

# Impact of Hospitalization on Patients Ability to Perform Basic Activities of Daily Living



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## ABSTRACT

Functional independence is dictated by the ability to perform basic activities of daily living (ADLs). Although hospitalization is associated with impairments in function, we know less about patients' functional trajectory following hospitalization. We examined patients' ability to do basic ADLs across pre-admission, admission, and follow-up (discharge or two-weeks post-admission) and determined which factors predicted changes in ADLs at follow-up. A secondary analysis of a small prospective cohort study of older patients (n=83, 50 females, 81 ± 8 years) from the Emergency Department and a Geriatric Unit were included. ADL scores (dressing, walking, bathing, eating, in and out of bed, and using the toilet) and frailty level (via the Clinical Frailty Scale) were measured. Comparing follow-up to pre-admission, patients reported worse ADL scores for dressing (36% of patients), walking (31%), bathing (34%), eating (25%), in and out of bed (37%), and using the toilet (35%). Most patients (59%) had more difficulty with 1+ ADL at follow-up versus pre-admission, with one-fourth of patients having greater difficulty with 3+ ADLs. Older age and higher frailty level were associated with (all,  $p < .04$ ) worse functional scores for eating, getting in and out of bed, and using the toilet (frailty only) at follow-up versus pre-admission. Here, most inpatients experienced worse difficulty performing multiple basic ADLs after hospital admission, potentially predisposing them for re-hospitalization and functional dependence. Older and frailer patients generally were less likely to recover to pre-admission levels. Hospitalization challenges patients' ability to perform ADLs in the short-term, post-discharge. Strategies to improve patients' functional trajectory are needed.

**Key words:** clinical frailty score, functional trajectory, acute hospital stay, patient care, tertiary hospital care

## INTRODUCTION

An impaired ability to perform basic activities of daily living (ADLs) is recognized as a measure of poor functional health and indicates a greater risk of further losing independence.<sup>(1)</sup>

Following a stressor, such as illness or hospital admission, older people often experience loss of physical function,<sup>(2)</sup> negatively impacting their ability to return to pre-illness or admission functional status.<sup>(3)</sup> Subsequently, functional decline can lead to loss of independence and an increased risk of re-hospitalization.<sup>(4)</sup> In this, the worse get worse still; the degree of frailty prior to admission impairs a patient's ability to respond to an acute stressor.<sup>(5,6)</sup> Compared to age-matched peers with lower levels of frailty, frailer patients admitted to hospital are more likely to experience worse health outcomes and longer lengths of stay.<sup>(7)</sup> Although hospitalization aims to diagnose and treat illnesses and thereby improve patients' health, the return to pre-admission physical function is less often the focus of hospitalization. Even so, being discharged from hospital with worsening ability to perform basic ADLs primes patients for re-admissions and further health complications.<sup>(8)</sup> Existing work demonstrates that hospitalized older adults<sup>(2)</sup> and those with higher frailty<sup>(5)</sup> exhibit a worse ability to recover in physical function from baseline to discharge. Our understanding of the predicting factors of this functional trajectory is limited.

Our objectives were to: 1) examine changes in ability to perform basic ADLs during hospitalization; and 2) determine which factors predicted worse function after hospitalization compared to pre-admission.

## METHODS

### Participants

Patients were approached within 48 hours of presenting to the Emergency Department and following consultation to Internal Medicine, or to a Geriatric Assessment Unit (an inpatient unit specializing in geriatric care) at a tertiary care hospital in Halifax, Canada. Complete data were collected in 83 of 130 patients. Included patients were 60 years or older, able to communicate in English, and were estimated to be in hospital for at > two days (based on physician estimate). This was secondary analysis of the prospective cohort Upright Time During Hospitalization Study,<sup>(9)</sup> and aimed to answer a novel, independent research question. This study was

approved by the Nova Scotia Health Research Ethics Board. Written, informed consent was obtained from all participants or their caregivers.

### Assessing Patient Functional Ability

Functional ability was determined for six basic ADLs, being the ability to dress, walk, bath, eat, get in and out of bed, and use the toilet (see Appendix A).

At admission, patients or their caregiver were asked about the ability of the patient to perform ADLs at both pre-admission (i.e., two weeks prior to admission) and admission. A caregiver was consulted if the patient could not self-report. Patients or their caregivers were again asked about ADL ability either at discharge or two weeks post-admission (for those whose hospitalization lasted more than two weeks). Given the difference in measurement time points, this is referred to as 'follow-up' throughout.

### Patient Illness and Frailty Level

The Canadian Triage and Acuity Scale (CTAS) was used to determine the severity of the patient's illness at admission; it is used to determine level of priority to treat a patient in the Emergency Department.<sup>(10)</sup> Scores range from 1 (resuscitation required and need immediate health-care provision) to 5 (non-urgent). Due to low sample size, CTAS 1 and 2 were combined (n=26) and CTAS 3 were combined with those admitted directly to the Geriatric Assessment Unit, who were not issued a CTAS score (n=57). A sub-sample (n=58) completed the Montreal Cognitive Assessment. Frailty level was measured by the Clinical Frailty Scale at admission.<sup>(11)</sup> Scores range from 1 (very fit) to 9 (terminally ill).

### Statistical Analyses

Analyses were completed in SPSS, Version 28.0 (IBM Corp., Armonk, NY, USA). Statistical significance was accepted as  $p < .05$ . All data are presented as means  $\pm$  SD. The difference in each ADL scores from follow-up to pre-admission were determined and coded as the same/better (value of 0) or worse (value of 1). Dying (n=5) was quantified as a 1. Binomial logistic regression examined whether age (in years), sex (females = 0, males = 1), CTAS score (high acuity = 1, low acuity = 0), or frailty at admission predicted worse ability in performing ADLs. These variables were selected due to their sufficient heterogeneity and relevance to our proposed research question.

## RESULTS

Patients were 81.4  $\pm$  8.3 years of age, primarily female (60% of participants), and most arrived by ambulance (69%) (Table 1).

The distribution of patients who reported greater difficulty performing basic ADLs from admission versus pre-admission were: 0 ADLs (16%), 1 ADL (24%), 2 ADLs (7%), 3 ADLs (13%), 4 ADLs (8%), 5 ADLs (11%), and all 6 ADLs (14%). From pre-admission to admission, most patients reported greater difficulty dressing (55%), walking

(60%), bathing (55%), getting in and out of bed (63%), and toileting (57%), with fewer reporting greater difficulty eating (20%; Figure 1A).

Comparing follow-up to admission, the distribution of patients who reported greater difficulty performing basic ADLs were: 0 ADLs (75%), 1 ADL (12%), 2 ADLs (1%), 3 ADLs (1%), 4 ADLs (0%), 5 ADLs (2%), and all 6 ADLs (8%; including patients who died). From admission to follow-up, few patients reported greater difficulty dressing (14%), walking (10%), bathing (13%), eating (18%) getting in and out of bed (11%), and toileting (14%; Figure 1B).

Comparing follow-up to pre-admission, the distribution of patients who reported greater difficulty performing basic ADLs were: 0 ADLs (41%), 1 ADL (22%), 2 ADLs (12%), 3 ADLs (8%), 4 ADLs (5%), 5 ADLs (5%), and all 6 ADLs (7%). Follow-up to pre-admission, ~ one-fifth to one-third of patients reported worse ADL scores for dressing (36%),

TABLE 1.  
Characteristics of patients included; data presented as means  $\pm$  SD (range) or proportional (n; %)

| Variable  | Participants (n=83)     |
|---|-------------------------|
| Age (yrs)   | 81.4 $\pm$ 8.3 (63-102) |
| Females (n, %)                                    | 50 (60%)                |
| Caucasian (n, %)                                  | 77 (93%)                |
| Education <sup>a</sup> (yrs)                      | 12 $\pm$ 5 (0-25)       |
| Admitted From Home, Assisted Living (n, %)        | 75 (90%), 8 (10%)       |
| Living Alone <sup>b</sup> (n, %)                  | 31 (38%)                |
| Currently Married (n, %)                          | 34 (41%)                |
| Admitted to Emergency Department (n, %)           | 74 (89%)                |
| Clinical Frailty Scale (scale: 1-9)               | 6.1 $\pm$ 1.3 (3-8)     |
| CTAS <sup>c</sup> : High, Low (n, %)              | 26 (31%), 57 (69%)      |
| Number of Health Conditions                       | 9.9 $\pm$ 3.9 (2-20)    |
| Mild Cognitive Impairment <sup>d</sup> (n, %)     | 19 (33%)                |
| Moderate Cognitive Impairment <sup>d</sup> (n, %) | 22 (38%)                |
| Severe Cognitive Impairment <sup>d</sup> (n, %)   | 11 (19%)                |
| Patient Arrived by Ambulance                      | 57 (69%)                |
| Hospital Length of Stay (days)                    | 19.5 $\pm$ 25.9 (3-72)  |
| Hospital Stay $\geq$ 14 days (n, %)               | 32 (39%)                |
| Died before Follow-up (n, %)                      | 5 (6%)                  |

<sup>a</sup>Total n=78.

<sup>b</sup>Total: n=82.

<sup>c</sup>The Canadian Triage and Acuity Scale (CTAS) was scored as high acuity (1-2) or low acuity (3 or did not admit through emergency).

<sup>d</sup>Total: n=58; cognitive impairment was defined as mild (18-25/30), moderate (11-17/30), or severe (<10).

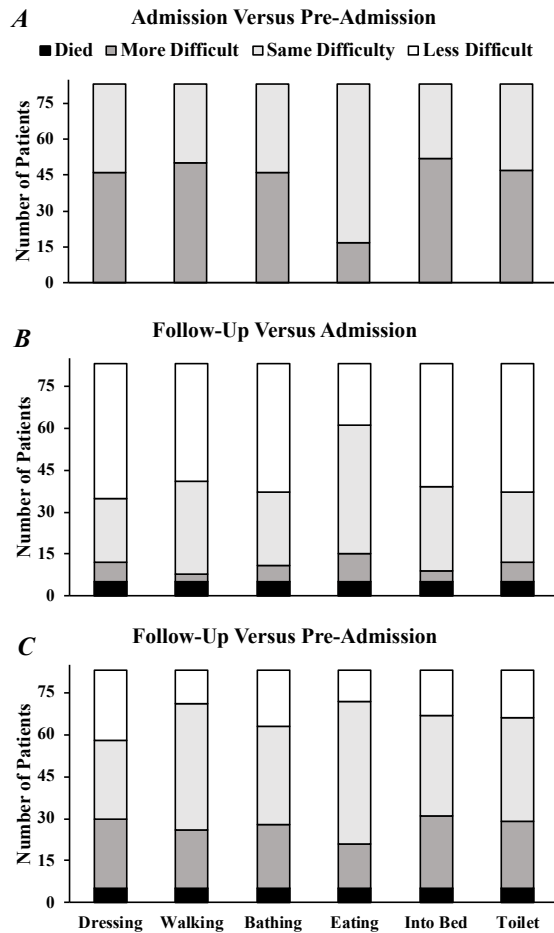


FIGURE 1. Presentation of individual changes in functional score for each basic activity of daily living from admission versus pre-admission (panel A), follow-up (discharge or two weeks after admission) to admission (panel B), and follow-up to pre-admission (panel C); N = 83

walking (31%), bathing (34%), eating (25%), in and out of bed (37%), and using the toilet (35%).

When examining predictors of ADL function, an older age was predictive of a worse functional score (or dying) for ease of eating and getting in and out of bed (both,  $p < .04$ ; Table 2). A higher frailty score was associated with worse score for eating, getting in and out of bed, and using the toilet between pre-admission versus follow-up (all,  $p < .03$ ). Neither sex nor CTAS scores were predictive of changes in ADL scores (all,  $p > .10$ ).

**DISCUSSION**

Approximately three in five patients experienced greater difficulty performing at least one ADL at follow up compared to pre-admission. Further, approximately one in four patients reported greater difficulty with 3+ ADLs, potentially predisposing them for re-hospitalization and a greater reliance on others for assistance. Acute hospitalization resulted in greater difficulty performing ADLs at follow-up compared to pre-admission, particularly for older and frailer patients.

The greater challenges performing ADLs at admission was unsurprising given that patients were acutely ill, requiring hospital admission. However, when examining the functional status of patients at follow up compared to pre-admission, a large proportion (25%) had a greater difficulty performing 3+ ADLs. A greater difficulty performing at least half of measured ADLs is problematic and may lead to higher rates of re-hospitalization than if patients returned to pre-admission function status.<sup>(12)</sup> Accordingly, patients did not completely return to their pre-admission functional baseline. The observation that older age and higher frailty level at admission were associated with an impaired ability to return to pre-admission ADL levels aligns with prior research indicating that pre-admission functional capacity predicts

TABLE 2. Predictors of greater difficulty in performing any basic activities of daily living at follow-up compared to pre-admission; data presented as odds ratio (95% confidence intervals)

|                 | Predictor Variable            |                                 |                                  |                               |
|-----------------|-------------------------------|---------------------------------|----------------------------------|-------------------------------|
|                 | Age<br>OR (95% CI)            | Sex <sup>a</sup><br>OR (95% CI) | CTAS <sup>b</sup><br>OR (95% CI) | CFS<br>OR (95% CI)            |
| Dressing        | 1.04 (0.98-1.11)              | 2.30 (0.85-6.26)                | 1.48 (0.52-4.20)                 | 1.23 (0.83-1.81)              |
| Walking         | 1.01 (0.95-1.07)              | 1.21 (0.45-3.24)                | 0.64 (0.23-1.75)                 | 1.33 (0.89-1.99)              |
| Bathing         | 1.04 (0.98-1.11)              | 1.76 (0.65-4.74)                | 0.84 (0.30-2.30)                 | 1.27 (0.85-1.88)              |
| Eating          | 1.11 (1.02-1.20) <sup>c</sup> | 1.54 (0.46-5.14)                | 1.22 (0.36-4.17)                 | 1.92 (1.13-3.26) <sup>c</sup> |
| In & Out of Bed | 1.07 (1.00-1.15) <sup>c</sup> | 1.10 (0.39-3.12)                | 0.45 (0.15-1.29)                 | 1.62 (1.04-2.53) <sup>c</sup> |
| Toileting       | 1.04 (0.98-1.11)              | 0.89 (0.32-2.44)                | 0.96 (0.34-2.74)                 | 1.62 (1.05-2.51) <sup>c</sup> |

<sup>a</sup>Sex: males = 1, females = 0;

<sup>b</sup>The Canadian Triage and Acuity Scale (CTAS) was scored as high acuity (CTAS values of 1-2 = 0) or low acuity (3 or did not admit through emergency = 1); binary logistic regression was conducted with all predictors inserted simultaneously to predict follow-up function being the same/better (0) or worse (1) than pre-admission; dying was quantified as a 1.

<sup>c</sup> $p < .05$ .

CFS = clinical frailty scale.

patients' capacity to recover.<sup>(13)</sup> Special attention should be directed towards those who are older and more frail during hospitalization to facilitate their efficacy performing ADLs.

This study adds to the current literature by examining the functional trajectory of patients and highlights specific challenges performing ADLs throughout the hospital course. This matches prior observations that the social isolation of the COVID-19 pandemic and higher social vulnerability are associated with worse functional status among older adults.<sup>(14–16)</sup> Our findings demonstrate a need for a greater focus on improving ADL function for tasks that require more mobility (using the toilet and getting in and out of bed). Strategies during hospitalization (e.g., through exercise<sup>(17)</sup>) are needed to bring patients back to their pre-admission functional levels.

ADLs abilities were self-reported, which may be less sensitive to identify impairments than objective measures. Also, approximately 39% of the patients stayed in the hospital more than two weeks<sup>(9)</sup> and thus their study discharge was not the same as hospital discharge for patients; it is possible that these patients could continue to recover after study participation was complete. Delirium may impact patients' functional capacity and is an area worthy of future study.<sup>(18,19)</sup> The study was observational in design and draws attention for interventional work with longer follow-up to better understand the impact of acute hospitalization on ADL, especially in older, frailer patients.

## CONCLUSION

Most patients do not return to their pre-admission level for all ADLs. These effects may be exacerbated in older and frailer patients. Strategies that assist patients to return to their pre-admission ADLs levels are needed.

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## CONFLICT OF INTEREST DISCLOSURES

MWO and KM declare that there are no conflicts of interest. KR has asserted copyright of the Clinical Frailty Scale and KR and OT have asserted copyright of the Pictorial Fit-Frail Scale which are both made freely available for education, research, and not-for-profit health care. Licenses for commercial use of the Clinical Frailty Scale and the Pictorial Fit-Frail Scale are facilitated through the Dalhousie Office of Commercialization and Industry Engagement.

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**APPENDIX A.**

Functional scale used to score patients' ability to perform basic activities of daily living ranging from 1 (can do) to 5 (cannot do) for each activity. This scale was used to assess function prior to and during hospitalization. Each point increase in score indicates that the task is more challenging, and that the patient has less independence in performing such activity.

| Left Box = Baseline<br>Right Box = Current     | Can Do  | Can do with difficulty                            | Can do with some assistance                       | Can do with major assistance                      | Cannot do   |
|--|---|---|---|---|---|
| Dressing, including putting on shoes and socks | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> |
| Walking across a room                          | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> |
| Bathing or showering                           | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> |
| Eating, such as cutting up your food           | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> |
| Getting in or out of bed                       | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> |
| Using the toilet, including getting up or down | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> |