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Nursing home status is an independent risk factor for adverse 30-day postoperative outcomes after common, nonemergent inpatient procedures

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Abstract

BACKGROUND: Nursing home residents undergoing surgery have a higher rate of postoperative adverse outcomes than nonnursing home patients. This study seeks to determine what contribution nursing home status makes to theses occurrences, independent of comorbid conditions.

METHODS: Using the American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database, the 30-day postoperative outcomes of the 5 commonest nonemergent inpatient procedures performed on nursing home residents were compared with those in nonnursing home residents using logistic regression analysis.

RESULTS: Nursing home status was found to be an independent risk factor for septic complications in all procedures, for blood transfusion requirement after lower leg amputation, for pneumonia and stroke/cerebrovascular accident after thromboendarterectomy, and for mortality after partial colectomy with primary anastomosis.

CONCLUSIONS: These data suggest that, in addition to serving as a surrogate indicator of health status and current morbidity, residence in a nursing home makes an independent contribution to adverse postoperative outcomes.

There are more than 1.3 million individuals residing in nursing homes in the United States [1] having a mean age of 80 years, with more than 90% of residents aged 65 or older.[2] It is estimated that 1 in 4 individuals who reach age 65 will spend some time residing in a nursing home.[3] The American population subset consisting of the most frail and dependent seniors, those aged 85 and above, is predicted to grow from 5.8 million in 2010 to 8.7 million in 2030, then to 19 million in 2050 due to an aging baby boomer population.[4] It is reasonable to assume that the United States nursing home population will also increase as the fraction of older age individuals increases. It is therefore crucial to consider what contribution the nursing home environment may make to the processes of disease and healing in its residents, especially when considering the

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wide variability of nursing home quality despite federal and state regulations.[5]

The period of healing after surgical procedures presents a particularly critical concern for seniors and their health care providers. Studies suggest that surgeries can be performed safely in the very old.[6–9] However, studies have mostly been carried out using single-center approaches, with a dearth of population-level evidence making it difficult to observe how widely this trend applies. When population-level support is obtained, it is seen that there is a positive correlation between age and 90-day mortality rates after major abdominal surgery in patients aged 65 years.[10] More robust studies have found that postoperative mortality, overall morbidity, and probability of mortality after postoperative complications all increase with advancing age.[11] However, the contribution of the nursing home to this paradigm has gone largely unaddressed.

There are some indications that a significant association exists between discharge to a nursing home after nonemergent general surgical procedures and higher 30-day, 90-day, and 1-year mortality rates as compared with patients discharged to their private homes with self-care.[12] Finlayson et al[13] conducted a very high-powered study published in 2011 that included approximately 1 million patient records using the Medicare inpatient files, finding that for most abdominal surgeries, a 65-year-old patient admitted to the hospital from a nursing home had equal risk of postoperative mortality as an 85-year old coming from a private residence. However, the Medicare inpatient files sample did not track a high variety of either comorbidities or other, more specific outcomes. These studies taken together imply that the protective effect of younger age is somewhat curtailed by a patient's status as a nursing home resident and merit further investigation to better characterize this effect.

The ACS-NSQIP database collects deidentified surgical patient data from more than 250 health care centers across the United States and tracks a total of 135 preoperative and 30-day postoperative variables per patient. A large and growing number of reports have been published using the NSQIP data in statistical analysis to determine risk factors and elucidate trends in surgical outcomes. This study seeks to use the power of the ACS-NSQIP database and its many variables to determine what significant contribution, if any, nursing home status makes to 30-day postoperative outcomes.

Methods

The ACS-NSQIP database was queried to form 2 groups of patients who had received nonemergent inpatient surgical procedures from 2005 to 2011: those who had been admitted to the hospital directly from nursing homes, referred to as the nursing home (NH) group, and those who had been admitted directly from private homes, referred to as the home (HO) group. Veterans Affairs facilities were excluded. The NH group was compiled based on ACS-NSQIP's "transfer status" variable that indicates whether patients were admitted to the hospital directly from home or from a chronic care facility and/or nursing home. The ACS assigns a surgical clinical reviewer who is present at each site to enter data into NSQIP fields using medical chart abstraction and other methods. The surgical clinical reviewer is responsible for accuracy of all preoperative and postoperative variables. Regular site audits are conducted by the ACS to ensure accuracy of data.

The NH group was then queried to find the top 5 commonest nonemergent inpatient surgical procedures performed among them. The procedures were searched and filtered for by their corresponding current procedural terminology (CPT) codes. The same 5 current procedural terminology codes were then used to select for patients who had received those procedures in the HO group.

A univariate analysis was performed via chi square for each procedure, comparing the 30-day postoperative outcome frequencies of the NH and HO groups. The following binary 30-day postoperative outcomes were considered: mortality, mortality during postoperative in-hospital recovery, the need for one or more blood transfusions up to 72 hours after leaving the OR, cardiac arrest, coma lasting more than 24 hours, stroke, deep vein thrombosis, increased length of stay, myocardial infarction, superficial surgical site infection, organ space surgical site infection, peripheral nerve injury, pulmonary embolism, pneumonia, progressive renal failure, return to OR, sepsis, septic shock, unplanned reintubation, urinary tract infection, need for ventilator support for more than 48 hours, wound disruption, and wound infection. Increased length of stay was defined as a postoperative stay greater than the 3rd quartile for patients in their respective NH or HO groups. An alpha of $P < .05$ was considered significant for this study.

Each procedure was analyzed independently. Outcome differences that were found to be significant on univariate analysis were then subjected to multivariate analysis using logistic regression. For the multivariate analysis, all patients from both the HO and NH groups were combined into single samples for each of the five selected procedures. Nursing home status was included as a preoperative variable in the models to test for its significance. The other preoperative variables considered in the regression analyses were as follows: age, sex, body mass index (BMI), smoker status, diabetic status, dyspnea, functional status, need for ventilator assistance, history of chronic obstructive pulmonary disease, ascites, history of heart failure, hypertension requiring medication, kidney failure, dialysis, disseminated cancer, steroid use for chronic condition, greater than 10% weight loss in last 6 months, bleeding disorders, transfusion of greater than 4 units packed RBCs in 72 hours before surgery, systemic sepsis, serum sodium, blood urea nitrogen, serum creatinine, white blood cell count, hematocrit, platelet count. Variables that contained greater than or equal to 10% of missing data were excluded.