Hearing, mobility, and pain predict mortality: a longitudinal population-based study

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Abstract

Objective: Measures of health-related quality of life (HRQL), including the Health Utilities Index Mark 3 (HUI3) are predictive of mortality. HUI3 includes eight attributes, vision, hearing, speech, ambulation, dexterity, cognition, emotion, and pain and discomfort, with five or six levels per attribute that vary from no to severe disability. This study examined associations between individual HUI3 attributes and mortality.

Study Design and Setting: Baseline data and 12 years of follow-up data from a closed longitudinal cohort study, the 1994/95 Canadian National Population Health Survey, consisting of 12,375 women and men aged 18 and older. A priori hypotheses were that ambulation, cognition, emotion, and pain would predict mortality. Cox proportional hazards regression models were applied controlling for standard determinants of health and risk factors.

Results: Single-attribute utility scores for ambulation (hazard ratio [HR] = 0.10; 0.04−0.22), hearing (HR = 0.18; 0.06−0.57), and pain (HR = 0.53; 0.29−0.96) were statistically significantly associated with an increased risk of mortality; ambulation and hearing were predictive for the 60+ cohort.

Conclusion: Few studies have identified hearing or pain as risk factors for mortality. This study is innovative because it identifies specific components of HRQL that predict mortality. Further research is needed to understand better the mechanisms through which deficits in hearing and pain affect mortality risks. © 2012 Elsevier Inc. All rights reserved.

Keywords: Health Utilities Index Mark 3; Mortality; Predictive validity; Mortality; Longitudinal; Health-related quality of life

1. Introduction

In population health studies, there is substantial evidence that baseline indicators of overall health-related quality of life (HRQL), such as self-rated health (excellent, very good, good, fair, or poor) predict subsequent health events including death [1−9]. For example, using data from the Manitoba Longitudinal Study on Aging, Mossey and Shapiro [1] found that after controlling for objective health status, age, sex, life satisfaction, and income, those who reported their health to be poor were nearly three times as likely to die as those who reported their health to be excellent. Gold et al. [10] using

data from the National Health and Nutrition Survey I Epidemiologic Follow-up Study showed that the overall score on an HRQL measure, the Health Utilities Index Mark 1 based on four attributes (physical function, role function, social-emotional function, and health problem), predicted subsequent mortality after controlling for other determinants of health, including chronic conditions, smoking, income, age, gender, and education. Similarly, Wilkins [11] and Kaplan et al. [12] provided evidence of the relationship between baseline overall Health Utilities Index Mark 3 (HUI3) scores and subsequent mortality. HUI3 includes eight attributes of health status: vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain and discomfort.

Given that baseline overall HUI3 scores predict mortality, which of the individual HUI3 attributes might account for that prediction? Or is it a combination of deficits in

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What is new?

Key message:
Health-related quality-of-life instruments, including hearing and pain, predict mortality (controlling for standard risk factors and health determinants).

What does this study add?
This is the first evidence that two important quality-of-life issues, hearing and pain, predict mortality.

Results also confirm that self-reported mobility predicts mortality.

Implications—what should change now?
These results suggest that more proactive interventions to improve hearing and pain might improve quality-adjusted survival.

multiple attributes that is important? The primary purpose of this study was to examine the association between individual HUI3 attributes and mortality risk prospectively and with a nationally representative population-based sample after adjusting for key covariates.

2. Methods

2.1. Health Utilities Index Mark 3

HUI3 is a generic preference-based measure of health status and HRQL. There are five or six levels per HUI3 attribute [13–15]. Levels within each attribute range from no disability (e.g., able to hear what is said in a group conversation with at least three other people, without a hearing aid) to severe disability (e.g., unable to hear at all). The health state of a subject at a point in time is summarized by the combination of the levels for each of the eight attributes (Table 1). There is substantial evidence on the construct validity of HUI3 in population health surveys [16–23].

HUI3 provides both single-attribute and overall utility scores. Single-attribute utility scores for HUI3 are on a scale in which the most severe level of disability for that attribute has a score of 0.00 and no disability/normal has a score of 1.00 [14]. For instance, the single-attribute utility scores for hearing are level 1 = 1.00, level 2 = 0.86, level 3 = 0.71, level 4 = 0.48, level 5 = 0.32, and level 6 = 0.00. Overall HUI3 scores are on the conventional scale in which dead = 0.00 and perfect health = 1.00.

The HUI3 scoring function is based on community preferences obtained from a random sample of the Canadian population elicited using a visual analog scale (VAS) and the standard gamble (SG). All health states were assessed on the VAS; a subset of health states was assessed on the SG. A power function was estimated to convert VAS into

SG scores. The validity of the scoring function was confirmed by an examination of agreement between SG scores for 73 HUI3 health states obtained from a different random sample and scores derived from the HUI3 scoring function with an intraclass correlation coefficient of 0.88 [14].

2.2. Data

Data from the longitudinal Statistics Canada National Population Health Survey (NPHS) for 1994/95 through 2006/07 were used for the analyses. The NPHS is a closed cohort survey. The target population of the longitudinal NPHS component includes household residents in the 10 Canadian provinces in 1994/95 excluding persons living on Indian Reserves and Crown Lands, residents of health institutions, Canadian Forces bases, and some remote areas in Ontario and Quebec. Using a stratified, multistage random sampling procedure, 17,276 household members were selected to be interviewed every 2 years starting in 1994/95 to gather detailed health status, health service utilization, and sociodemographic data for the longitudinal component of the survey; see Tambay and Catlin [24] for a more complete description of the NPHS. Mortality was ascertained by proxy responses. Deaths up to December 31, 2005 were confirmed against the Canadian Vital Statistics Database [25]. In 13 cases, data on the date of death was missing. If the month of death was known, the date was imputed as the 15th; when the day and month were missing the day of death was imputed as 15 and month of death was imputed as June.

2.3. Independent variables

Single-attribute utility scores for each of the eight attributes are the key independent variables. The association among the 28 pairs of single-attribute scores was assessed.

2.4. Controlling for potential confounders

Standard risk factors and determinants of health identified by previous studies [12,26,27], all measured at baseline, were included in the analyses. These included sociodemographic factors (age, sex, marital status, household income, and education); number of chronic conditions associated with an elevated risk of mortality (high blood pressure, chronic bronchitis or emphysema, diabetes, heart disease, cancer; and stroke); possibly associated with an elevated risk of mortality (asthma and Alzheimer Disease or other dementia); and not associated with an elevated risk of morality (food allergies, allergies other than food allergies, arthritis or rheumatism, back problems excluding arthritis, migraine headaches, sinusitis, epilepsy, stomach or intestinal ulcers, urinary incontinence, cataracts, glaucoma, and other long-term conditions); body mass index; health behaviors (smoking, physical activity, and alcohol use); psychological health and resources (psychological distress, sense of coherence, and chronic stress); and perceived social support. The number of other attributes affected with