

ORIGINAL ARTICLE

Comparison of Complex Versus Simple Activity of Daily Living Staging: Validation of Simple Stages

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Abstract

Objective: To compare activities of daily living (ADL) staging based on 2-level responses to ADL difficulty questions (simple ADL stages) with ADL staging based on 4-level ADL question responses (complex ADL stages).

Design: Analysis of the Second Longitudinal Study of Aging, a prospective cohort study, using descriptive statistics and logistic regression.

Setting: Participants' homes.

Participants: Community-dwelling persons (N=9447) aged ≥ 70 years in 1994.

Interventions: Not applicable.

Main Outcome Measures: (1) Agreement and face validity: baseline simple ADL stage; (2) construct validity: baseline health, difficulty, and need characteristics; (3) prognostic comparison (determined at the Wave 2 interview): primary—nursing home use and/or death; secondary—death.

Results: The systems showed good agreement ($\kappa = .75$). The simple ADL stages stratified people into distinct groups and reflected the expected stepwise increases from stage 0 to stage IV in health and need characteristics, such as the prevalence of home-related challenges (2.9%–84.5%) and perceived need for home modifications (2.1%–33.6%). In comparing the prognostic ability using the primary outcome, the complex system model demonstrated slightly increased discrimination between milder stages and a slightly higher C statistic (.666 vs .664).

Conclusions: Although complex staging appears slightly better at classifying people into distinct prognostic strata with respect to nursing home use and/or death at Wave 2, simple ADL stages demonstrate strong, clinically relevant associations with health and need characteristics.

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Nearly 5 million Americans have difficulty with 1 or more activities of daily living (ADL) based on the 2010 National Health Interview Survey (NHIS), including almost 15% of those older than 65 years.¹ The public health importance of assessing how disabilities impact health outcomes is increasingly recognized, and the Centers for Disease Control and Prevention (CDC) now includes disability as a category for examining health disparities.²

Clinicians also need a comprehensive assessment of function and an understanding of how that function translates to care needs and other outcomes, in order to screen patients and design appropriate interventions.

Traditional aggregate measures of ADL difficulty relying on counts, summary indexes, or binary expressions fail to express the activities that groups of people are still able to perform. Consequently, we are establishing a series of activity limitation staging systems that express discrete patterns of retained abilities for various patient populations.³⁻⁵ Staging approaches recognize that people usually demonstrate functional problems with the most difficult activities before easier ones.⁶⁻⁸ By expressing distinct functional thresholds, stages group people in ways that provide insights about the types of assistance needed and the care burden.

Our objective is to compare 2 staging approaches designed for elder community-dwelling persons. The complex approach applies

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4-level responses to ADL difficulty questions (fig 1). The simple approach, presented here for the first time, uses 2-level responses (fig 2). While complex ADL staging has demonstrated good face, construct, and discriminative capacity for adverse outcomes,^{3,9-12} simple ADL staging may be easier to use clinically if it demonstrates good face and construct validity and comparable predictive capacity. Thus, we will assess agreement between the approaches, face and construct validity of the simple approach, and compare the predictive capacity of the 2 approaches using nursing home use (NHU), death, or both, as the primary outcome.

Methods

The University of Pennsylvania institutional review board approved this study.

Study population

The Second Longitudinal Study of Aging (LSOA II) was a nationally representative prospective cohort (N=9447) of community-dwelling persons, 70 years and older at baseline (Wave 1) in 1994. Wave 2 interviews occurred in 1997 and 1998, and the overall Wave 2 response rate was 84.7% (n=7998).¹³

ADL measures

The LSOA II asks 2 questions for each ADL (bathing/showering, dressing, eating, getting in and out of bed or chairs, walking, using the toilet including getting to the toilet) to determine ADL difficulty. The first question asks, "Because of a health or physical problem do you have ANY difficulty...?" An affirmative answer is followed by asking "how much difficulty," which leads to 4 response levels (no, some, a lot, unable). Complex stages were developed using the 4-level responses.³ We used the first question's 2-level response (difficulty, no difficulty) to develop simple stages, using an empirical approach similar to that used in the complex system development.¹¹ Complex ADL stage development has been described elsewhere,¹¹ so we only present the development of simple stages.

Each person was assigned an ADL profile based on the answers to the 6 ADL questions. Profiles were then sorted by the total number of reported difficult ADL (range, 0–6). The most frequent profile of those reporting 1 difficult ADL defined the "hardest" ADL. An additional criterion was that once an ADL entered the hierarchy, it had to remain difficult in the most frequently occurring profiles of higher totals of ADL difficulties. Hence, for each unit increase in total number of difficult ADL, only 1 ADL was added, which was then considered the "next hardest" ADL (table 1). After determining the ADL hierarchy, we constructed 5 stages (see fig 2) to reflect the 5 *International Classification of Functioning, Disability and Health* self-care performance levels. We grouped the 2 hardest ADL, followed by the next 2 hardest ADL. Those reporting difficulty with all

ADL were assigned stage IV. Stage III was designed to accommodate atypical patterns of difficulty where a person reported difficulty with 1 (or both) of the 2 easiest ADL, but no difficulty with at least 1 ADL (which often includes one of the harder ADL).

After establishing the stages, we then developed algorithms (see figs 1 and 2) to facilitate assigning stages efficiently in a clinical setting. In addition, in some cases, algorithms allow assignment of stage with partial ADL information, enabling better use of available data. Algorithms first assess the easiest ADL and move on to harder ones as needed. For example, the simple algorithm first assesses difficulty eating or toileting, or both. The threshold is no difficulty with either. Those who report difficulty are assigned either stage III or stage IV. If the threshold is met, then transferring/dressing is assessed. If this threshold is not met, stage II is assigned; otherwise walking and bathing are assessed. If this threshold is not met, stage I is assigned. Stage 0 is assigned if there is no difficulty with any ADL.

The following 2 case examples illustrate the reduced complexity of stage assignment using the simple versus complex staging:

- Mr. J is an 87-year-old community-dwelling man with Parkinson's disease and prostate cancer living with his 82-year-old wife who provides care. He describes some difficulties dressing and bathing. He notes a lot of difficulty walking but has no difficulty with the remaining ADL. He is assigned stage II according to both algorithms (see figs 1 and 2). Applying the complex algorithm required 3 decision points compared with only 2 with the simple algorithm.
- Ms. M is a community-dwelling 66-year-old woman with rheumatoid arthritis who describes some difficulty toileting, dressing, getting up from a chair, bathing, and walking. She has no difficulty with eating. She is assigned stage II using the complex algorithm, but stage III using the simple algorithm. Staging with the complex algorithm required 4 decision points compared with only 2 using the simple algorithm, illustrating the clinical efficiency and reduced complexity of the simple approach.

Variables used for evaluating construct validity

Age, ADL stages, self-perceived health, and interview proxy use were assessed using the baseline LSOA II interview. Baseline physical health conditions were assessed using the questions, "have you ever had..." diabetes, arthritis, respiratory disease (chronic bronchitis, emphysema, or asthma), hypertension, heart disease, stroke, and cancer (excluded those reporting only skin cancer). Baseline urinary and fecal incontinence were determined by self-reported difficulty controlling urination and bowels, respectively. The Disability Phase I Questionnaire contained most of the mental illness and Alzheimer disease questions. Those LSOA II participants (n=586) who did not receive this questionnaire were excluded from the analysis of these variables. Dementia was defined by reported Alzheimer disease in the past 12 months or using a proxy/assistant because of poor memory, senility, confusion, or Alzheimer disease. Mental illness was defined by requiring a proxy because of other (nondementia) mental health conditions, or reporting having 1 or more of the following disorders in the past 12 months: schizophrenia, paranoid/delusional disorder, bipolar disorder, major depression, severe personality disorder, or other mental/emotional disorder that seriously interfered with the person's ability to work or attend school or manage day-to-day activities. The NHIS Core Interview

List of abbreviations:

ADL	activities of daily living
CDC	Centers for Disease Control and Prevention
LSOA II	Second Longitudinal Study on Aging
NHIS	National Health Interview Survey
NHU	nursing home use

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