Patients, their families, and physicians are increasingly concerned with cognitive, functional, and psychological outcomes of chronic and acute medical conditions. This has led to increased emphasis on patient-reported outcomes (PROs), such as quality of life (QoL), depression, anxiety and functional and cognitive status, in observational studies. In addition, the consolidated standards of reporting trial statement was recently updated to include standards for reporting PROs in randomized controlled trials, highlighting the awareness of including PROs as key outcomes of trials. The development of the Patient-Centered Outcomes Research Institute in 2010, with an emphasis on answering questions most important to patients, their caregivers, and providers, further increased the attention paid to PROs by clinical outcomes researchers. During the same time period, a posthospital syndrome has been described as a period of generalized risk after hospitalization when patients may experience impairments in physical, psychological, and cognitive function and are vulnerable to poor health outcomes, seemingly unrelated to the condition for which they were hospitalized. The recognition and characterization of the posthospital syndrome have further enhanced interest in characterizing the patient beyond the clinical factors contained in the medical record.

In this issue of Circulation: Cardiovascular Quality and Outcomes, Levine et al. present data on trajectories of cognitive and physical function after hospitalization for acute myocardial infarction (MI) or stroke. Data from the Health and Retirement Study are unique in that they include detailed cognitive and physical function assessments before (≤10 years) and after (≤13 years) hospitalizations. Linking claims data with detailed study assessments of cognitive and physical function assessments before and after hospitalization rate of decline, so that they could answer the question, “Am I going to develop impairments at a faster rate than I did before I had this stroke/heart attack?” Hospitalization for MI and stroke each increased the rate of developing additional functional impairments and the rate of development of impairments after hospitalization increased most rapidly in those with the fewest impairments before hospitalization. Hospitalization for stroke, but not MI, increased the odds of subsequent moderate to severe cognitive impairment. The authors suggest that their findings have important implications for increased surveillance for functional impairments after stroke and MI hospitalizations.

These results of this study also have implications for routine screening of cognitive and physical function in all, and particularly older, patients. Because the rate of development of functional impairments changed most significantly in patients with the fewest impairments before hospitalization, knowing the cognitive and functional status of a patient before an acute event would be helpful for understanding what to expect after hospitalization. In addition, although there is considerable controversy regarding the benefit of cognitive screening for treatment decision making and clinical outcomes, there is also acknowledgment of changes in the cognitive function during or after acute illness or hospitalization. The findings in the Levine article suggest that cognitive changes can be expected in the years after stroke, but not MI. Systematic cognitive screening and surveillance would identify patients deviating from an expected trajectory (eg, the development of moderate cognitive impairment in the years after an MI).

Questions remain unanswered regarding whether there is temporary cognitive or physical impairments that resolve quickly after the transitional period from hospital to home, but that may influence success in rehabilitation and, in turn, short-term outcomes (eg, 30-day readmission). Because the HRS data set interviews are conducted every 2 years, cognitive and functional assessments were not necessarily representative of function around the time of the hospitalization, including during the critical peridischarge and hospital to home transition periods. Because of the study design, the authors are unable to report time to the first cognitive/functional assessment after the acute event, nor how many assessments were made after the event. Both are important to understand the significance of the data. In addition, because no assessments were conducted in hospital, it is not possible from the health and retirement study data to examine short-term trajectories of cognitive and functional changes (improvement and decline) around the time of hospitalization.

PROs research has advanced our assessment of function beyond the activities of daily living and instrumental activities of daily living dramatically in the past decade.
Health-related QoL measures capturing general QoL, such as SF-36, and disease-specific QoL, such as the Seattle Angina Questionnaire and the Disease Impact Scale, are increasingly included in longitudinal studies of hospitalized and chronically ill patients. These health-related QoL measures represent not only functional impairment but also how functional impairments affect a person’s ability to engage in or maintain family, social, and work roles. Trajectories of general and disease-specific health-related QoL measures would extend the findings of Levine et al and allow us to answer additional patient questions, such as, “Is my heart problem (or stroke) going to limit my ability to enjoy the everyday activities I always have?”

Modern approaches to trajectory analysis, such as growth mixture modeling or group-based trajectory modeling, have improved our ability to model complex trajectories and to identify characteristics of patients who follow a specific trajectory. Levine et al modeled trajectories of average change before and after stroke and MI using multivariable conditional logistic regression. Although appropriate, this approach assumes that the trajectories experienced in the population are fairly homogeneous. However, when the model was stratified by the baseline level of impairment, trajectories differed. Thus, it is possible that additional factors, such as socioeconomic status, affect trajectories of cognitive and physical functions after an acute event and are important to consider for modeling change over time. Growth mixture modeling and group-based trajectory modeling use Bayesian approaches to first identify different outcome trajectories and classify individuals into one of these according to their characteristics. These approaches should be considered in future work on trajectories of function after acute events to better characterize the heterogeneity in change experienced by patients and to understand patient characteristics associated with specific trajectories.

In addition to understanding the changes in trajectories because of an acute medical event, it is also important to understand whether the increased physical and cognitive impairments observed in the years or decade after a stroke or MI are above and beyond that which would be expected because of normal aging. For instance, yearly declines in the cognitive function of 0.03 to 0.04 standard deviations are observed in general populations because of aging alone. The future studies should report results relative to what expected age-related declines would be. Similarly, normative trajectories of cognitive and physical functions may be able to be established within the health and retirement study data set for which future studies of increased rates of impairment could be compared. It is also important to disentangle the cognitive and physical effects of an acute exacerbation of a chronic condition from that of the accelerated cognitive and physical declines that is caused by the chronic condition itself. For example, increased rates of cognitive and physical declines are observed in patients with atherosclerosis, the underlying disease for MI and most strokes. Understanding the punctuated decline associated with an acute event above and beyond the constant deleterious effect of the underlying condition is important for surveillance planning and tailoring services at critical points. This article provides a starting point from which to continue to examine these important questions.

In conclusion, increasing evidence shows that patients prefer quality over quantity of life. As a result, patients, their families, and physicians need to know what factors influence their QoL, such as functional and cognitive impairments, after acute medical events. Physicians will increasingly be asked, “How is this heart attack (or stroke) going to affect my thinking and remembering or my ability to live alone and take care of myself?” The study by Levine et al starts to answer these important questions. Yet, like all good research, this study raises important questions, which cannot be answered. It is a step in the right direction, opening up avenues of research to better elucidate the determinants of functional impairments for patients with cardiovascular disease. But it is just the start of an era of greater understanding of how cardiovascular disease affects the functional status of patients and what we can do to optimize the patient QoL outcomes.

**Sources of Funding**

This work was supported by grant No. NIH1U01 HL105268. Dr Saczynski is supported by award number K01AG033643 from the National Institute on Aging.

**Disclosures**

None.

**References**


**Key Words:** Editorial ▪ cognition ▪ epidemiology ▪ methodology ▪ outcome
Dawning of a New Era: Understanding the Functional Outcomes of Cardiovascular Disease
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Circ Cardiovasc Qual Outcomes. 2014;7:812-814; originally published online November 11, 2014;
doi: 10.1161/CIRCOUTCOMES.114.001427
Circulation: Cardiovascular Quality and Outcomes is published by the American Heart Association, 7272
Greenville Avenue, Dallas, TX 75231
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Print ISSN: 1941-7705. Online ISSN: 1941-7713

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://circoutcomes.ahajournals.org/content/7/6/812

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