

## Viewpoint

# Cognitive dysfunction after critical illness: measurement, rehabilitation, and disclosure

Cheryl Misak

Simcoe Hall, King's College Circle, University of Toronto, Toronto, Ontario, Canada M5S 1A1

Corresponding author: Cheryl Misak, [cheryl.misak@utoronto.ca](mailto:cheryl.misak@utoronto.ca)

Published: 26 August 2009

This article is online at <http://ccforum.com/content/13/4/312>

© 2009 BioMed Central Ltd

*Critical Care* 2009, **13**:312 (doi:10.1186/cc7962)

## Abstract

A growing consensus seems to be emerging that neurocognitive outcomes are poor for patients who have been critically ill with acute respiratory distress syndrome and multiple organ failure. However, intensive care unit delirium, post-traumatic stress disorder, and other outcomes must be considered as potentially confounding factors. Once the uncertainty around the causes of postmorbidity cognitive functioning is acknowledged, there are practical implications for appropriate rehabilitative interventions and there are ethical implications for the kinds of appropriate disclosure to patients.

## Introduction

Intensivists are now examining cognitive outcomes after prolonged critical illness and advanced life support. The results are gripping - Hopkins and Brett [1] suggest that 'the neurocognitive impairments in ARDS [acute respiratory distress syndrome] survivors are long lasting and likely permanent'.

I shall argue that it is difficult to pull apart the diverse factors that might prevent a patient's return to clear thinking. I shall also argue that disclosure of information about cognitive function, around which there is genuine uncertainty, may have a negative or self-fulfilling effect on patients' subsequent progress. Thus, important questions are raised about both the issue of disclosure of uncertain prognostic information and about just what interventions might be appropriate for those patients who are experiencing cognitive difficulties after being gravely ill.

In 1998 I spent weeks in an intensive care unit (ICU) with an invasive infection, severe ARDS, and an alarming number of organs in failure. I am also an academic philosopher and found much that was of genuine ethical and methodological interest in that first-hand experience. I shall draw on this experience in what follows, keeping alert to the danger of making unwarranted generalizations.

## Measuring cognitive impairment: intensive care unit delirium as a confounding factor

Delirium is a frequent phenomenon in critically ill patient populations. Ely and coworkers [2] found that 18.5% of 275 mechanically ventilated patients had persistent coma, and of the remaining patients 81.7% developed delirium. Similar findings have been reported by other investigators [3-6]. The delirium tends to involve bizarre and terrifying nightmares, hallucinations, and paranoid delusions - often of the clinical staff trying to rape, murder, or otherwise harm the patient [7,8]. I have suggested that what makes ICU delirium especially insidious is that, unlike nightmares and more like paranoid delusions, it tends to occur in real time and hook onto slices of external reality [9,10]. One takes actual people in the ICU, whips up what is often a violent fantasy around them, and then has the fantasy play itself out in the midst of actual conversations and medical procedures. One loses one's grip on what is true and what is false because the true and the false are mixed together in one mess of experience.

Kapfhammer and coworkers [11] surmised that the process of traumatization in ARDS patients has to do with the initial immediate threat of death by suffocation, the fact that patients must be at least partially awake and cooperative during weaning, the limited ability to communicate, and the lack of possibilities to flee. However, Jones and colleagues [12] have found that it is not memories of terrible real events during critical illness that are related to the stress disorders which can plague ex-ICU patients. It is the memories of the delusions [12-14]. Only these memories were strenuously retained over time - recall of unpleasant factual events, such as suctioning and pain declined. Also, trauma patients, who might be expected to experience increased psychological distress because of memories of horrific actual events, did not have higher levels of anxiety if they did not have memories of delusions. It seems that the mental horrors experienced by ICU patients are more traumatizing than the physical ones.

ARDS = acute respiratory distress syndrome; ICU = intensive care unit; PTSD = post-traumatic stress disorder.

There is some evidence that those who have delirium in the ICU are at greater risk for cognitive dysfunction in the years to come [15,16]. Of course, this kind of result requires investigation into the default hypothesis: ICU delirium is a symptom of a kind of brain failure, sedative use, etc., and that very brain failure, sedative use, etc., is responsible also for the subsequent cognitive impairment. That is, ICU delirium and post-ICU cognitive impairment have a common cause, the precise nature of which has yet to be discovered.

The heretical alternative hypothesis I want to put forward is that rather than the delirium and the impairment having a common cause, the experience of delirium might in some instances be responsible for the low neuropsychological test scores seen in post-ICU patients. Notice that both of the hypotheses could well be true, as long as they are not taken to be universal generalizations; in some instances there may be a common cause and in some instances delirium may be a confounding factor in testing for cognitive impairment. The argument for the heretical hypothesis is as follows.

Depression and anxiety are known to exacerbate the findings of neurological impairment [17]. Indeed, studies of cognitive impairment screen for patients with these identifiable prior psychological problems [18]. However, surely it is not only pre-existing psychological problems that are potentially confounding factors. We need also to consider psychological and emotional problems that have come into existence during and after ICU admission. My suggestion is that, at least sometimes, what one may be seeing when one sees cognitive dysfunction in patients discharged from the ICU may in part be a lingering effect of devastating ICU delirium and the struggle to cope with it.

This thought gets some support from Rothenhausler and coworkers [18], who found their 'most interesting result' to be that post-ARDS cognitive impairments involve attention deficits and that other research suggests that this kind of impairment 'may be related to "psychological distress" or emotional problems.' That is, patients who become depressed or otherwise distressed in the ICU can display the very kind of cognitive impairment most associated with ARDS, and distressed and depressed ex-ICU patients are thick on the ground. Kapfhammer and colleagues [11] found 'long-lasting emotional sequelae for most patients' after ARDS and 'pronounced impairments in psychosocial dimensions of health-related quality of life'. At 8 years, almost 24% were still suffering from 'full-blown PTSD [post-traumatic stress disorder]' and 17% from 'sub-PTSD'. Hopkins and coworkers [19] found 23% of patients to have moderate to severe symptoms of depression and anxiety 2 years after discharge.

In my own case I had a whiff of this, and that was bad enough. For a long time after my release, every time I saw or heard an ambulance I was hit by a sinking feeling and by the thought that there would now be all that effort to save one

measly life. I also found myself, night after night, dreaming that I was in the ICU. Nothing terrible was happening so I wouldn't call them nightmares. I was simply back in the ICU, watching the goings-on in the middle of the night - the patient checks, the new admissions, the small disputes and dramas. The result wasn't a serious dysfunction but merely a dearth of sleep for a year after discharge, as I would wake and stay awake every night. Many of those affected by post-ICU PTSD suffer much more debilitating effects.

What all of this points to is that it is clear that inquiry needs to be conducted not just into the physical factors that might influence the neurocognitive outcomes for those who have been critically ill - factors about individuals such as increasing age and prior cognitive reserve, genetic factors that might influence responses to injury and capacity to repair, and external factors such as the extent, duration, and nature of specific metabolic events and sedative regimens. Inquiry needs to be conducted also into the emotional and psychological factors that might influence neurocognitive outcomes for these patients. Then the question needs to be asked, as Jackson and coworkers [16] have, whether these are distorting influences on test scores.

### **Measuring cognitive impairment: further entanglements**

It is hard to convey just how terribly shaky one is after an insult of this magnitude. De Jonghe and coworkers [20] and Herridge and colleagues [21] have found persistent muscle weakness in post-ARDS patients. In my own case it took a while before I was up to the most minimal of tasks, such as sitting in a chair, and I suffered a kind of weakness and exhaustion that one simply does not encounter during the normal course of life. It is also a kind of exhaustion that manifests itself in a disguised way - disguised because one is getting stronger by the day yet suffers sustained physical deficits. It was enormously helpful during my rehabilitation that I had run university track and knew the feeling of your lungs being ripped out, having just bested your previous best time. That extreme feeling I experienced after ARDS was present during cardiovascular exercise for well over a year after my discharge.

In light of this kind of phenomenon, I suggest that we need to ask whether the rates of post-ICU cognitive impairment might represent, at least in part, a psychological reaction not just to the stress of ICU delirium but also to the whole range of phenomena that arise from critical illness. We need to ask whether reduced reserves, fatigue, extreme weakness, and decreased quality of life might have an impact on the results of tests for post-ICU cognitive impairment.

Another potential distorting influence has to do with confidence, an issue that will bring us to what we might call the moral outcomes. Being highly proficient in the art of denial, I returned to my job after 1 month. In retrospect, I was

performing poorly. I had just taken on an administrative position and, as my predecessor filled me in on the countless things that needed my attention, I heard mostly a blur of words. This mental fuzziness was akin to a really bad hangover. Even at the time I could not pull apart the mental deficits from the physical ones. I could hardly stand, my hands shook because of muscle loss, and I was always out of breath. None of that is conducive to feeling and being mentally sharp.

I pushed my rehabilitation very hard and 8 months after discharge, apparently back to something approximating normal, I gave a talk to the philosophy heavyweights in Oxford. It was a disaster. I seemed not to have the lung capacity to speak to a large audience, and I felt unable to grasp the complex and tough questions that were thrown at me. I could see the shape of the question ('That's the objection from the principle of bivalence. I know what I have to say about that.'). but I couldn't actually formulate the answer. Things got better with each subsequent talk, but it still isn't clear to me whether this gradually improving problem was cognitive dysfunction, a lack of confidence, or a physical/pulmonary deficit.

What I want to point to is a potential looping effect, which might further skew the estimation of rates of cognitive impairment. For those who are suffering from mental fuzziness, the inference that one is permanently cognitively damaged sits there, waiting to be drawn. Drawing it, I suggest, might also affect the results of neurocognitive tests to which the patient is subjected. Studies show that the impact of stereotypes and expectations of how one is likely to perform affect performance on cognitive function tests [22]. We also know from our own experience how confidence is fragile and interwoven with success. Not being sure that you can hit that backhand drive results in a truncated and useless shot; not being confident about speaking in public diminishes your performance. Thinking that you are likely to be cognitively impaired may affect your performance on cognitive function tests. Indeed, the very fact that the medical community is interested in your neurocognitive status is an alert that there is an expectation of cognitive damage.

### Practical and ethical upshots

It might be asked whether poor performance, induced either by some organic/biochemical problem (such as hypoxia or liver failure) or by some functional problem (such as psychological fallout from delirium, fatigue, or a lack of confidence), is poor performance nonetheless. That is, whatever the cause, the brain is not working properly and there is impairment. However, the difference in what induces poor performance plays out both in terms of interventions and ethical outcomes.

If the injury in a particular case is such that there is no actual physical damage to the brain, but rather a reversible metabolic injury, then it might be advisable for the patient to

engage in cognitive and cardiovascular exercises to improve mental functioning. If the injury is due to prolonged hypoxia or cessation of blood flow to the brain, resulting in cell death or loss of nerve cell connectivity, then such rehabilitative interventions may be still appropriate. If, however, there is anything to the idea of the plasticity of the brain, then other kinds of intensive rehabilitation might be called for as well. Alternatively, if the brain works properly physically, but psychological or emotional problems disrupt cognitive functioning, appropriate interventions might include cognitive behavior or drug therapy.

Work on post-ICU psychological rehabilitation is just now starting to be conducted, led by Griffiths and Jones [23,24] in the UK. As it continues, a constellation of issues - the connection between confidence, fear of failure, motivation, and success - needs to be carefully considered. If patients think that they will do poorly on complex cognitive tasks, then the temptation may be to not make the attempt, but declining to undertake such tasks leads to lack of cognitive activity and a further shrinking of possibilities.

Hard on the heels of these practical implications follow some ethical implications. The measurement difficulties provide a set of moral challenges for the intensivist. Hospitals fail some of their most fragile patients if they are not sent out of the ICU equipped with some substantial information about what is likely to come [9,10,12,25]. Matters, however, are made complex when it comes to the potential cognitive troubles patients might encounter upon discharge. Should the results of cognitive tests, if such tests were administered, be given to patients or their families? Should they be told that cognitive dysfunction is a common outcome? What are the practical and ethical consequences of giving or withholding such information?

This of course is a common problem in medicine. Physicians grapple with the issue of whether to provide information when they suspect that it is likely to have an adverse effect. It may make patients, for instance, not do something they should do. However, withholding information seems to deny full autonomy to their patients.

What I have offered here is a set of considerations in favor of caution in alerting patients and their families to scores on postmorbidity neurocognitive tests. It is not just that those scores may be affected by confounding factors. The caution is amplified because of the looping effect. Even if an adequate test battery in regard to all potential confounding factors could be developed, the ethical dimension of the potential negative looping effect would not disappear.

### Conclusions

It is one thing to try to get over the physical deficits after being gravely ill. It is another thing to try to get over cognitive, emotional, or psychological deficits. For in the latter case,

some thoughts can themselves be damaging. Imagine having been through a significant period of extreme madness and cognitive dysfunction. You wonder whether you will entirely shake it off. Then you are told (or you infer from the fact that you are being tested) that the impairment might be permanent. It is hard to imagine how this knowledge could fail to loop back and affect your cognitive abilities.

It is important to see the depth of this point. It is not just that knowledge of expected difficulties might make one perform more poorly on cognitive function tests or may actually exacerbate existing difficulties. It may have an even more profound effect. As Hacking [26] puts it, when clinical medicine identifies a kind of person - in this case, the cognitively impaired survivor of critical illness - the identification affects the persons identified. The target at which medicine is aiming - the kind of person it is trying to characterize - starts to move, as the identifications and diagnoses interact with and change the people identified.

There is some reason to think that cognitive impairment after critical illness provides an especially sharp example of this phenomenon, because cognitive impairment strikes at the very core of one's personal identity. Who you are is bound up with your cognitive capacities and characteristics. Having those capacities and characteristics damaged quite literally strikes at the heart of your self.

The physicians who cared for me exercised the requisite caution after my release, no doubt due in part to an implicit sensitivity to these looping effects. I might not have embarrassed myself in Oxford had they warned me about the expected cognitive impairments. However, treating me with kid gloves in this way would have had, I surmise, disastrous consequences. I might never have regained the confidence required to expose myself to the usual onslaught of critical scrutiny - a room full of excellent philosophers wanting to maul my arguments. Indeed, I may have been one of those who never fully returned to work, or my return to work might have been the return of someone diminished. To follow up on Hacking's thought, it might have been the return of a different kind of person.

Of course, mine is but one case out of many and it would be foolish to suggest that every post-ICU patient should charge ahead and ignore whatever difficulties they may be encountering. Nonetheless, we can say at least the following general things. It is clear that intensivists should continue to try to explore the issue of cognitive outcomes after critical illness, while trying their best not to trigger looping effects in their patients and research subjects. Especially in the absence of knowledge of the precise causes of cognitive dysfunction, special care must be taken in what is said to patients. Perhaps patients should be told that, just as they will be experiencing physical weakness that will improve as the weeks go by, they may well experience disturbed sleep,

depression, and cognitive weakness that may improve with time. They should be told, if it is in fact the case, that the hope is for a full or at least a significant recovery, on both physical and cognitive fronts. Of course, they also need to be given a realistic sense of what they can achieve so that they can feel motivated and encouraged rather than crushed. The same issues arise for people with strokes, dementia, brain tumors, and traumatic brain injuries. Here it appears to be standard practice to offer 'neuro-rehab' - cautiously optimistic advice about the unknown future with encouragement to push the boundaries and not to get upset if failure is experienced. Something approximating the required sensitivity, it seems to me, is achieved in the excellent 'Patient/family info' section of ICUdelirium.org [27] from Ely's ICU Delirium and Cognitive Impairment Study Group at Vanderbilt University.

There is another ethical issue here. Care must be taken in making the kind of argument I make, lest it be inferred that research into post-ICU cognitive impairment is not something that ought to go forward. This research has real significance for the short- and long-term outcomes of those who have been gravely ill, and nothing I say here diminishes its importance. Nonetheless, it is important to ask the hard questions and to try to arrive at the best answers.

## Competing interests

The author declares that they have no competing interests.

## Acknowledgments

I am a tourist in this field and owe a tremendous debt to generous tutelage from some of its proper inhabitants, including Jonathan Freedman, Peter St. George Hyslop, Mona Hopkins, Jim Jackson, Christina Jones, David Naylor, David Mazer, and Lucy Padina. Special thanks go to Wes Ely and Margaret Herridge for their extremely helpful comments and encouragement. My philosophy colleagues Jim Brown, Ian Hacking, Diana Raffman, and Jennifer Nagel gave me excellent comments of a very different sort.

## References

1. Hopkins RO, Brett S: **Chronic neurocognitive effects of critical illness.** *Curr Opin Crit Care* 2005, **11**:369-375.
2. Ely EW, Shintani A, Truman B, Speroff T, Gordon SM, Harrell FE, Inouye SK, Bernard GR, Dittus RS: **Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit.** *JAMA* 2004, **291**:1753-1762.
3. Rosene KA, Copass MK, Kastner LS, Nolan CM, Eschenbach DS: **Persistent neuropsychological sequelae of toxic shock.** *Ann Intern Med* 2002, **96**:865-870.
4. Jackson JC, Hart RP, Gordon SM, Shintani A, Truman B, May L, Ely EW: **Six month neuropsychological outcome of medical intensive care unit patients.** *Crit Care Med* 2003, **31**:1226-1234.
5. Jones C, Griffiths RD, Slater T, Benjamin KS, Wilson S: **Significant cognitive dysfunction in non-delirious patients identified during and persisting following critical illness.** *Intensive Care Med* 2006, **32**:293-296.
6. Rothenhausler HB, Grieser B, Nollert G, Reichart B, Schelling G, Kapfhammer HP: **Psychiatric and psychosocial outcome of cardiac surgery with cardio-pulmonary bypass: a prospective 12 month follow-up study.** *Gen Hosp Psychiatry* 2005, **27**:18-28.
7. Schelling G, Stoll C, Haller M, Briegel J, Manert W, Hummel T, Lenhart A, Heyduck M, Polasek J, Meier M, Preuss U, Bullinger M, Schuffel W, Peter K: **Health-related quality of life and post-traumatic stress disorder in survivors of the acute respiratory distress syndrome.** *Crit Care Med* 1998, **26**:651-659.
8. **ARDS Support Center** [<http://ARDS.org>]

9. Misak C: **The critical care experience: a patient's view.** *Am J Respir Crit Care Med* 2004, **170**:357-359.
10. Misak C: **ICU psychosis and patient autonomy: some thoughts from the inside.** *J Med Philos* 2005, **30**:411-430.
11. Kapfhammer H, Rothenhausler H, Krauseneck T, Stoll C, Schelling G: **Post-traumatic stress disorder and health-related quality of life in long term survivors of acute respiratory distress syndrome.** *Am J Psychiatry* 2004, **161**:45-52.
12. Jones C, Griffiths R, Humphris G, Skirrow P: **Memory, delusions, and the development of acute posttraumatic stress disorder-related symptoms after intensive care.** *Crit Care Med* 2001, **29**:573-580.
13. Perrin J, King N, Collings J: **Assessment of long-term psychological well-being following intensive care.** *Intensive Crit Care Nursing* 1998, **14**:108-116.
14. Jones C, Skirrow P, Griffiths R, Humphris G, Ingleby S, Eddleson J, Waldmann C, Gager M: **Rehabilitation after critical illness: a randomized controlled trial.** *Crit Care Med* 2003, **31**:2456-2461.
15. Katz I, Curyto K, TenHave T, Mossey J, Sands L, Kallan M: **Validating the diagnosis of delirium and evaluating its association with deterioration over a one-year period.** *Am J Geriatr Psychiatry* 2001, **9**:148-159.
16. Jackson JC, Gordon SM, Ely WE, Burger C, Hopkins RO: **Research issues in the evaluation of cognitive impairment in intensive care unit survivors.** *Intensive Care Med* 2004, **30**: 2009-2016.
17. Richards PM, Ruff RM: **Motivational effects on neuropsychological functioning: comparison of depressed vs. non-depressed individuals.** *J Consult Clin Psychol* 1989, **57**: 396-402.
18. Rothenhausler HB, Ehrentraut S, Stoll C, Schelling G, Kapfhammer HP: **The relationship between cognitive performance and employment and health status in long term survivors of the acute respiratory distress syndrome: results of an exploratory study.** *Gen Hosp Psychiatry* 2001, **23**:90-96.
19. Hopkins RO, Weaver LK, Collingridge D, Parkinson RB, Chan K, Orme JF: **Two year cognitive, emotional and quality of life outcomes in acute respiratory distress syndrome.** *Am J Respir Crit Care Med* 2005, **171**:340-347.
20. De Jonghe B, Cook D, Sharshar T, Lefaucheur JP, Carlet J, Outin H: **Acquired neuromuscular disorders in critically ill patients: a systemic review.** *Intensive Care Med* 1998, **24**:1242-1250.
21. Herridge M, Cheung A, Tansey C, Matte-Martyn A, Diaz-Granados N, Al-Saidi F, Cooper A, Guest C, Mazer D, Mehta S, Stewart T, Barr A, Cook D, Slutsky A: **One-year outcomes in survivors of the acute respiratory distress syndrome.** *N Engl J Med* 2003, **348**:683-693.
22. Steele CM: **A threat in the air: how stereotypes shape intellectual identity and performance.** *Am Psychol* 1997, **52**:613-629.
23. Griffiths R, Jones C: **Delirium, cognitive dysfunction and post-traumatic stress disorder.** *Curr Opin Anaesthesiol* 2007, **20**: 124-129.
24. Griffiths R, Jones C: *Intensive Care Aftercare.* Amsterdam: Elsevier; 2001.
25. Herridge M, Angus D: **Acute lung injury – affecting many lives.** *N Engl J Med* 2005, **353**:1736-1738.
26. Hacking I: **Making up people.** *London Rev Books* 2006, **28**:23-26.
27. **Patient Family Information** [<http://icudelirium.org/delirium/Family.html>]