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Reliability and utility of the Acute Care Index of Function in intensive care patients: An observational study

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ABSTRACT

Objectives: To establish the inter-rater reliability of the Acute Care Index of Function (ACIF) in intensive care unit (ICU) patients and determine whether ACIF scores have predictive utility beyond ICU discharge.
Background: Accurate and reliable measures of physical function are required to describe the recovery trajectory of ICU survivors. The clinimetric properties of the ACIF are yet to be established in ICU patients.
Methods: Prospective observational study in a single tertiary ICU. ACIF scores were recorded independently by 2 physiotherapists across a convenience sample of 100 physiotherapy assessments, and at ICU discharge.
Results: Inter-rater reliability of total ACIF scores was very strong (ICC = 0.94). ACIF <0.40 at ICU discharge predicted hospital discharge to a destination other than home (area under ROC = 0.79, 95% CI 0.64–0.89) (sensitivity 0.78).
Conclusion: The ACIF has excellent inter-rater reliability in ICU patients and scores at ICU discharge predict the likelihood of discharge home.
Trial registration: ACTRN12614001008617 (September 18 2014).

Introduction

Over the past decade, clinicians working in intensive care units (ICU) have started to recognize the adverse effects of immobility. Lack of early mobilization in ICU patients is associated with longer duration of hospital stay,[1] and increased risk of readmission and mortality.[2] In contrast, early mobilization of ICU patients results in shorter duration of ventilation, better functional outcomes and reduced delirium.[3] Not surprisingly, there has been a worldwide paradigm shift toward early mobilization and rehabilitation of ICU patients,[3,4] including those who in the past may have been managed with deep sedation and immobility.

The shift toward early rehabilitation in ICU has been enabled through a willingness of multidisciplinary teams to overcome the barriers to early mobilization,[4–6] including minimization of sedation which is thought to contribute to delirium and poor outcomes.[7] Through effective collaboration of nursing, medical and physiotherapy staff, ICU patients are now achieving higher levels of physical function in the acute phase of their illness, including mobilization whilst still ventilator-dependent.[4] However, while we explore the limits of physical function in ICU patients, the lack of

Abbreviations: ICU, Intensive Care Unit; ACIF, Acute Care Index of Function; IMS, ICU Mobility Scale; APACHE II, Acute Physiology and Chronic Health Evaluation II; P-FIT, Physical Function in ICU Tool; CPax, Chelsea Critical Care Physical Assessment Tool; FIM, Functional Independence Measure.

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accurate and reliable tools to quantify physical function in this group presents a new challenge.

The need to measure physical function accurately is even more important in the context of the financial cost of ICU survivorship. In Australia and New Zealand, approximately 74% of ICU survivors eventually achieve sufficient physical function to return home.[8] For patients who experience prolonged mechanical ventilation, the cost of ICU survivorship has been estimated to be US$306 135 per year.[9] As clinicians and researchers strive to minimize the physical, social and financial burdens of ICU survivorship, there is a need for measurement tools which can reliably and accurately describe physical function across the patient journey.

There has been recent interest in establishing the clinimetric properties of tools which can robustly describe physical function in a heterogeneous ICU population.[10] In the last 3 years, tools have been designed to specifically measure physical function in ICU patients such as the Physical Function in ICU Tool (P-FIT),[11] the Chelsea Critical Care Physical Assessment tool (CPax)[12] and the ICU Mobility Scale (IMS).[13] All these tools have demonstrated inter-rater reliability. However to our knowledge, none of these tools have been used to measure physical function for ICU survivors beyond their ICU admission. While early physical rehabilitation in ICU is of great importance, much of the rehabilitation continues beyond ICU discharge. A tool that could be used to describe physical function across the continuum of ICU and rehabilitation would be advantageous in terms of allocating rehabilitation resources, as well as determining which interventions improve physical function in the short and long term for ICU survivors.

The Acute Care Index of Function (ACIF) tool was developed in 1988 to measure the physical function of patients with acute neurological problems[14](Fig. 1). It has excellent inter-rater reliability (intraclass correlation coefficient 0.98) and validity in patients with neurological disease.[15] More recently it has been suggested that the ACIF is currently utilized by clinicians to measure physical function in other patient populations, including those with cardiopulmonary disease, however this evidence is purely anecdotal.[16] Although the tool was developed 27 years ago, and length of stay may have changed over this time for acute care patients, its construct validity remains relevant, covering four main domains of function including mental status, bed mobility, transfers and mobility. The utility of the ACIF in broader patient populations is appealing due to its ready availability, low cost and minimal training required.

The ACIF consists of 20 items that are divided into 4 subsets:

Subscale/Item	Grading			Score
	No	Yes		
Mental status (MS)				MS Score = (/6)
1. *Verbal commands*	0	2		
2. *Commands*	0	1		
3. *Learning*	0	2		
4. *Safety awareness*	0	1		
	Unable	Dependent	Independent	
Bed Mobility (BM)				BM Score = (/40)
6. *Roll supine to right*	0	4	10	
7. *Roll supine to left*	0	4	10	
8. *Supine to sit*	0	4	10	
9. *Sit to supine*	0	4	10	
Transfers (T)				T Score = (/60)
10. *Chair to bed*	0	5	10	
11. *Bed to chair*	0	5	10	
12. *Sit to stand*	0	5	10	
13. *Stand to sit*	0	5	10	
14. *Sitting balance*	0	5	10	
15. *Standing balance*	0	5	10	
Mobility (M)				M Score = (/70)
16. *Gait with device (15m)*	0	14	20	
17. *Gait without device (15m)*	0	21	30	
18. *Ascend 5 stairs*	0	7	10	
19. *Descend 5 stairs*	0	7	10	
20. *Propel wheel chair*[a]	*0*	*14*	*20*	
21. *Set-up wheel chair*[a]	*0*	*7*	*10*	
Total Score: (1) x MS + (1) x BM + (2) x T + (2) x M = .../6 =				

Unable: Patient cannot physically perform the activity
Dependent: Patient assists to perform the activity but requires physical or verbal assistance.
Independent: Patient performs the activity without verbal or physical assistance.
[a]Wheelchair item disregarded unless relevant to patient. For relevant patients M Score = (/100)

Fig. 1. Acute Care Index of Function tool for quantifying physical function.
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For the past five years, we have been utilizing the ACIF to map the physical function trajectories of ICU patients from ICU admission through to hospital discharge.[17,18] Due to the lack of established clinimetric properties of the ACIF in an ICU population, the objectives of this study were to establish the inter-rater reliability of the ACIF in a heterogeneous sample of ICU patients, and in the absence of a gold-standard by which to test validity, to describe the relationship between the ACIF and the IMS. As a crude approximation of construct validity, we also sought to ascertain whether ACIF scores at ICU discharge could predict the recovery trajectory beyond the ICU stay.

Thus the aims of this study were to answer the following questions:

1) Does the ACIF have acceptable inter-rater reliability in a heterogeneous sample of ICU patients?
2) What is the relationship between the ACIF and the IMS?
3) Can the ACIF measured at ICU discharge predict hospital discharge destination?

Method

Ethics, consent and permissions

This study was approved by the Australian Capital Territory Health Human Research Ethics Committee (ETH.14.213), including a waiver of patient consent as the study did not require change to usual practice for the patient. All 8 staff provided verbal consent to participate in this study.

Design and setting

In this prospective observational study, data was collected from September to December 2014 inclusive in a 31-bed tertiary ICU (Canberra, Australia) with a mixed surgical/medical population, including trauma patients. This ICU has a standard practice of minimal sedation and early mobilization, as described elsewhere.[5]

Participants

A convenience sample of 8 physiotherapists participated in the study including the senior ICU physiotherapist, two senior physiotherapists each with more than 10 years' experience, as well as the rotating junior staff working in ICU throughout the duration of the study. No staff were excluded from the study.

The patients were selected as a convenience sample of all ICU patients from Day 3 of admission onwards, such that whenever 2 physiotherapists were simultaneously involved in the assessment of a patient in ICU during the study period, the patient was enrolled in the study. Day 3 of ICU stay was selected to exclude patients who were admitted to ICU with minor illness or for observation only (e.g. following elective surgery without complication) as these patients rarely require substantial assistance to regain independent function. Apart from those whose ICU stay was shorter than 2 days, no patients were excluded from the study.