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## The Importance of Delirium: Economic and Societal Costs

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### Abstract

Although a number of studies have documented the negative clinical and economic consequences of delirium, interventions to prevent and treat delirium are infrequently implemented. The importance of delirium may continue to be underestimated until its societal and economic impact is documented. We outline the existing literature related to long-term sequelae and costs associated with delirium, and stress the importance of such research in prompting recognition, prevention, and treatment efforts that could reduce the impact of delirium and improve quality of life for our older population and their caregivers.

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Delirium, defined as an acute decline of cognition and attention, is a common and severe problem for hospitalized older patients, with occurrence rates ranging from 14–56% and hospital mortality rates ranging from 25–33%.<sup>1, 2</sup> The development of delirium has been associated with increased morbidity, persistent functional decline, increased nursing time per patient, higher per day hospital costs, increased length of hospital stay, higher rates of nursing home placement and increased mortality.<sup>3–6</sup> Delirium often initiates a cascade of events that can include functional decline, caregiver burden, increased morbidity and mortality, and higher health care costs.<sup>3–5, 7–10</sup> Delirium in older hospitalized patients is of particular concern because patients aged 65 years and over currently account for more than 48% of all days of hospital care.<sup>11</sup>

Given the burden associated with delirium both in terms of patient functioning and health care costs, and the fact that a number of interventions have been shown to be effective in preventing or treating delirium,<sup>12–17</sup> one might think that there would be widespread economic incentives to prevent delirium. For example, hospital administrators should have an incentive to adopt delirium prevention interventions to avoid the clinical and financial consequences of delirium. However, such interventions are implemented infrequently, in part because of erroneous ingrained views about delirium. On one hand, many clinicians and administrators view delirium as an all-but-inevitable part of hospital stays for older patients, while others view delirium as a transient, reversible condition, without long-term sequelae or substantial lasting clinical implications. Contrary to the latter view, recent evidence suggests that delirium has substantial long-term sequelae with significant implications for both health care utilization and costs.<sup>2–6, 8, 10, 18–24</sup>

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While delirium has been increasingly recognized as a common, serious, and potentially preventable source of morbidity and mortality for hospitalized older persons, as well as an important patient safety issue, it receives little attention in terms of resource allocation for clinical care and research. The importance of delirium may continue to be underestimated until its societal and economic impacts are established. Our previous work has advanced the field by developing and validating a widely used delirium instrument (the Confusion Assessment Method),<sup>25</sup> identifying delirium risk factors,<sup>26, 27</sup> evaluating the prognosis of delirium,<sup>4</sup> developing and testing delirium prevention strategies,<sup>12, 28</sup> and demonstrating their cost-effectiveness.<sup>5, 29</sup> In another study, we determined that patients who develop delirium had a 62% increased risk of mortality and lost an average of 13% of a year of life compared to patients without delirium.<sup>6</sup> In addition, delirium prevention – such as with the Hospital Elder Life Program (HELP), a targeted, multicomponent intervention – has been demonstrated to be cost-effective. In the initial controlled trial involving 852 patients, HELP saved an average of \$831 per intervention patient for acute hospital costs<sup>29</sup> and \$9,446 per patient per year in long-term nursing home costs.<sup>5</sup> At a dissemination site in a large community hospital, HELP was evaluated using administrative data, and saved \$1.25 million per year in 704 patients on one 400-bed unit.<sup>30</sup> A follow-up study involving 7,000 patients per year on 6 hospital units resulted in annual savings of \$6.9 million (\$7.4 million less \$440K for costs of program).<sup>31</sup> Finally, in the capitated system of Australia, HELP resulted in an annual cost savings of \$129,186 (Australian).<sup>32</sup> Despite these studies, continued advances in the field are hampered by insufficient recognition of the seriousness and impact of the problem of delirium on a national scale. The lack of attention to delirium is of great concern, given that the problem is common and associated with serious complications, is increasing in magnitude with the aging population, and is potentially preventable.

Hence, understanding and documenting the economic burden of delirium is critical. Information on the costs associated with delirium is relevant to insurers, hospitals, health care systems, and government programs (such as Medicare). There is an opportunity cost associated with treatment of delirium: resources used to treat patients with delirium are then not available for treating other patients. Quantifying these costs may lead to a more efficient allocation of health care resources and improved care for hospitalized patients. Estimates of the health care costs associated with delirium may also increase awareness of delirium among insurers, hospitals, health care systems, and policy-makers, and encourage the implementation of interventions to prevent delirium.

Although a number of studies have examined health care costs related to delirium, many have been limited to specific services (i.e., hospital length of stay, intensive care unit, or nursing home care) or patient subgroups (i.e., mechanically ventilated patients or those undergoing elective surgery) and have been limited by relatively small sample sizes.<sup>33, 34</sup> However, two studies have examined more general long-term implications of delirium among a large sample of 841 non-intensive care patients. In the first, patients who experienced delirium (N=109) were found to have a 62% increased risk of mortality within 1 year after discharge and lived on average 274 days, compared to 321 days among patients without delirium, a difference of 13% of a year.<sup>6</sup> In the second study,<sup>24</sup> total post-discharge one-year health care costs were compared across patients who had delirium during their inpatient stay versus those who did not. Costs included inpatient, outpatient, nursing home, home health, rehabilitation and other services costs. Total costs attributable to delirium ranged from \$16,303 (in 2005 dollars) to \$64,421 per patient. Following Inouye et al.<sup>2</sup> and assuming that delirium complicates hospital stays for 20% of the 11.8 million persons aged 65 and older who are hospitalized each year, these results imply that total direct 1-year health care costs attributable to delirium range from \$143 billion to \$152 billion nationally.

To put these costs into perspective, one can compare them to costs associated with other conditions. National annual health care costs have been estimated for a number of conditions, including hip fracture (\$7 billion),<sup>35</sup> non-fatal falls (\$19 billion),<sup>36</sup> diabetes (\$91.8 billion),<sup>37</sup> and cardiovascular disease (\$257.6 billion).<sup>38</sup> While we acknowledge the difficulty and limitations in comparing across conditions due to differences in study methodology, diagnostic overlap, and shared comorbidities, our results suggest that the economic burden of delirium is substantial, even relative to other conditions.

Further research is needed to refine and extend these cost estimates, such as estimating indirect costs and caregiver burden. Already, the work to date highlights the considerable burden of delirium as a serious condition with significant long-term clinical and economic consequences. A call to action in recognition, prevention, and treatment is imperative to reduce the impact of delirium and improve quality of life for our older population and their caregivers.

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## REFERENCES

1. Pandharipande P, Jackson J, Ely EW. Delirium: Acute cognitive dysfunction in the critically ill. *Curr Opin Crit Care*. 2005; 11:360–368. [PubMed: 16015117]
2. Inouye SK, Schlesinger MJ, Lydon TJ. Delirium: A symptom of how hospital care is failing older persons and a window to improve quality of hospital care. *Am J Med*. 1999; 106:565–573. [PubMed: 10335730]
3. Cole MG, Primeau FJ. Prognosis of delirium in elderly hospital patients. *CMAJ*. 1993; 149:41–46. [PubMed: 8319153]
4. Inouye SK, Rushing JT, Foreman MD, et al. Does delirium contribute to poor hospital outcomes? A three-site epidemiologic study. *J Gen Intern Med*. 1998; 13:234–242. [PubMed: 9565386]
5. Leslie DL, Zhang Y, Bogardus ST, et al. Consequences of preventing delirium in hospitalized older adults on nursing home costs. *J Am Geriatr Soc*. 2005; 53:405–409. [PubMed: 15743281]
6. Leslie DL, Zhang Y, Holford TR, et al. Premature death associated with delirium at 1-year follow-up. *Arch Intern Med*. 2005; 165:1657–1662. [PubMed: 16043686]
7. Francis J, Kapoor WN. Prognosis after hospital discharge of older medical patients with delirium. *J Am Geriatr Soc*. 1992; 40:601–606. [PubMed: 1587979]
8. Levkoff SE, Evans DA, Liptzin B, et al. Delirium. The occurrence and persistence of symptoms among elderly hospitalized patients. *Arch Intern Med*. 1992; 152:334–340. [PubMed: 1739363]
9. Murray AM, Levkoff SE, Wetle TT, et al. Acute delirium and functional decline in the hospitalized elderly patient. *J Gerontol*. 1993; 48:M181–186. [PubMed: 8366260]
10. O'Keeffe S, Lavan J. The prognostic significance of delirium in older hospital patients. *J Am Geriatr Soc*. 1997; 45:174–178. [PubMed: 9033515]
11. A Profile of Older Americans: 2001. Administration on Aging, U.S. Department of Health and Human Services; Washington, DC: Mar. 2002 2001
12. Inouye SK, Bogardus ST Jr, Charpentier PA, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. *N Engl J Med*. 1999; 340:669–676. [PubMed: 10053175]
13. Leung JM, Sands LP, Rico M, et al. Pilot clinical trial of gabapentin to decrease postoperative delirium in older patients. *Neurology*. 2006; 67:1251–1253. [PubMed: 16914695]
14. Marcantonio ER, Flacker JM, Wright RJ, et al. Reducing delirium after hip fracture: A randomized trial. *J Am Geriatr Soc*. 2001; 49:516–522. [PubMed: 11380742]
15. Naughton BJ, Saltzman S, Ramadan F, et al. A multifactorial intervention to reduce prevalence of delirium and shorten hospital length of stay. *J Am Geriatr Soc*. 2005; 53:18–23. [PubMed: 15667371]

16. Tabet N, Hudson S, Sweeney V, et al. An educational intervention can prevent delirium on acute medical wards. *Age Ageing*. 2005; 34:152–156. [PubMed: 15713859]
17. Taguchi T, Yano M, Kido Y. Influence of bright light therapy on postoperative patients: A pilot study. *Intensive Crit. Care Nurs*. 2007; 23:289–297.
18. Dolan MM, Hawkes WG, Zimmerman SI, et al. Delirium on hospital admission in aged hip fracture patients: Prediction of mortality and 2-year functional outcomes. *J Gerontol A Biol Sci Med Sci*. 2000; 55:M527–534. [PubMed: 10995051]
19. Inouye SK. The dilemma of delirium: Clinical and research controversies regarding diagnosis and evaluation of delirium in hospitalized elderly medical patients. *Am J Med*. 1994; 97:278–288. [PubMed: 8092177]
20. Inouye, SK. Delirium and cognitive decline: Does delirium lead to dementia?. In: Fillit, HM.; Butler, RN., editors. *Cognitive Decline: Strategies for Prevention*. Greenwich Medical Media; London: 1997. p. 85-107.
21. McCusker J, Cole M, Dendukuri N, et al. Delirium in older medical inpatients and subsequent cognitive and functional status: A prospective study. *CMAJ*. 2001; 165:575–583. [PubMed: 11563209]
22. Rockwood K. The occurrence and duration of symptoms in elderly patients with delirium. *J Gerontol*. 1993; 48:M162–166. [PubMed: 8315229]
23. Rockwood K, Cosway S, Carver D, et al. The risk of dementia and death after delirium. *Age Ageing*. 1999; 28:551–556. [PubMed: 10604507]
24. Leslie DL, Marcantonio ER, Zhang Y, et al. One-year health care costs associated with delirium in the elderly population. *Arch Intern Med*. 2008; 168:27–32. [PubMed: 18195192]
25. Inouye SK, van Dyck CH, Alessi CA, et al. Clarifying confusion: The confusion assessment method. A new method for detection of delirium. *Ann Intern Med*. 1990; 113:941–948. [PubMed: 2240918]
26. Inouye SK, Charpentier PA. Precipitating factors for delirium in hospitalized elderly persons. Predictive model and interrelationship with baseline vulnerability. *JAMA*. 1996; 275:852–857. [PubMed: 8596223]
27. Inouye SK, Viscoli CM, Horwitz RI, et al. A predictive model for delirium in hospitalized elderly medical patients based on admission characteristics. *Ann Intern Med*. 1993; 119:474–481. [PubMed: 8357112]
28. Inouye SK, Bogardus ST Jr, Baker DI, et al. The Hospital Elder Life Program: A model of care to prevent cognitive and functional decline in older hospitalized patients. *Hospital Elder Life Program. J Am Geriatr Soc*. 2000; 48:1697–1706. [PubMed: 11129764]
29. Rizzo JA, Bogardus ST Jr, Leo-Summers L, et al. Multicomponent targeted intervention to prevent delirium in hospitalized older patients: What is the economic value? *Med Care*. 2001; 39:740–752. [PubMed: 11458138]
30. Rubin FH, Williams JT, Lescisin DA, et al. Replicating the Hospital Elder Life Program in a community hospital and demonstrating effectiveness using quality improvement methodology. *J Am Geriatr Soc*. 2006; 54:969–974. [PubMed: 16776794]
31. Rubin FH, Neal K, Fenlon K, et al. Sustainability and scalability of the Hospital Elder Life Program (HELP) at a community hospital. *J Am Geriatr Soc*. 2011 in press.
32. Caplan GA, Harper EL. Recruitment of volunteers to improve vitality in the elderly: The REVIVE Study. *Intern Med J*. 2007; 37:95–100. [PubMed: 17229251]
33. Franco K, Litaker D, Locala J, et al. The cost of delirium in the surgical patient. *Psychosomatics*. Jan-Feb;2001 42(1):68–73. [PubMed: 11161124]
34. Milbrandt EB, Deppen S, Harrison PL, et al. Costs associated with delirium in mechanically ventilated patients. *Crit Care Med*. 2004; 32:955–962. [PubMed: 15071384]
35. Haentjens P, Lamraski G, Boonen S. Costs and consequences of hip fracture occurrence in old age: An economic perspective. *Disabil Rehabil*. 2005; 27:1129–1141. [PubMed: 16278182]
36. Stevens JA, Corso PS, Finkelstein EA, et al. The costs of fatal and non-fatal falls among older adults. *Inj Prev*. 2006; 12:290–295. [PubMed: 17018668]
37. Hogan P, Dall T, Nikolov P. Economic costs of diabetes in the US in 2002. *Diabetes Care*. 2003; 26:917–932. [PubMed: 12610059]

38. Thom T, Haase N, Rosamond W, et al. Heart disease and stroke statistics--2006 update: A report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2006; 113:e85–151. [PubMed: 16407573]