

A systematic review of the impact of delirium on allied health interventions: A surprising lack of data

¹Damian Johnson *BSc MD*, ¹Erin Maylin *BSc MD*, ¹Linley Hayes *BSc MD*, ¹Casey Hair *BN PG Cert Neuroscience Nursing*, ¹Thomas Kraemer *MBBS FRACP*, ¹Mandy Lau *MBBS FRACP*, ^{2,3,4}Amy Brodtmann *PhD FRACP*, ^{1,3}Ramesh Sahathevan *PhD FRACP*

¹Internal Medical Services, Ballarat Health Services, Ballarat, Victoria; ²Royal Melbourne Hospital, Parkville, Melbourne, Victoria; ³Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, Victoria; ⁴Florey Institute of Neuroscience and Mental Health, Melbourne, Victoria, Australia

Abstract

Background & Objectives: There is increasing interest in the impact of delirium on mortality and morbidity in stroke patients. Whilst there are published studies assessing this impact, they are primarily focused on the short/long-term physical and cognitive outcomes of stroke survivors. We conducted a systematic review of the literature to determine the impact of delirium on participation in allied health interventions and measurable outcomes immediately following a stroke. **Methods and Results:** We used a broad search strategy and interrogated three online databases; CINAHL, EMBASE and MEDLINE. Our initial search yielded no results specific to stroke. The search was then expanded to include studies in any patient population and the final result yielded two publications that fulfilled inclusion criteria. One was a case report of a post-arthroplasty patient, and the second an observational study in an ICU. Both groups concluded that delirium had a negative impact on participation in allied health therapy. **Conclusion:** The lack of research on the impact of delirium on participation in allied health therapies in stroke patients is surprising. Intuitively, we would assume a negative association but this needs to be studied systematically to identify the incidence, risk factors, and potential interventions aimed at improving outcomes. The overall management of stroke must keep pace with the gains shown in hyperacute stroke management to ensure maximal benefit to stroke survivors.

Keywords: Delirium, stroke, Allied Health intervention, physical therapy

INTRODUCTION

Delirium is linguistically defined as madness. Medically, it is defined in the DSM-V as an acute cognitive deficit that manifests as a fluctuation in the level of consciousness and poor attention.¹ It has long been recognised as a clinical entity but has only relatively recently been studied in depth. The incidence of delirium in the general medical population ranges widely, from 25-50%.² Similarly, delirium affects a significant number of stroke patients and has a negative effect on outcome. The incidence of delirium following stroke and the impact on physical and cognitive outcome was the subject of two fairly recent reviews and meta-analyses.^{3,4} There is substantial data on the negative impact of delirium on both short and long-term patient outcomes.²

Various risk factors for delirium have been identified, generally^{5,6} and in stroke specifically.⁷ This knowledge has led to the development of

at least one validated predictor of delirium in stroke⁸, although there is sadly little in the way of published data that use of the tool has gained traction amongst stroke clinicians.

Delirium is therefore a clearly defined, and predictable clinical entity that has immediate and distant consequences on the outcome of stroke patients. There remain gaps in our knowledge. We sought to determine the influence, if any, of delirium on the ability of stroke patients to participate in allied health interventions (occupational therapy, physiotherapy and speech and language pathology) and the impact this might have on recovery by conducting a systematic review of the literature.

METHODS

Search strategy

We conducted a structured search of the

CINAHL, EMBASE and MEDLINE databases. Search terms included “delirium”, “acute confusion”, “severe confusion”, “confusion* state”, “clouding of consciousness”, “metabolic encephalopathy”, “altered mental state”, “deliri*”, “stroke rehabilitation”, “neurorehabilitation”, “rehabilitation”, “occupational therapy”, “physiotherapy”, “speech and language rehabilitation”, “physiotherapy*”, “occupational therap*”, “physical therap*”, “speech therap*”, “speech therap*”, “exercise”, “early mobilisation”, “early mobilization”.

Our initial search was limited to research conducted in stroke but this returned no results. We then expanded our search to include articles examining the impact of delirium in patients’ ability to participate in rehabilitation of any kind following any form of acute illness. Our inclusion criteria included all studies that looked at the impact of delirium on a patient’s ability to participate in allied health interventions following hospital admission. We only assessed studies conducted in an adult population. Articles were excluded if the objective of the study was to determine if the use of physical therapy or other intervention could limit the incidence of delirium, as well as those that purely looked at the impact on delirium on functional outcome with no analysis of the impact on participation in allied health interventions. We also excluded articles published prior to 1995 and limited our search to articles published in English. Our methodology is outlined in Figure 1.

Study identification and validity assessment

Two reviewers (D.J. and E.M.) assessed titles and abstracts to determine eligibility. Disagreements between reviewers were resolved by a third reviewer (RS), who made a final decision. The two reviewers independently assessed the titles and abstracts. The main criteria to determine suitability were that the paper was based on original research assessing the impact of delirium in patients with acute illness and the impact on ability to participate in rehabilitation of any kind.

RESULTS

We retrieved 1959 publications across the three databases and identified 1755, following removal of duplicates. These publications included conference abstracts and proceedings, and full papers, including cases studies. We adopted a less stringent approach due to the small number of articles relevant to the topic. Following title and

abstract screening, 11 papers were identified for full-text evaluation. Eight articles were excluded following full-text review and despite our efforts, we were unable to locate one other article. The methodology is shown in Figure 1 as a flowchart.

Outcomes

Only two papers^{9,10} addressed the impact of delirium on participation in allied health intervention, while the rest focused more on the impact of delirium on functional outcome. Of the remaining eight publications reviewed, six were excluded because the outcome investigated was whether delirium was associated with poorer functional outcomes at discharge¹¹⁻¹⁶; one looked solely at patients with delirium and the difference in outcomes for those with and without pre-existing dementia¹⁷; and the final paper was a case study discussing the role of physical therapists in the management of delirious patients.¹⁸

The first publication, by Tekin *et al.*⁹, was a case study of a 78-year-old man who developed delirium while admitted to a rehabilitation unit following hip arthroplasty. Delirium was identified as having a significant impact on the patient’s ability to participate in rehabilitation. This paper does not detail the specifics of the rehabilitation program attempted, but presumably it was physical therapies centred around regaining pre-morbid mobility, as this is mentioned as a functional outcome at the time of the patient’s discharge. By managing his symptoms using pharmacological and non-pharmacological interventions, the patient improved, and he demonstrated a significant increase in voluntary participation in his rehabilitation program. However, given that this was a case study of a single patient, there were no significant statistical analysis to demonstrate an association between treatment of delirium and improved participation in rehabilitation.

The second study, by Kamdar *et al.*, was ICU based and looked at a range of factors and their association with daily participation in physical therapy.¹⁰ The aim of this study was to compare the association of delirium, perceived sleep quality and sedation status with daily participation in physical therapy in ICU patients. This study analysed a total of 327 patients, with an average age of 55 years (IQR 44-66), 49% were female. Admission diagnoses were categorised as “Respiratory failure” (31%), “Gastrointestinal” (16%), “Sepsis, non-pulmonary” (12%), “Cardiovascular” (10%) and “Other” (31%). The ICU that this study was conducted in had a

structured early mobilisation program involving daily monitoring of patient status for eligibility for physical therapy. Patients involved were those who spent at least one night in the unit. Standard protocols for physical therapy were used. The presence of delirium was determined using the CAM-ICU tool¹⁹, with 61% of those included experiencing delirium. Perceived sleep quality was determined using the Richards-Campbell Sleep Questionnaire daily.²⁰ Additional variables relevant to the ICU setting were also recorded, including infusions and bolus use of benzodiazepines and opioids.

The authors identified a statistically significant reduction of daily participation in physical therapies in delirious patients compared to those with normal mental status. This was irrespective of whether the delirious patients had received benzodiazepines (RRR 0.25, 95% CI 0.13-0.50, $p < 0.001$) or not (RRR 0.56, 95% CI 0.41-0.76, $p < 0.001$). They also found that in non-delirious patients there was no significant difference in physical therapy participation regardless of benzodiazepines use.

DISCUSSION

We have found that there is scant research on the impact of delirium on participation in allied health therapies which are meant to improve functional outcome. In contrast, there is substantial data identifying delirium as a cause for poor functional outcome following an acute illness.²¹ It therefore seems logical that the relationship between delirium and poor outcome should be investigated from the aspect of lack of participation in interventions designed to improve patient recovery. In addition, there is the financial cost of delirium to be considered in arguing the benefit of such a research approach. It is estimated that the cost of delirium to the American health system is approximately \$164 billion annually, and over \$182 billion per year in the European Union.²²

Recovery from an acute illness does not only involve resolution or improvement of the disease process. It also requires a patient to regain functional capacity in order to return to their premorbid level of function.²³⁻²⁵ Functional ability is particularly reduced following severe, prolonged illness, especially in the elderly. Allied Health Practitioners, including physiotherapists, speech therapist and occupational therapists, play a key role in a patient's ability to regain their premorbid function and maintain independence.^{23,24}

Despite a literature search that identified 1959 articles, we were only able to include two papers that looked at the impact of delirium on ability to participate in allied health interventions, in the setting of admission for an acute illness. In support of our research question, the authors of both publications suggest that delirium does negatively impact on the ability of a patient to participate in allied health therapy.

One case study does not a theory support.⁹ The authors nonetheless provide some evidence that delirium had a negative impact on participation in physical therapy. Their argument is supported by the observation that by treating the delirium, their patient was able to participate in therapy. They report use of non-pharmacological and pharmacological means of improving delirium; the latter is especially relevant given recently published research on the negative impact of antipsychotics on mortality when used to treat delirium.²⁶ However, being a case report, the authors were not able to reasonably defend their observation or explore the role of confounding factors. In this respect, the second article we included in the review fared better.

Kamdar *et al.* report on the impact of delirium, sedation status and perceived sleep quality on physical therapy in an ICU setting and its relationship with levels of participation in daily physical therapy.¹⁰ They report that delirium significantly reduced participation in physical therapy, independent of other factors such as sedation.

Delirium is a common neuropsychiatric complication of acute illness.⁴ It is estimated to affect 20-30% of patients admitted to hospital and is more prevalent amongst the elderly and in the presence of pre-existing cognitive impairment.^{2,27} Delirium in stroke is a significant complication and was the subject of two meta-analyses. Carin-Levy *et al.* determined the incidence of post-stroke delirium to be 26% (95% CI 19-33%).³ They also found that the presence of delirium was more likely to cause unfavourable outcomes. Shi *et al.* published another systematic review and meta-analysis of delirium in acute stroke.⁴ They identified and reviewed ten studies with an incidence of delirium ranging from 10% to 48%. Along with longer hospitalisations, they also reported that patients presenting with delirium were 4.91-times more likely to die within 12 months (OR 4.91; 95% CI 3.18-7.6). In addition, stroke patients with delirium were more likely to be discharged to long-term care institutions or nursing homes (OR 3.39; 95% CI 2.21-5.21).

Neither publication mentions the potential impact of delirium on participation in allied health intervention, despite these treatments having known positive impacts on length of stay in hospital, functional outcome, likelihood of returning to place of residence prior to admission, and mortality.²³⁻²⁵ The authors of both meta-analyses were obviously limited by the scope of the papers included in their own review, as were we.

Our review was initially undertaken to determine the impact of delirium on participation in allied health interventions following acute stroke. Our initial search yielded no results, a surprising and disappointing outcome. We then expanded the search to include the impact of delirium in acute illness of any kind and identified only two papers that looked at the impact of delirium on the ability to participate in allied health interventions, detailed above. Less surprising, but no less disappointing.

We have highlighted a significant lack of research in this field. Given that allied health interventions are a key part of in-patient care following many acute illnesses, there is a clear need for evidence on how a common complication like delirium might impact on patient-participation in these interventions. Any health practitioner would instinctively assume that delirium negatively impacts on patient participation in any form of therapy. We suggest that this is most likely a correct assumption, but in this age of evidence-based medicine, we require proof positive.

This area of study requires a large prospective study which looks specifically at the impact of delirium on a patient's ability to participate in allied health interventions. A general medical approach to this question is best, but as health professionals involved in stroke care, we admit to a bias of studying the topic in stroke patients particularly. The first requirement would be to determine the scope of the problem based on observational data collected from a large cohort of patients. This should be followed by a randomised controlled trial to determine the impact of interventions designed at reducing the incidence of delirium, or actively treating delirium, on participation in therapy and subsequent outcome.

In conclusion, there is almost zero data on the impact of delirium on ability to participate in allied health interventions. We suggest that any future study will clearly demonstrate the negative impact of delirium on allied health intervention. We also predict a positive impact of therapy aimed at reducing the incidence or treating delirium. There is a clear gap in understanding that needs to be resolved. Are we up to the challenge?

ACKNOWLEDGEMENTS

The authors would like to acknowledge the library staff at Ballarat Base Hospital for their assistance in undertaking the literature review

DISCLOSURE

Financial support: None

Conflict of interest: None

REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders : DSM-5*. Fifth edition. Arlington, VA : American Psychiatric Publishing, [2013] ©2013; 2013.
2. Siddiqi N, House AO, Holmes JD. Occurrence and outcome of delirium in medical in-patients: A systematic literature review. *Age Ageing* 2006;35(4):350-64. doi:10.1093/ageing/af005
3. Carin-Levy G, Mead GE, Nicol K, Rush R, Van Wijck F. Delirium in acute stroke: Screening tools, incidence rates and predictors: A systematic review. *J Neurol* 2012;259(8):1590-9.
4. Shi Q, Presutti R, Selchen D, Saposnik G. Delirium in acute stroke: A systematic review and meta-analysis. *Stroke* 2012;43(3):645-9.
5. Chan D, Brennan N. Delirium: Making the diagnosis, improving the prognosis. *Geriatrics* 1999;54(Mar):28-42.
6. Lynch E, Lazor M, Gellis J, Orav J, Goldman L, Marcantino E. The impact of postoperative pain on the development of postoperative delirium. *Anesth Analg* 1998;86(4):781-5.
7. Mcmanus J, Pathansali R, Stewart R, Macdonald A, Jackson S. Delirium post-stroke. *Age Ageing* 2007;36(6):613-8.
8. Oldenbeuving AW, de Kort PLM, van Eck van der Sluijs JF, Kappelle LJ, Roks G. An early prediction of delirium in the acute phase after stroke. *J Neurol Neurosurg Psychiatry* 2014;85(4):431-4.
9. Tekin L, Özçakar L, Isik, AT. "Clinical Consultation: Delirium: A Critical Diagnosis for Every Member of the Rehabilitation Team. *Rehabilitation Nursing* 2011; 36(5):214-5.
10. Kamdar BB, Combs MP, Colantuoni E, et al. The association of sleep quality, delirium, and sedation status with daily participation in physical therapy in the ICU. *Crit Care* 2016;20(1):1-9.
11. Tay L, Mark Chan PC, Chong MS. Potential for functional recovery following delirium in older adults with dementia: Impact of a multi-component delirium Management program. *Alzheimer's Dement* 2012;8(4):P566-P567.
12. Abizanda P, León M, Domínguez-Martín L, et al. Effects of a short-term occupational therapy intervention in an acute geriatric unit. A randomized clinical trial. *Maturitas*. 2011;69(3):273-8.
13. Olofsson B, Lundstrom M, Borssen B, Nyberg L, Gustafson Y. Delirium is associated with poor rehabilitation outcome in elderly patients treated

- for femoral neck fractures. *Scand J Caring Sci* 2005;19(2):119-27.
14. Heyman N, Nili F, Shahory R, Seleznev I, Ben Natan M. Prevalence of delirium in geriatric rehabilitation in Israel and its influence on rehabilitation outcomes in patients with hip fractures. *Int J Rehabil Res*. 2015;38(3):233-7.
 15. Turco R, Bellelli G, Morandi A, Gentile S, Trabucchi M. The effect of poststroke delirium on short-term outcomes of elderly patients undergoing rehabilitation. *J Geriatr Psychiatry Neurol* 2013;26(2):63-8.
 16. Atalay A, Mete G, Turhan N. The effect of complications on rehabilitation outcome in first-ever ischemic stroke patients. *Cerebrovascular Diseases* 2009;27(suppl 6):210-235.
 17. Morandi A, Davis D, Fick DM, *et al*. Delirium superimposed on dementia strongly predicts worse outcomes in older rehabilitation inpatients. *J Am Med Dir Assoc* 2014;15(5):349-54.
 18. Erikson A, Wilmarth M. The role of the physical therapist in the assessment and management of the elderly patient with postoperative delirium following hip fracture surgery: an evidence-based case report. *Orthop Phys Ther Pract* 2006;18(2):12-7.
 19. Ely E, Inouye S, Bernard G, *et al*. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). *J Am Med Assoc*. 2001;286(21):2703-10.
 20. Ely E, Truman B, Shintani A, *et al*. Monitoring sedation status over time in ICU patients: reliability and validity of the Richmond Agitation-Sedation Scale (RASS). *J Am Med Assoc* 2014;289(22):2983-91.
 21. McCusker J, Cole M, Dendukuri N, Belzile E. Does delirium increase hospital stay? *J Am Geriatr Soc* 2003;51(11):1539-46.
 22. Inouye SK, Westendorp RGJ, Saczynski JS. Delirium in elderly people. *Lancet* 2015;383(9920):911-22.
 23. Gosselink R, Bott J, Johnson M, *et al*. 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(7):1188-99.
 24. Martin U, Hincapie L, Nimchik M, Gaughan J, Criner G. Impact of whole-body rehabilitation in patients receiving chronic mechanical ventilation. *Crit Care Med* 2005;33(10):2259-65.
 25. Chiang L, Wang L, Chin-Pyng W, Wu H, Ying-Tai W. Effects of physical training on functional status in patients with prolonged mechanical ventilation. *Phys Ther* 2006;86(9):1271-81.
 26. Agar MR, Lawlor PG, Quinn S, *et al*. Efficacy of oral risperidone, haloperidol, or placebo for symptoms of delirium among patients in palliative care: A randomized clinical trial. *JAMA Intern Med*. 2017;177(1):34-42.
 27. Morandi A, McCurley J, Vasilevskis E, *et al*. Tools to detect delirium superimposed on dementia: A systematic review. *J Am Geriatr Soc* 2012;60(11):2005-13.