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. Desai SV, Law TJ, Needham DM: **Long-term complications of critical care.** *Crit Care Med* 2011, **39**:371–379.
7. Bienvenu OJ, Colantuoni E, Mendez-Tellez PA, Dinglas VD, Shanholtz C, Husain N, Dennison CR, Herridge MS, Pronovost PJ, Needham DM: **Depressive symptoms and impaired physical function after acute lung injury: a 2-year longitudinal study.** *Am J Respir Crit Care Med* 2012, **185**:517–524.
8. Barnato AE, Albert SM, Angus DC, Lave JR, Degenholtz HB: **Disability among elderly survivors of mechanical ventilation.** *Am J Respir Crit Care Med* 2011, **183**:1037–1042.
9. Berney S, Haines K, Skinner EH, Denehy L: **Safety and feasibility of an exercise prescription approach to rehabilitation across the continuum of care for survivors of critical illness.** *Phys Ther* 2012, **92**:1524–1535.
10. Berney S, Harrold M, Webb SA, Seppelt I, Patman S, Thomas PJ, Denehy L: **ICU mobility practices in Australia and New Zealand: a point prevalence study.** *Crit Care Resusc.* in press.
11. Thompson BT, Schoenfeld D: **Usual care as the control group in clinical trials of nonpharmacologic interventions.** *Proc Am Thoracic Soc* 2007, **4**:577–582.
12. Hart T, Bagiella E: **Design and implementation of clinical trials in rehabilitation research.** *Arch Phys Med Rehab* 2012, **93**:S117–S126.
13. Minneci PC, Eichacker PQ, Danner RL, Banks SM, Natanson C, Deans KJ: **The importance of usual care control groups for safety monitoring and validity during critical care research.** *Intensive Care Med* 2008, **34**:942–947.
14. Needham DM, Davidson J, Cohen H, Hopkins RO, Weinert C, Wunsch H, Zawistowski C, Bemis-Dougherty A, Berney SC, Bienvenu OJ, Brady SL, Brodsky MB, Denehy L, Elliott D, Flatley C, Harabin AL, Jones C, Louis D, Meltzer W, Muldoon SR, Palmer JB, Perme C, Robinson M, Schmidt DM, Scruth E, Spill GR, Storey CP, Render M, Votto J, Harvey MA: **Improving long-term outcomes after discharge from intensive care unit: report from a stakeholders' conference.** *Crit Care Med* 2012, **40**:502–509.

10.1186/cc12884

Cite this article as: Parker et al.: Critical care rehabilitation trials: the importance of 'usual care'. *Critical Care* 2013, **17**:183