Clinical Characteristics and Six-Month Outcomes of Nursing Home Residents With Low Activities of Daily Living Dependency

Amna Buttar,[1,2] Caroline Blaum,[1,3,4] and Brant Fries[2,3,4]

[1]Department of Internal Medicine, University of Michigan Medical School, Ann Arbor.
[2]Geriatric Research Education and Clinical Center, Veterans Affairs Medical Center, Ann Arbor, Michigan.
[3]Department of Health Management and Policy, University of Michigan School of Public Health, Ann Arbor.
[4]University of Michigan Institute of Gerontology, Ann Arbor.

Background. Up to 30% of nursing home residents have very little dependency in activities of daily living (ADLs). We compared the characteristics and six-month outcomes of a sample of low-ADL–dependent nursing home residents (LDR) with other residents.

Methods. This is a cross-sectional, six-month follow-up study using secondary data analysis. We combined the separate 1990 and 1993 cohorts in the Resident Assessment Instrument evaluation study. In each case these data were collected in the same 254 nursing homes in 10 states. We studied residents with a length of stay greater than 60 days and age 65 years and older ($N = 3955$). We compared the baseline characteristics of LDR ($n = 985$) with all other residents. We then compared six-month outcomes of LDR with other residents and characteristics of LDR with poor outcomes (death or worsened ADL disability) with LDR who remained stable.

Results. The LDR had a significantly decreased frequency of geriatric syndromes (i.e., cognitive impairment, urinary incontinence, under-nutrition, vision problems, poor balance, and pressure ulcers) and neurological disease but had the same frequency of non-neurological chronic diseases and were on more medications. Thirty-one percent had poor six-month outcomes associated with baseline poor cognition, incontinence, poor appetite, and presence of vascular disease, daily pain, shortness of breath, and multiple medications.

Conclusion. Our research identified 29% of nursing home residents with higher physical function (LDR) who had fewer geriatric syndromes and neurological disease diagnoses; 69% of these remained stable at 6 months. Those LDR with a higher risk of poor outcomes could be prospectively identified. LDR who remained stable for 6 months may represent a group who could potentially be maintained in the community.

ALMOST 1.6 million Americans aged 65 and over currently live in nursing homes, and this number is expected to more than double in the next two decades (1). Of interest are a group of low-care residents first described in nursing homes at least twenty years ago (2–5) whom many suspect may not require nursing home care. Despite the increasing sophistication of screening, policy researchers have continued to identify low-care residents in nursing homes in the United States and abroad (6). In the United States, depending on the definition, up to 30% of residents are thought to be low care. Many of these low-care nursing home residents may be a potential target population for programs to keep more elderly individuals in the community. Given the nearly $60 billion cost of nursing home care, even the lowest estimates regarding the number of low-care residents suggest a potential reallocation of over $1.3 billion to design community programs for such residents.

A significant body of research has addressed risk factors for nursing home admission. Although ethnicity (7,8), chronic diseases (7–9), cognitive impairment (10,11), rural residence (12), and social support (7,8,10,13) were found to be important in some studies, the most consistent and powerful predictors of nursing home admission are older age (7,14) and poorer function (14–16). Low activities of daily living (ADL)-dependent nursing home residents (LDR), therefore, must have medical, psychiatric, social, or behavioral reasons to be there. Several studies found that approximately one of ten persons admitted to a nursing home required only minimal ADL assistance (2,3,5,6,17,18). Weissert and colleagues (5) analyzed 6094 nursing home residents using the 1977 National Nursing Home Survey and found that 36% of the residents were only dependent in bathing and/or dressing. Nyman and colleagues compared the ADL dependency of elderly community-dwelling persons with nursing home residents in two Iowa counties (4). Of the 492 nursing home residents, 11% had a score of 0, and another 11% had a score of 1 in their ADL dependency scale (range 0–12). Spector and colleagues (19) defined a low-care population on the basis of three sets of criteria that states use to target persons for personal care homes, using the 1987 National Medical Expenditure Survey ($N = 3170$). Even with the most restrictive criteria (continence of bowel and bladder, no behavior problems, and no rehabilitation or medical needs), 15% of nursing home residents were low care. These studies, however, did not focus on clinical characteristics in depth, and none of them considered clinical outcomes.

The goal of our study was to develop an improved clinical understanding of low-ADL–dependent long-staying nursing home residents (i.e., few ADL impairments and more than 2 months as a nursing home resident) and their clinical course over time. We looked for clinical (medical and psychiatric) as well as social and behavioral characteristics that might account for their presence in the nursing home despite relatively preserved ADL function. In addition, we are the first to evaluate whether LDR remain clinically stable or tend to decline and whether risk factors for clinical and functional deterioration could be prospectively identified.

Methods

Type of Study and Data

We conducted a cross-sectional, six-month follow-up study using secondary data analysis of a sample of nursing home residents from ten states. Data was obtained from the Resident Assessment Instrument (RAI) Evaluation Study, which sampled a different cohort of residents in the same 254 nursing homes in 10 states in 1990 and 1993. The RAI is the resident assessment system mandated in 1991 by the Health Care Finance Administration (HCFA), which includes the Minimum Data-Set (MDS), an assessment instrument that evaluates residents' cognitive, behavioral, functional, and medical status. HCFA sponsored the RAI evaluation study to assess the RAI's impact on nursing home care. A detailed account of the sampling strategy, methodology, and results of RAI evaluation study are beyond the scope of this paper and are published elsewhere (20).

Multi-stage sampling was used within the ten states chosen for the study. Data for the RAI Evaluation Study were collected in four waves (two pre- and two postimplementation) by research nurses in each of the participating facilities. Waves 1 (fall, 1990) and 3 (spring 1993) had pre- and postimplementation baseline data, and waves 2 (spring, 1991) and 4 (fall, 1993) had six-month follow-up data. The states were chosen to reflect different reimbursement strategies and staffing and included California, Connecticut, Iowa, Maryland, Minnesota, Ohio, Oregon, Tennessee, Texas, and Virginia. The facilities in each state included urban and rural nursing homes. Ninety-five percent of the facilities were retained throughout all four waves. In each facility, an average of eight residents was randomly sampled. The sample of residents chosen, although not a population-based sample of all U.S. nursing home residents, was a probability sample chosen specifically to represent the general nursing home population in ten key states. Within the chosen sampling frame, weights defining each sampled resident's probability of selection were available.

For this study, we pooled data from the 1990 and 1993 cohorts to construct a synthetic cohort of residents with baseline and 6-month follow-up data. We excluded residents with length of stay less than 60 days and age less than 65 years (study $N = 3955$).

Variables and Their Measurement

We defined low ADL-dependent residents (LDR, $n = 985$) as those with the fewest ADL limitations, determined by their presence in the lowest quartile of an additive scale of ADL dependency. Eight ADLs are measured in the RAI/MDS on a scale of 0 to 4 (0 = no dependence; 4 = complete dependence): eating, dressing, bathing, toileting, personal hygiene, bed mobility, transfer, and locomotion. The interrater reliabilities for the ADL measures used in this scale ranged from 0.89 to 0.98 (21). The additive scale therefore had a range of 0 to 32 (0 = no dependency; 32 = complete dependency in all ADLs). The mean ADL score for all residents was 18 ± 11, and the median was 19. The cut-off score for the lowest quartile, our LDR, was 8.

We compared our ADL scale with a published ADL scale developed from RAI variables—the RUG-III ADL Index scale, which succinctly summarizes the effects of resident functionality (22). The measure of physical function for the multivariate analysis was the mean value for a composite of ADL Index that combined self-performance in "late-loss ADLs": bed mobility, bed–chair transfer, eating, and toileting. The range for this scale in our data set is 3 to 15, and the LDR had a mean score of 3.1 ± 0.68 versus residents with medium and high ADL dependency (M/HDR) who had a mean score of 10.3 ± 3.3 ($p < .001$).

All the independent variables used were taken from the MDS (research nurses collected this data following standard published directions) (23). Variables included demographic and social variables; advance directives and legal oversight; chronic disease diagnoses; diagnoses of dementia, depression, and anxiety; cognitive performance; gait; balance; nutritional status; behaviors suggesting delirium and depression; behavioral problems; medications; and physical restraints. The average interrater reliability of MDS variables chosen for analysis ranged from 0.5 to 0.98 (21).

Most variables studied were measured by a single MDS question. However, the cognitive performance and the depressed behavior variables were composites of several questions (24,25). The MDS Cognitive Performance Scale (CPS) has been validated against the Mini Mental Status Examination and the Test for Severe Impairment (24). The CPS is a seven-category rating scale (range 0–6), and the items used for the CPS have an average interrater reliability of 0.85 (24). The MDS Sad or Anxious Mood Scale is based on 12 MDS items and exhibits moderate to good specificity and sensitivity when compared with clinical judgments made by trained facility staff (25).

Model Development and Statistical Analysis

The LDR were compared with all others using standard descriptive statistics including the *t* test for continuous variables and the chi-square test of association for categorical variables. Variables analyzed were chosen on the basis of clinical experience and previous literature and represented important characteristics associated with ADL disability: sociodemographics, advance directives; cognitive performance; depressive symptoms and behaviors; nutritional status; sensory problems; medications; and chronic medical, neurological, and psychiatric diseases. Variables significantly associated with low-dependency status were then entered into a logistic regression model to assess their multivariate association.

For our longitudinal analysis, we first compared the different six-month outcomes of the LDR and M/HDR with re-

spect to ADL status change, discharge, and death. Then, within the LDR group, we studied those baseline characteristics associated with a poor six-month outcome, defined as the combined outcome ADL status (decline in ADL status from the LDR to the M/HDR group in six months) and death. The independent variables tested for the longitudinal analyses within the LDR group were the same as those for the cross-sectional analyses described above. Variables found to be significant were evaluated in a logistic regression model to assess the multivariate associations of variables with a poor outcome. Residents who had died in six months were not included in the six-month comparison of ADL status and cognitive performance. All analyses were weighted for resident selection probability. Multivariate analyses were controlled for age, gender, and cohort (1990 or 1993). The statistical program used was Statistical Analysis System for Windows (SAS, SAS Institute, Cary, NC) (26).

RESULTS

The LDR, defined as the lowest quartile of the ADL dependency scale (range 0–8), had a mean ADL score of 4 ± 2.5. Table 1 compares the characteristics of the LDR with the all other residents (M/HDR, mean ADL score 23 ± 7). The LDR did not differ significantly in age from the other residents but were more likely to be married and to have lived alone before admission and were less likely to have a "do not resuscitate" order.

The LDR had fewer diagnoses of neurological conditions, including Alzheimer's disease and other dementia, stroke, and seizures. However, the frequencies of most other chronic conditions and diseases were similar in both groups. In fact, the mean number of non-neurological disease diagnoses was the same in the two groups. However, the LDR had a lower frequency of sensory and balance impairments, urinary incontinence, and fewer indicators of poor nutrition. The LDR had a higher frequency of the diagnosis of anxiety and were more frequently on antidepressants, anxiolytics, and more than 6 medications.

One of the major differences between the LDR and M/HDR was in the distribution of cognitive impairment within the two groups. Figure 1 compares the percent of each group in each of the seven levels of cognitive performance on the CPS. This scale ranges from 0 to 6, where 0 is no impairment and 6 is severe cognitive impairment. There were no LDR in Level 6 of the CPS, compared with 22% of the M/HDR. Over 73% of the LDR group had very little or no cognitive impairment, with scores of 0, 1, or 2.

Multivariate associations of demographic, social, and clinical variables are shown in Table 2. The strongest associations with low-dependency status were found with urinary continence, no pressure ulcers, and absence of balance problems. Higher levels of cognitive performance, a good appetite, and the absence of seizures, strokes, and visual impairments were also strongly associated with low-dependency status.

The six-month follow-up showed that while most LDR remained LDR, 24% moved into the M/HDR group, and 7% died. In contrast, only 8% of the M/HDR group improved to LDR, and 16% died. The LDR had only minimally more

Table 1. Comparison of Demographic, Social, and Clinical Characteristics of Low ADL Dependency Residents to Others

	LDR (n = 985)	M/HDR (n = 2970)
Demographics		
Mean age $\pm$ SD	81 $\pm$ 11	82 $\pm$ 12
Male (%)	27*	22
Medicare (%)	25**	30
Do not resuscitate (%)	33***	44
Indicators for social isolation		
Married (%)	21***	15
Lived alone before admission (%)	34***	22
Neurological Diseases and Conditions		
Alzheimer's disease and other dementia (%)	35***	56
Stroke (%)	13***	27
Parkinson's disease (%)	5*	7
Seizures (%)	5***	10
Diseases, Conditions, Physical Function, and Sensory Impairments		
Chronic obstructive pulmonary disease (%)	15***	10
Coronary artery disease (%)	21	22
Congestive heart failure (%)	19	18
Hypertension (%)	33	31
Diabetes (%)	16	15
Arthritis (%)	25*	22
Mean ADL score $\pm$ SD	4 $\pm$ 2.5***	23 $\pm$ 7
Hearing impairment (%)	14***	21
Visual impairment (%)	10***	26
Balance problems (%)	30***	64
Mean number of non-neurological diseases $\pm$ SD	1.8 $\pm$ 1.5	1.7 $\pm$ 1.4
Urinary Incontinence	6***	61
Symptoms, Depressive Behaviors, and Treatments		
Joint pain (%)	14*	12
Depressive symptoms (%)	8	8
Diagnosis of depression (%)	15*	12
Diagnosis of anxiety (%)	6***	3
>6 medications (%)	34***	29
Antidepressant medications (%)	15***	12
Antianxiety medications (%)	18***	11
Antipsychotic medications (%)	15	14
Nutrition Variables		
Pressure ulcers (%)	1***	11
Body mass index <19 (%)	17***	27
Decrease in oral intake	14***	27
Mean body mass index $\pm$ SD	25 $\pm$ 11***	23 $\pm$ 9

Note: ADL = activity of daily living; LDR = low-ADL–Dependency Residents; M/HDR = moderate- to high-ADL–dependent residents.
*$p < .05$; ***$p < .001$.

discharges to the community when compared with M/HDR (3% vs 2%).

Table 3 shows that LDR who worsened or died were older, more likely to pay privately, and were more likely to have urinary incontinence, stroke, peripheral vascular disease (PVD), pressure ulcers, a low BMI, and to be taking more than six medications. They were also more likely to exhibit poor and worsened cognitive performance and symptoms such as shortness of breath, daily pain, and decreased appetite. Small but significant differences in baseline ADL and cognitive performance scores were found between the groups (Table 4), with larger differences at 6 months (ADL 17 ± 5 vs 4 ± 3, CPS 2.6 ± 1.6 vs 1.6 ± 1.4). In multivariate analysis (Table 5), older age remained significantly associated with poor outcomes, as did PVD,
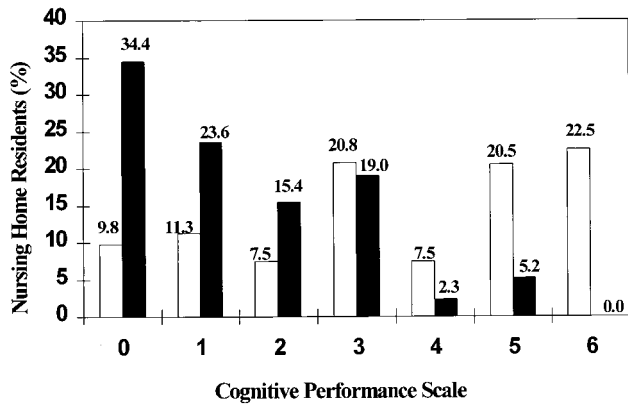
Figure 1. Comparisons of distributions of cognitive performance scores of nursing home residents with low Activities of Daily Living dependency. Open bars: moderate/high dependency residents ($n = 2970$); closed bars: low dependency residents ($n = 985$).

stroke, urinary incontinence, poor cognitive performance, decreased appetite, worsened cognitive status, and multiple medications. The diagnosis of anxiety was associated with a decreased likelihood of worse outcomes.

DISCUSSION

Our results show that the major difference between LDR and other nursing home residents was the LDRs significantly decreased frequencies of neurological conditions and geriatric syndromes (i.e., cognitive impairment, pressure ulcers, balance problems, urinary incontinence, and undernutrition (27)). These results point out the excess functional disability associated with these conditions in nursing home residents, because the medical and psychiatric disease burdens of LDR were very similar to all others. Clearly, many LDR have significant clinical problems, which would need to be addressed in any care setting. However, the relatively

Table 2. Logistic Regression Results: Variables Associated With Low ADL Dependency

	Odds Ratio	95% Confidence Interval
No urinary incontinence	15.0	(11, 21)
No pressure ulcers	6.0	(3.2, 11)
No balance problems	3.1	(2.5, 3.8)
Mild/no cognitive impairment (CPS score 0–2)	2.7	(2.2, 3.4)
No diagnosis of seizures	2.2	(1.4, 3.7)
No vision impairment	2.1	(1.6, 2.8)
Eats >75% of food in tray	2.0	(1.5, 2.6)
No diagnosis of stroke	2.0	(1.5, 2.6)
Insurance other than Medicare	1.5	(1.2, 1.9)
Body mass index >19	1.4	(1.1, 1.8)
Antianxiety medications	1.4	(1.0, 1.8)
Male gender	1.2	(1.0, 1.7)
No do not resuscitate orders	1.2	(1.0, 1.5)
Lived alone before admission	1.2	(1.0, 1.5)

Notes: Model: -2 LOG L $= 1328$ ($p = .0001$); C $= 0.87$; % concordant $= 87$; sensitivity $= 87$; specificity $= 73$; HL $=$ NS; weighted and controlled for age and cohort. ADL $=$ activity of daily living.

Table 3. Clinical Description of Low ADL Dependent Residents at Baseline by Outcome Status

	Changed ADL Status or Died in 6 Months ($n = 269$)	Stable ADL Status in 6 Months ($n = 624$)
Mean age $\pm$ SD	83 $\pm$ 9***	80 $\pm$ 11
Male (%)	24	28
Medicaid (%)	55**	64
Private pay (%)	43***	33
Do not resuscitate orders (%)	39	32
Married (%)	16**	24
Lived alone before admission (%)	29	34
Urinary incontinence (%)	10***	4
Diagnosis of stroke (%)	18**	11
Diagnosis of diabetes (%)	13**	18
>6 medications (%)	40**	31
Diagnosis of anxiety disorders (%)	3**	7
Pressure ulcers (%)	3**	0.5
Body mass index <19 (%)	25***	14
Decreased appetite (%)	22***	11
Less alert	5**	2
Cognitive status deteriorated (%)	9***	4
Shortness of breath	11***	6
Daily pain	21**	15
Peripheral vascular disease (%)	12***	5

Note: ADL $=$ activity of daily living.
**$p < .01$; ***$p < .001$.

high degree of functioning and lack of geriatric syndromes and neurological diseases suggest that many LDR could potentially be maintained in community settings with appropriate help.

The social picture was mixed. In bivariate analyses, living alone, but also being married before nursing home residence, was associated with low dependency. Living alone before admission would be expected to be associated with low dependency because those with lower dependency but poor social support might end up in nursing homes; previous literature has also noted this association (7,8,10,11,13). The relationship of low dependency with being married before admission suggests that the situation may be more complex and that important variables may be unmeasured; for instance, a less impaired person might move into a nursing home with a more debilitated spouse. In multivariate models, only living alone was borderline associated with low dependency.

Table 4. Comparison of Cognitive and Physical Function of Low ADL Dependency Residents by Outcome Status

	Worsened ($n = 198$)	Stable ($n = 624$)
Mean ADL score at baseline $\pm$ SD	5 $\pm$ 3*	4 $\pm$ 2
Mean ADL score in 6 mo $\pm$ SD	17 $\pm$ 5***	4 $\pm$ 3
Mean cognitive performance scale score at baseline $\pm$ SD	1.7 $\pm$ 1.5*	1.4 $\pm$ 1.4
Mean cognitive performance scale score in 6 mo $\pm$ SD	2.6 $\pm$ 1.6***	1.6 $\pm$ 1.4

Note: ADL $=$ activity of daily living.
*$p < .05$; ***$p < .001$.

Table 5. Logistic Regression Results: Variables Associated With
the Worsening of ADL Status or Death

	Odds Ratio	95% Confidence Interval
Pressure ulcers	5.1	(1.2, 2.2)
Diagnosis of peripheral vascular disease	3.7	(1.9, 7.1)
No diagnosis of anxiety	3.4	(1.4, 8.3)
Decreased alertness	3.2	(1.1, 9.3)
Urinary incontinence	3.1	(1.6, 6.1)
Moderate to severe cognitive impairment (CPS score ≥5)	2.3	(1.1, 4.9)
Diagnosis of stroke	2.1	(1.3, 3.4)
Decreased appetite	2.1	(1.3, 3.3)
>6 medications	1.6	(1.1, 2.3)
Private pay	2.0	(1.0, 3.8)
Shortness of breath	1.8	(1.0, 3.3)
Did not live alone before admission to nursing home	1.4	(1.0, 2)
Age	1.04	(1.02, 1.06)

Notes: Model: -2 Log L score $= 138$ ($p = .0001$); % concordant: 72; c $= 0.72$; HL $=$ NS; sensitivity $= 78$; specificity $= 52$; controlled for age and cohort. ADL $=$ activity of daily living.

Of the LDR in our sample, 31% showed poor six-month outcomes (worsened functional status or death). Those baseline characteristics that increased the likelihood of poor outcomes suggested that two groups of LDR are most likely to experience poor outcomes: those who most resemble M/HDR, as indicated by a worsened cognitive status, incontinence, and nutritional problems, and those with significant medical burden as indicated by symptoms, increased medication use, or peripheral vascular disease. Notably, the majority of LDR were stable at the six-month follow-up.

These results showed that the LDR with a higher risk of poor outcomes could be prospectively identified. Those LDR who remained stable may be an important group within nursing homes. People in the stable LDR group have medical and psychiatric conditions and some functional dependency; however, these problems could potentially be identified, and treatment plans could be developed to handle them in a community setting.

Some previous research has used the RAI to study low ADL-dependent nursing home residents. Ikegami and colleagues (6) extended the definition of lowcare beyond low ADL dependency in a paper comparing the number of low-care cases in the United States with the number in four other countries using the RAI. The U.S. data were collected in 1992 and 1993 from all nursing homes in six states ($n = 242,391$). Using three definitions of low care (broad, narrow, and strict) on the basis of ADL, medical and psychiatric assistance, and supervision, they found that 30% of residents were lowcare using a broad definition, 14% using a narrow definition, and 2.3% using a strict definition.

Morris and colleagues (18) defined lowcare on the basis of expected resource use using data from the HCFA Multistate Case Mix and Quality Demonstration ($N = 7658$) (28) and from the RAI evaluation study (29). They used the Resource Utilization Group-III (30) Groups "Physical-A" or "Physical-B" to identify light-care residents. Their criteria identified 11% of residents who had no rehabilitation services, major medical or cognitive problems, or bed mobility, toileting, transfer, and eating problems.

Our research extends and complements the above studies of prevalence and resource use of LDR by adding a clinical and longitudinal dimension. We still cannot definitively answer the crucial question of whether LDR belong in a nursing home, but we have taken an important first step by identifying this group and describing their clinical characteristics and outcomes. Future studies must evaluate the social characteristics of such residents in more depth than we could to identify potential barriers to their discharge and to determine whether it is actually the nursing home care that leads to a high proportion of LDR having a stable clinical course. Similarly, no research has yet addressed the issue of ADL improvement within the nursing home or whether M/HDR on admission sometimes become long-staying LDR.

Our study has several limitations. The first limitation is due to strength and weakness of MDS variables. Many questions on the MDS have been shown to be reliable (21,31) and valid (25). However, the accuracy of other questions, such as diseases and conditions (which are recorded from a medical chart), is not known. In addition, the severity of diseases and conditions cannot be determined. Variables such as multiple medications or services needed might indicate disease severity, but preserved ADL function suggests lack of severity. Future research is necessary to determine the relationships between chronic diseases, their severity, and low ADL dependency in nursing home residents.

We were also unable to adequately study the social characteristics of LDR. The only variables available on the MDS include marital status, living alone before admission, and variables regarding insurance and legal oversight, which do not adequately capture social support information. Future research with nursing home residents and their families using different instruments would be needed to understand the social characteristics associated with nursing home residence of low-ADL–dependent elderly persons. Also, we compared LDR with other nursing home residents as an important step toward answering clinical questions about LDR. However, a more appropriate comparison group would be community-dwelling elderly persons with similar ADL dependency levels, and future research should be focused there.

Finally, we designated those residents in the lowest quartile of an ADL scale as LDR and did not speculate a priori about what level of ADL dependency is appropriate for nursing home residence. We currently do not know the optimum site for care for low-ADL–dependent elderly persons. However, we do know that, given a choice, many older persons would prefer to receive care in their homes or in other community settings instead of in nursing homes (32). We believe that our conceptualization of low-ADL–dependent nursing home residents with a low risk of poor outcomes may be useful to future research regarding the optimum site of care for such patients.

Address correspondence to Amna Buttar, MBBS, MS, Department of Medicine, Indiana University School of Medicine, 1001 W. 10th Street, OPW-M200, Indianapolis, IN 46202. E-mail: abuttar@iupu.edu

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