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# Preoperative impairment is associated with a higher postdischarge level of care



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### ABSTRACT

**Background:** Although preoperative risk factors have been shown to lead to postdischarge institutionalization, an association between preoperative risk factors, preoperative level of required care, and discharge to higher levels of care has not previously been demonstrated. **Materials and methods:** Using an institutional American College of Surgeons National Surgical Quality Improvement Program database, a retrospective review of elderly patients undergoing nonemergent inpatient general surgery procedures was performed with the goal of identifying preoperative risk factors that indicated the need for a higher level of care on hospital discharge. Univariate and multivariate analyses were performed on the patient population.

**Results:** Over a 4-y period, 585 patients (29%) within the database were aged  $\geq 65$  y. In this population, 12% of patients required discharge to a higher level of care compared with their preoperative origin. In patients aged  $\geq 65$  y, impaired cognition, decreased functional capacity, advanced age ( $\geq 79$  y), high American Society of Anesthesiologists class, and long hospital length of stay were found in univariate analysis to be associated with postoperative discharge to a higher level of care, although all of these variables except decreased functional capacity were also associated with a higher discharge level of care in multivariate analysis. **Conclusions:** Cognitive and functional capacity scoring can be used as simple ways to indicate discharge to a higher level of care for older adults. Preoperative counseling in high-risk older adults needs to include the likelihood for discharge to a higher level of care, so that a possible referral to social work can be placed during discharge planning.

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## 1. Introduction

As the number of older adults (aged  $\geq 65$  y) in the United States is anticipated to increase to 71 million by 2030, the focus on medical management of this population grows as well [1]. Older adults have surgery four times more often than the rest of the population, making care for elderly surgical patients of

prime importance [2]. Recent studies have attempted to characterize elderly patients preoperatively to predict surgical outcomes [2–9]. However, there is still a need to identify preoperative measures that are not only effective but are also efficient and practical to implement.

Previous studies of elderly patients used the Comprehensive Geriatric Assessment (CGA), a tool that has been proven

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to predict both mortality and disability [2,3,5,6,10]. One CGA model found to correlate with poor outcomes is composed of eight domains: Katz Index of Independence in Activities of Daily Living (ADL), Lawton Instrumental Activities of Daily Living Scale (IADL), cognition, depression, fall risk, nutrition, polypharmacy, and social support [5]. Although the CGA provides a comprehensive assessment of an elderly patient, because of its many categories, it may be perceived as too cumbersome, and therefore not performed.

Previous studies have also connected preoperative variables with hospital discharge destination in elderly patients [5,9]. Discharge to a skilled nursing facility in older adults hospitalized for heart failure has been shown to result in higher 30-d and 1-y mortalities and higher rates of 30-d and 1-y rehospitalization than those patients discharged home [11]. These studies focused on specific discharge locations or examined discharge destination without considering the origin of each patient. A patient who comes to a hospital from an institution and is discharged back to the same institution is not the same as a patient who lives at home initially and is discharged to an institution after their hospital course. Therefore, patients discharged to an institution after a surgical procedure need to be considered in separate groups based on their place of origin, or the level of care they were receiving before their operation.

The purpose of this study was to use validated preoperative measurements from the proposed CGA model to create a high-risk profile for older patients regarding discharge level of care in the context of multiple discharge destinations after general surgery. In addition, this study aimed to incorporate patient origin into the determination of discharge level of care. The hypothesis is that patients with poor scores in the measured variables were more likely to be discharged to a higher level of care.

## 2. Materials and methods

After obtaining institutional review board approval, a retrospective review of the prospectively maintained American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database of an academic tertiary referral center was performed. Nonemergent general surgery operations between 2008 and 2012 were identified. Further inclusion criteria were adult patients (aged  $\geq 18$  y) who underwent a general surgery procedure after the institution of an electronic medical record (EMR) in 2008. Exclusion criteria included patients with an unknown hospital discharge destination and patients who expired while still in the hospital. These patients were excluded because they could not be accurately classified into a discharge level of care. Demographic information was recorded and compared between those aged  $<65$  and  $\geq 65$  y. Since an association between older patients and discharge to a higher level of care was determined in this initial comparison between patient groups, all further analyses focused on the older adult population. All recorded variables were obtained from the ACS-NSQIP database or from the associated institutional EMR. All continuous variables were split into quartiles to ensure that enough patients would be present in each group during analysis, and so that the first or fourth quartile could be used as a high-risk group when no standard high-risk group was previously established in the literature. Unknown values

for each variable were included in a separate category to be considered as a distinct group during statistical analyses.

Several operative and diagnostic factors were considered in the sample population to identify impact on discharge level of care. General surgery subspecialty, operative approach (laparoscopic versus open), and the absence or presence of malignancy were the three factors chosen for this study. Surgical subspecialty and/or type of procedure performed was classified into six categories based on Current Procedural Terminology codes and *International Classification of Diseases, Ninth Revision* codes as follows: intestinal and/or colorectal, hepatobiliary and/or splenic, gastroesophageal, hernia, other intra-abdominal, other nonabdominal. The origins and discharge destinations of the patients were compared with respect to these explanatory variables.

Because a complete CGA is not performed at our institution, components of the CGA model that are assessed by floor nurses on admission were specifically selected for this study. These components included measures for functional capacity and cognition, which were consistently documented in the medical record. Functional capacity was assessed using two tests: ADL and the IADL, which were both performed according to the standard protocol [12,13]. ADLs were scored based on standard scoring for the examination with a scale of 0–6 (6 being normal), whereas the scores that fell within the first quartile of all recorded scores ( $<2$ ) were considered a high-risk group [13]. IADLs were recorded based on the institutional scoring system with a scale of 0–16 (16 being normal), whereas the scores that fell within the first quartile of all recorded scores ( $<8$ ) were considered a high-risk group. The institutional IADL scoring for each activity is as follows: 0 = completely unable; 1 = with some help; and 2 = without help. Cognition was assessed using the standard test at our institution, the abbreviated Mini Mental State Examination (MMSE). The abbreviated MMSE was performed and scored according to customary protocol and scale (0–21) [14,15]. Cognitive impairment is defined as a score  $\leq 14$  [14]. Cognitive and functional capacity scores were recorded and compared against age quartiles to determine if there was any difference in scores among the age groups.

Age was assessed at the time of the operation and any age within the fourth quartile of all older patients (aged  $\geq 79$  y) was grouped into a variable of interest. The American Society of Anesthesiologists physical status classification system (ASA class) was assessed at the time of the operation, and scores  $\geq 3$  were considered high risk based on the ASA class definitions [16]. Body mass index was assessed at the time of the operation, and patients were divided into the standard categories ( $<18.5$  is underweight, 18.5–25 is normal, 25–30 is overweight, and  $>30$  is obese) [1]. Hospital length of stay (LOS) was measured from the admission date to the discharge date and was recorded as whole number of days. Any LOS within the fourth quartile of all older patients ( $\geq 9$  d) was grouped into a variable of interest.

The primary outcome variable was the discharge level of care for each patient. Origins and discharge destinations for all patients were collected from the EMR to determine if patients transitioned to a different level of care compared with their place of origin. Three categories were recorded for origins and discharge destinations: home, chronic care, and acute care. Home was defined as a living residence that did not qualify as a medical support facility of any kind. This group included

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