

# What Does the Medical Record Reveal about Functional Status?

## A Comparison of Medical Record and Interview Data

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**OBJECTIVE:** Functional status measures are potent independent predictors of hospital outcomes and mortality. The study objective was to compare medical record with interview data for functional status.

**SUBJECTS AND METHODS:** Subjects were 525 medical patients, aged 70 years or older, hospitalized at an academic medical center. Patient interviews determined status for 7 basic activities of daily living (BADLs) and 7 instrumental activities of daily living (IADLs). Medical records were reviewed to assess documentation of BADLs and IADLs.

**RESULTS:** Most medical records contained no documentation of individual BADLs and IADLs (61% to 98% of records lacking documentation), with the exception of walking (24% of medical records lacking documentation). Impairment prevalence was lower in medical records than at interview for all BADLs and IADLs, and agreement between interview and medical record was poor ( $\kappa < 0.40$  for individual BADLs and IADLs). Sensitivity of the medical record for BADL and IADL impairment was poor (range 95% to 44%), using the interview as a reference standard. Sensitivity and specificity of the medical record for detection of BADL and IADL impairment changed substantially when records with nondocumentation of functional status were excluded or were assumed to be equivalent to independence.

**CONCLUSIONS:** The results suggest that the medical record is a poor source of data on many functional status measures, and that assuming that nondocumentation of functional status is equivalent to independence may be unwarranted. Given the prognostic importance of functional status measures, the results highlight the importance of developing reliable and efficient means of obtaining functional status information on hospitalized older patients.

**KEY WORDS:** functional status; activities of daily living; medical record; prognosis; risk adjustment.

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The concept of functional status refers to the behaviors necessary to maintain independence in daily life and encompasses physical, cognitive, and social functioning.<sup>1</sup> Impaired functional status results neither from the number

of illnesses a patient has nor from the effect of illness on physiologic parameters, but rather represents the overall impact of illness on the whole person. Functional status measures, including basic activities of daily living (BADLs)<sup>2</sup> and instrumental activities of daily living (IADLs),<sup>3</sup> are often used to describe degree of disability and to predict need for services, such as home health care and nursing home placement. Importantly, previous research in older persons has demonstrated that functional status is a potent predictor of hospital outcomes and mortality.<sup>1,4-13</sup> For example, functional status is a stronger predictor of hospital outcomes such as functional decline, length of stay, institutionalization, and death than admitting diagnoses, diagnosis related groups, and other illness measures.<sup>5,10-12</sup> Furthermore, a measure of physical functioning has been shown to be a better predictor of hospital mortality in older persons than acute physiologic measures.<sup>13</sup> Although most existing tools for risk adjustment are based on comorbidities and physiologic data, previous research has demonstrated that functional status measures provide additional information about prognosis beyond that provided by routine physiologic data and comorbidities in older persons,<sup>4</sup> and improve the prognostic ability for 2-year mortality of 5 standard burden-of-illness indices.<sup>1</sup> Knowing whether functional status measures are reliably recorded in the medical record would assist efforts to develop feasible burden-of-illness indices incorporating functional status information.

Despite the prognostic importance of functional status in older persons, most existing burden-of-illness indices do not include functional measures. If such indices are to include functional measures, the information must be readily and reliably available from a source such as the medical record.<sup>1</sup> Yet it remains unclear whether functional status is routinely recorded in the medical records of older persons, and consequently whether the medical record is a suitable source of such information. Functional abilities are often not accurately assessed by health care providers,<sup>14-16</sup> and evidence suggests that physicians often underestimate functional difficulties reported by patients.<sup>17-20</sup> Patient self-report has a stronger relationship to observed function than physician report.<sup>21</sup> Moreover, patients may report more functional dependencies than are documented in the medical record.<sup>22</sup> Separate studies have also demonstrated underrecognition and/or underreporting of other areas of functioning, including cognitive impairment<sup>23-29</sup> and depression.<sup>30-33</sup> Several other studies have documented imperfect agreement between different sources for patient data.<sup>34-38</sup> In addition to questions about whether functional

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status is reliably recorded in the medical record, it is unknown whether lack of mention of functional status is equivalent to lack of impairment in functional status. In many studies, however, no mention of a variable has been assumed to be equivalent to no impairment or abnormality in that variable.<sup>8,9,22,39-41</sup> Yet, the assumption of equivalence between no mention and no impairment can lead to substantial misclassification and systematic biases if untrue.

The goal of this study was to evaluate how the medical record performs in providing information on patient functional status, compared with information obtained directly at patient interview. We examined the entire medical record, including notes by nursing staff, physical and occupational therapy, and other health professionals, in addition to physician notes. Our specific aims were to determine the frequency with which data on functional measures are recorded in medical records, to determine whether absence of functional status information in the medical record is equivalent to absence of functional impairment, and to evaluate the accuracy of medical record data relative to the self-report of the patient obtained in an interview.

## METHODS

### Data Source and Study Participants

Potential participants were 1,169 patients, aged 70 years or older, admitted consecutively on weekdays to the 6 general medicine (non-intensive care) wards at Yale-New Haven Hospital (YNHH), in whom patient care needs and staff availability permitted interview within 48 hours of admission. YNHH is an 800-bed urban teaching hospital with 200 medical beds, serving a large community and referral population. A total of 644 patients were excluded for the following reasons: they could not be interviewed as a result of intubation, coma, severe aphasia, or terminal condition ( $n = 208$ ); they were discharged in less than 24 hours ( $n = 162$ ); they had been enrolled in the study on a previous admission ( $n = 101$ ); the patients or their physicians declined participation ( $n = 85$ ); or for other reasons (e.g., patient off the floor or in the operating room, patient receiving sedatives) ( $n = 88$ ). The final sample included 525 participants.

Each patient (or the closest relative if the participant was unable) gave informed consent for study participation. The Human Investigation Committee of Yale University School of Medicine approved the study.

### Data Collection

All interview data for this study were provided by patients, who completed structured interviews with trained clinician-researchers blinded to study aims and hypotheses within 48 hours of admission. The patient provided information on sociodemographics (i.e., age, gender, race, educational attainment, domicile) and preadmission BADLs and IADLs.<sup>3</sup> The Folstein Mini-Mental State Examination (MMSE)<sup>42</sup> was administered to the patient. Depression was

assessed with the 15-item Geriatric Depression Scale.<sup>43</sup> Severity of illness was measured by the APACHE II score,<sup>44</sup> Charlson score,<sup>45</sup> and length of stay (dichotomized as <5 days,  $\geq 5$  days). To indicate high burden of illness, a cut-point of more than 16 is used on the APACHE II index, as supported by previous studies.<sup>6,9</sup> The Charlson score was designed to predict death in longitudinal studies, and is usually coded as 0, 1,  $\geq 2$  to represent increasing levels of illness burden. The APACHE II score, Charlson score, and length of hospital stay were derived from the medical record. Data on death within 1 year were obtained at follow-up interview and/or through a search of the National Death Index.

A single trained abstractor, blinded both to study aims and hypotheses and to the patients' interview responses, obtained functional status information from the medical record. The abstractor, who was a nurse with previous experience in medical record abstraction, reviewed the entire medical record, including notes of medical, nursing, social work, and rehabilitation (i.e., physical and occupational therapy) staff. Functional status information, which consisted of any comments regarding a patient's preadmission ability to perform basic and instrumental activities of daily living (see detailed description below), was recorded verbatim and reviewed by study personnel. Any questionable cases were adjudicated by one of the investigators (SKI), who was also blinded to the patients' interview responses.

### Study Variables

The current study focuses on BADLs and IADLs as measures of physical functioning. The two data sources are patient interview and the medical record, as described below.

**Interview.** The baseline interview included questions relating to BADLs and IADLs. BADLs were assessed by asking if patients needed no help, needed some help, or were unable to perform each of the BADLs (bathing, grooming, dressing, feeding, toileting, transferring, and walking) 2 weeks prior to hospitalization. Using the same format, patients were asked about their ability to perform IADLs (using the telephone, grocery shopping, using transportation, preparing meals, doing housework, managing medications, and handling finances) during the month prior to hospitalization. The validity of assessing baseline functional status by this method has been established in previous studies.<sup>46-48</sup> Impairment in a BADL or IADL function was defined as needing the help of another person to perform that function or being unable to perform that function. Use of a compensatory or adaptive device for a BADL or IADL was not defined as an impairment if the participant did not need the help of another person to accomplish the BADL or IADL.

**Medical Record.** The entire medical record for the index hospitalization was reviewed in detail for comments

regarding the 14 individual items of the BADLs and IADLs indicated above. The abstractor searched for comments indicating the subject's status prior to admission. For each item, the abstractor noted if the subject needed help or no help, or if there was no documentation in the record regarding that item. In addition, the abstractor noted if there was any general comment, not linked to a specific BADL or IADL, regarding the subject's functional status (e.g., "independent" or "functionally impaired"). The definition of impairment was analogous to that for the interview, that is, any indication of needing the help of another person in performing a specific BADL or IADL prior to admission, or inability to perform the BADL or IADL; use of compensatory or adaptive devices was not interpreted as necessarily indicating impairment.

A global functional impairment measure called "Any ADL Impairment" was created for both interview and medical record data by accepting any mention of a specific BADL or IADL impairment (including the need for help in that BADL or IADL) or a general comment about functional impairment as indicating "Any ADL Impairment."

## Data Analysis

The SAS release 6.12 statistical software package (SAS Institute, Cary, NC) was used for all analyses. Standard univariate descriptive statistics were used to describe the study sample. The prevalence of functional impairments according to the interview and the medical record was calculated, as was the prevalence of "Any ADL Impairment."

Data obtained from the personal interview were used as the reference standard for the presence of functional impairment against which to compare data from the medical record. Agreement between interview data and medical record data was calculated, using  $\kappa$  as a measure of agreement beyond that expected on the basis of chance alone.  $\kappa$  values above 0.75 were taken to represent excellent agreement beyond chance, values from 0.40 through 0.75 to represent fair to good agreement beyond chance, and values below 0.40 to represent poor agreement beyond chance.<sup>49</sup> Sensitivity, specificity, negative predictive value, and positive predictive value for functional impairments were computed, using standard formulae, for the medical record compared with the interview as reference standard. Nondocumentation of a functional status item was assumed to indicate independence in that item for the purposes of calculating sensitivity, specificity, and negative and positive predictive values.

To compare the effects of different assumptions regarding the meaning of "no documentation" on the sensitivity and specificity of medical record data, these measures were computed for each BADL and IADL in two ways. First, "no documentation" was combined with "no help needed" to determine sensitivity and specificity when lack of functional status documentation is assumed to be equivalent to lack of functional impairment, a common assumption among clinical investigators. Second, subjects

with "no documentation" were excluded from all analyses of BADL and IADL sensitivity and specificity, to compare effects when no assumptions are made about the lack of documentation.

To better understand factors that may contribute to lack of functional status documentation, analyses were performed to examine the association between lack of functional status documentation and variables including demographic factors, cognitive and physical functioning, illness severity and comorbidity, length of stay, and mortality. Unadjusted odds ratios for nondocumentation and 95% confidence intervals were calculated for each of these measures. Variables having a bivariate association with  $P \leq .10$  were further evaluated as explanatory variables in multivariable logistic regression analysis, with calculation of adjusted odds ratios and 95% confidence intervals. To better examine correlates of nondocumentation in patients with functional impairment, similar bivariate and multivariate analyses, with calculation of unadjusted and adjusted odds ratios and 95% confidence intervals, were performed on the subsample of subjects who had evidence of any functional status impairment by interview.

## RESULTS

### Patient Characteristics

Patient characteristics are shown in Table 1. The medical records for 6 of the 525 eligible subjects were unavailable; therefore, the sample size for this study was

Table 1. Characteristics of Study Group (N = 519)

Characteristic	Study Group
Mean age, y (SD)	78.7 (6.1)
Age $\geq 80$ y, %	40.1
Female, %	55.7
White, %*	90.9
Mean education, y (SD)	11.3 (3.4)
<9 years, %	24.7
9–12 years, %	44.8
>12 years, %	30.5
MMSE, mean (SD)*	22.8 (6.5)
MMSE <20, %	26.5
Geriatric Depression Scale $\geq 7$ , %*	17.8
Any ADL impairment, %	64.7
Living alone, %*	33.4
APACHE II, mean (SD)	14.9 (3.7)
>16, %	29.8
Charlson, %	
=0	9.6
=1	19.7
$\geq 2$	70.7
Length of stay $\geq 5$ days, %	73.6
Death within 1 y, %	29.3

\* Missing data were present for the following variables: race (1 subject), education (21 subjects), MMSE (6 subjects), depression (12 subjects), living alone (1 subject), and living in a nursing home (3 subjects).

SD, standard deviation; MMSE, Mini-Mental State Examination; ADL, activities of daily living.

519. The study sample had 56% women and was predominantly white, reflecting the population encountered at the study site. While a third of patients lived alone, a sizable proportion (27%) had cognitive impairment (i.e., MMSE <20). The burden of illness in this group was relatively high (as indicated by the APACHE II and Charlson scores), and 1-year mortality was 29%.

**Comparison of Interview and Medical Record Data for Functional Status**

Table 2 demonstrates the prevalence of and agreement on BADL and IADL impairments according to interview and medical record data, as well as the sensitivity and specificity of medical record documentation for BADL and IADL impairments. For these analyses, the patient interview was used as the reference standard, and nondocumentation of a functional status item was assumed to be equivalent to independence in that item. Most medical records contained no documentation of the status of individual BADLs and IADLs (61% to 98% of medical records with no documentation for the various individual BADLs and IADLs), with the exception of walking, for which only 24% of medical records had no documentation. However, 91% of medical records contained mention of at least one BADL or IADL, or a general comment on physical functioning status (as captured by the "Any ADL Impairment" variable).

Prevalence of BADL impairments ranged from 6% to 24%, and prevalence of IADL impairments ranged from

12% to 50%, according to the interview. The medical record prevalence of impairments was consistently lower than the prevalence according to the interview for each individual BADL and IADL and for "Any ADL Impairment." Agreement between the interview and the medical record was relatively low, with  $\kappa$ s ranging from 0.10 to 0.31 for individual BADL and IADL items, representing poor agreement.  $\kappa$  for "Any ADL Impairment" was 0.48, representing fair agreement. Although a substantial proportion of patients whose medical record lacked documentation of impairment actually had either BADL or IADL impairments by interview (4% to 21% with BADL impairments and 13% to 52% with IADL impairments), the majority were functionally independent; conversely, the majority of patients with impairments did not have medical record documentation of those impairments (56% to 91% of subjects with BADL impairments lacked medical record documentation of the impairment, except walking impairment, where only 24% lacked medical record documentation; corresponding numbers for IADLs were 58% to 87%).

Sensitivity of the medical record for BADL and IADL impairment was low, ranging from 9% to 31% for BADLs and 13% to 44% for IADLs, indicating that existing functional impairments were often missed in the medical records (high false-negative rate). Values for positive predictive value were also low, ranging from 30% to 66% for BADLs and 26% to 78% for IADLs. Values for specificity were substantially higher, ranging from 85% to 99% for individual BADL and IADL items. Values for negative

**Table 2. Comparison of Interview and Medical Record Data for Detecting Individual BADL and IADL Impairments**

Measure	No Documentation in Medical Record, %	Prevalence of Impairments, %			Sensitivity, %*	Specificity, %*	PPV, %	NPV, %
		Interview	Medical Record	$\kappa$				
<b>BADLs</b>								
Grooming	98	10	2	0.14	10	99	56	99
Dressing	95	15	3	0.11	9	99	54	86
Bathing	92	24	6	0.17	15	98	66	78
Feeding <sup>†</sup>	90	6	3	0.27	22	98	47	95
Transferring <sup>†</sup>	61	14	8	0.30	29	96	51	89
Walking	24	18	10	0.30	31	94	54	86
Toileting	82	10	4	0.12	12	97	30	91
<b>IADLs</b>								
Shopping <sup>†</sup>	79	47	19	0.23	31	91	75	60
Transportation	78	50	16	0.18	25	93	78	55
Finances	92	29	8	0.14	16	96	59	74
Meal preparation*	69	28	23	0.31	44	85	53	80
Housework	78	45	18	0.24	30	93	77	62
Taking meds	86	24	10	0.24	24	95	59	80
Using phone*	93	12	6	0.10	13	95	26	89
Any ADL Impairment <sup>‡</sup>	9	65	52	0.48	71	81	87	60

\* Interview data used as reference standard for sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

<sup>†</sup> Missing data were present for the following variables: feeding, shopping, transferring (one subject each); meal preparation (two subjects); phone (three subjects).

<sup>‡</sup> "Any ADL Impairment" includes specific mention of needing help in any of the above individual items as well as any general indication of functional impairment.

BADLs, basic activities of daily living; IADLs, instrumental activities of daily living.

predictive value ranged from 55% to 99%. Generally, sensitivity, specificity, and positive and negative predictive values were all somewhat higher for "Any ADL Impairment" than for the individual items. Reanalysis of data in Table 2 after exclusion of subjects with dementia or delirium at baseline revealed a generally lower prevalence of impairments in both interview and medical record but did not substantively change results (data not shown).

### The Impact of Assuming Equivalence between "No Documentation" and "No Impairment"

Table 3 documents the impact of different assumptions about the interpretation of "no documentation" for selected BADLs and IADLs on the sensitivity and specificity of the medical record for detecting impairment. To compare the effect of two varying methods of handling nondocumentation, sensitivity and specificity were calculated both after excluding medical records without documentation of the specific BADL or IADL and after classifying nondocumentation of the BADL or IADL status as equivalent to independence in that BADL or IADL (a common practice in previous studies). The interview represented the reference standard for these analyses. The three BADLs and three IADLs shown in the table were chosen to represent the upper, lower, and intermediate values for percentage of medical records without documentation of status for BADLs and IADLs. Sensitivity differs substantially for each of the BADLs and IADLs when medical records with nondocumentation of the selected BADL or IADL are excluded (range 81% to 100%) versus assumed to indicate independence (range 10% to 44%), except for walking (sensitivities of 41% and 31%, respectively), which tended to be well documented in the medical records. The differences in specificity depending on the 2 methods of handling nondocumentation are less striking but still substantial, particularly for grooming (43% vs 99%) and using the telephone (4% vs 95%). These differences may be explained, at least in part, by the large differences in the proportion of medical records with nondocumentation for the different BADLs and IADLs. Reanalysis of data in Table 3

after exclusion of subjects with dementia or delirium at baseline resulted in generally slightly lower sensitivity and slightly higher specificity but did not substantively change results (data not shown).

### Correlates of Nondocumentation of Functional Status

Correlates of nondocumentation of functional status in the medical record are presented in Table 4 with unadjusted and adjusted odds ratios and 95% confidence intervals. Significant independent correlates of nondocumentation by multivariable analysis included age <80 years (adjusted odds ratio 2.9, 95% confidence interval 1.2 to 6.8) and length of stay <5 days (adjusted odds ratio 3.0, 95% confidence interval 1.5 to 5.7). Higher education, better cognitive status, lack of functional impairment, and lower APACHE II score were associated with nondocumentation at  $P \leq .10$  in bivariate analysis but were not independently associated with nondocumentation in multivariate analysis. Depression, as assessed by the Geriatric Depression Scale, was not associated with nondocumentation. When correlates of nondocumentation were examined in the subset of patients with functional status impairment by interview, the only variables significantly associated with nondocumentation were age <80 years (adjusted odds ratio 4.1, 95% confidence interval 1.3 to 12.5) and length of stay <5 days (adjusted odds ratio 2.9, 95% confidence interval 1.1 to 7.2); no other variables were significantly associated with nondocumentation (data not shown). Thus, patients with age <80 years and shorter hospitalizations were less likely to have medical record documentation of functional status overall, and even when functional impairment was present.

## DISCUSSION

The results of this study indicate that the medical record is generally a poor source of data on functional status measures. With the exception of walking (76% of records documented walking status), most charts did not

**Table 3. The Effect of "No Documentation"\* on Sensitivity and Specificity of the Medical Record in Detecting Selected BADL and IADL Impairments**

Activity	No Documentation, %	Sensitivity <sup>†</sup>		Specificity <sup>†</sup>	
		"No Documentation" Excluded, % (n)	"No Documentation" = "No Help," % (n)	"No Documentation" Excluded, % (n)	"No Documentation" = "No Help," % (n)
Grooming	98	100 (5)	10 (50)	43 (7)	99 (469)
Transferring	61	81 (26)	29 (73)	89 (178)	96 (444)
Walking	24	41 (71)	31 (95)	92 (325)	94 (423)
Using phone	93	100 (8)	13 (62)	4 (24)	95 (447)
Transportation	78	92 (72)	25 (260)	56 (43)	93 (259)
Meal preparation	69	91 (68)	44 (142)	41 (94)	85 (375)

\* "No documentation" refers to the lack of any documentation regarding either ability or impairment for a basic or instrumental ADL activity.

<sup>†</sup> Interview data used as reference standard for calculations of sensitivity and specificity.

BADL, basic activity of daily living; IADL, instrumental activity of daily living.

Table 4. Correlates to Nondocumentation of Functional Status in Medical Record (N = 519)

Correlate	No Functional Status Documentation in Medical Record, %	OR (CI)*	Adjusted OR (CI)†
Age, y			
<80	11.9	3.9 (1.7 to 8.8)§	2.9 (1.2 to 6.8)§
≥80	3.4	1.0	1.0
Gender			
Male	9.1	1.2 (0.6 to 2.2)	
Female	8.0	1.0	
Race			
White	8.5	1.0 (0.3 to 2.9)	
Other	8.5	1.0	
Education, y			
>12	11.8	3.1 (1.2 to 8.0)§	2.3 (0.8 to 6.3)
9–12	9.0	2.3 (0.9 to 5.8)	1.7 (0.6 to 4.5)
<9	4.1	1.0	1.0
MMSE			
≥20	9.8	2.0 (0.9 to 4.6)	1.1 (0.4 to 2.8)
<20	5.2	1.0	1.0
Geriatric Depression Scale			
<7	9.4	1.6 (0.7 to 3.8)	
≥7	5.6	1.0	
Any ADL impairment‡			
None	12.6	2.2 (1.2 to 4.0)§	1.4 (0.6 to 3.2)
Any	6.3	1.0	1.0
Living alone			
No	9.3	1.4 (0.7 to 2.7)	
Yes	6.9	1.0	
APACHE II			
≤16	10.0	2.0 (0.9 to 4.4)	1.3 (0.6 to 3.1)
>16	5.2	1.0	1.0
Charlson			
=0	14.0	1.9 (0.8 to 4.6)	
=1	7.8	1.0 (0.4 to 2.2)	
≥2	7.9	1.0	
Length of stay			
<5 days	16.8	3.5 (1.9 to 6.5)§	3.0 (1.5 to 5.7)§
≥5 days	5.5	1.0	1.0
Died within 1 year			
No	9.5	1.7 (0.8 to 3.6)	
Yes	5.9	1.0	

\* OR, odds ratio for nondocumentation; CI, 95% confidence interval.

† Adjusted OR: odds ratio for nondocumentation adjusted for variables of at least marginal significance in bivariate analysis (i.e.,  $\chi^2 P \leq .10$ ).

‡ Refers to impairment in any of the 7 basic activities of daily living (BADLs) or the 7 instrumental activities of daily living (IADLs), according to patient interview.

§  $P < .05$ .

MMSE, Mini-Mental State Examination; ADL, activities of daily living.

contain any documentation regarding specific BADL and IADL measures (60% to 98% contained no documentation). Documentation was better, however, if one accepted any specific or general comment pertaining to function as indicating functional impairment or independence. The prevalence of impairment in individual functional status items was consistently lower according to the medical record, and the chance-corrected agreement between the medical record and the interview was poor ( $\kappa < 0.40$ ), using the interview as reference standard. Sensitivity and positive predictive values for the medical record in detecting functional impairment were also generally poor. In addition, the impact of different methods of handling

BADL and IADL nondocumentation on sensitivity and specificity of the medical record for those BADL or IADL measures was substantial, highlighting the great potential impact of assumptions made about the meaning of no documentation. When no documentation was assumed to be equivalent to independence in a specific BADL or IADL, the sensitivity and specificity of the medical record for that BADL or IADL item changed substantially from the values obtained when the “no documentation” records were excluded; for example, the sensitivity for transportation dropped from 92% to 25% when no documentation was assumed to reflect independence, and the corresponding specificity rose from 56% to 93%. Even though subjects

with “no documentation” are somewhat more likely to be independent for a given BADL or IADL, substantial proportions may still have functional impairment, and the potential for misclassification and systematic bias is great.

The study had important strengths that differentiate it from previous attempts to investigate the value of the medical record as a source of functional status data. The clinically rich data on a large group of hospitalized older patients allowed us to examine in detail all of the standard basic and instrumental activities of daily living, as well as general comments about functional status. Furthermore, we were able to compare data from the entire medical record, not solely physician notes, with carefully collected interview data from the patients and consequently examine the presence of functional impairment in patients whose medical records contained no documentation of functional status. Finally, we were able to examine the impact of different assumptions about the presence or absence of functional impairment in those patients without medical record documentation of functional status. Our data suggest that it is not valid to assume that lack of documentation of functional status is equivalent to lack of impairment, an assumption that has been a common practice in previous studies.

The analysis for correlates of nondocumentation of functional status indicated that shorter length of stay was associated with nondocumentation, suggesting that increasing length of stay provides correspondingly greater opportunity for documentation of functional status. The association of lower age with nondocumentation may reflect an assumption on the part of hospital staff that people less than 80 years old are more likely to be independent than those over 80 years old. The lack of association of functional or cognitive impairment or illness severity with nondocumentation was surprising, given our expectation that there would be better documentation among those participants with impairment, but is consistent with the other data in this study suggesting that nondocumentation is not equivalent to functional independence.

Among study limitations, the issue of generalizability of findings from a single study site is important. Although the major aim of this study was concerned more with internal validity (i.e., the interpretation of nondocumentation of functional status), other health care systems may approach the documentation of functional status measures differently. For example, some health care systems may do a better job of encouraging nursing staff to document functional status measures when staffing levels for nurses are based on an acuity system driven in part by functional status. Nonetheless, the results of the study concerning interpretation of missing functional status data are likely to be generalizable to other settings. Another potential limitation is the reliance on patient report for functional status, given the presence of cognitive impairment in some participants. However, patient report is likely to provide the bulk of patient-related functional

status data in most hospital settings, and at least one report has found higher correlation between patient and proxy responses on BADL items among moderately cognitively impaired patients than among cognitively intact patients.<sup>50</sup> Moreover, reanalysis after removing subjects with cognitive impairment did not substantively change results. Finally, the exclusion of potential participants may have biased results, although it is difficult to know whether the exclusions would have biased the medical record data toward lower documentation (if those excluded had higher documentation, e.g., because of severe illness) or toward higher documentation (if those excluded had less documentation, e.g., because of rapid discharge). The latter possibility is supported by the association of shorter length of stay with lower documentation, a bias that would tend to overestimate the performance of the medical record.

The results of this study hold substantial implications for both medical researchers and health policy experts. For researchers, our results suggest that assuming that lack of documentation of a particular variable (in our study, functional status measures) implies that the variable is “normal” may not be valid. Making such an assumption may result in substantial misclassification of subjects with regard to the variable(s) and thus may introduce systematic bias, which could jeopardize the veracity of study results. Examining the interpretation of lack of medical record documentation for other variables is an extremely important topic for future research in other areas, given the frequency with which research data are gathered from medical records and the broad variety of studies for which the data are used. For health policy experts, our results suggest that it will be necessary to investigate and support reliable and efficient methods of gathering functional status data, because functional status is an important predictor of mortality and resource utilization in older patients. Although the medical record may not currently be adequate on its own, augmentation by methods such as functional assessment during nursing admission assessments (already performed at many institutions) would provide this important information. While realizing the additional burden this admittedly brief assessment places on already busy nursing staff, the value of this information for determining risks for adverse outcomes during hospitalization, targeting high-risk patients for interventions (e.g., case management, geriatric consultation), determining need for services, and predicting long-term prognoses justifies the staff time commitment.

We conclude that the medical record is a relatively poor source of data on many specific functional status measures at the study site, although most medical records contain at least one reference, either general or specific, to some aspect of functional status. Furthermore, assuming that lack of documentation of functional impairment implies functional independence may result in substantial misclassification of subjects with regard to functional status. These results have implications for researchers studying

functional status and for policy experts examining the feasibility of including functional status measures in risk adjustment methodologies. Investigating the prognostic value of those functional measures that are recorded with some frequency (e.g., walking) and evaluating new strategies for ascertaining and recording functional status are critical topics for future research.

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