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## Selecting post-acute care settings after abdominal surgery: Are we getting it right?

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### ABSTRACT

**Background:** We investigated whether variation in post-acute care (PAC) services could be explained by surgeons discharging clinically similar patients to different PAC destinations, including home health (HH), skilled nursing facilities (SNF), and inpatient rehabilitation (IR).

**Methods:** We studied patients having colectomy, pancreatectomy or hepatectomy in the 2008–2011 Nationwide Inpatient Sample. We used propensity matching to determine:

1. Proportion of patients discharged to SNF/IR who could be matched to clinically similar patients discharged with HH.

2. Potential cost savings from greater use of HH.

**Results:** 30,843 patients were discharged with HH and 23,172 to SNF or IR. 14,163 (61%) SNF/IR patients could be matched to similar patients discharged with HH. Potential cost savings from increasing use of HH as an alternative to SNF/IR ranged from \$2.5–\$438 million annually.

**Conclusions:** There is considerable potential for reducing variation in PAC use and costs by better understanding how surgeons make decisions about PAC placement.

**Summary:** Many surgical patients discharged to inpatient rehabilitation or skilled nursing facilities have similar pre- and postoperative characteristics as individuals discharged home with home health. In order to reduce variation and deliver cost-effective care after discharge, it is important to understand how surgeons make decisions about post-acute care, and to develop processes to identify which type of post-acute care is best for each patient.

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### 1. Introduction

Variation in the use of post-acute care services represents a significant problem for patients and health systems. Medicare spends \$62 billion annually for patients to receive post-acute care

services in settings that include skilled nursing facilities, inpatient rehabilitation hospitals, and at home with home health providers.<sup>1</sup> Patients rely on post-acute care for assistance during postoperative recovery when they are unable to regain independence during the acute care hospital stay, or when caregivers cannot adequately address their post-discharge care needs.<sup>2,3</sup>

Up to 45% of patients rely on post-acute care after abdominal surgery, but there are no guidelines to help identify whether the best option for recovery is treatment at home with home health, or whether they might benefit from placement in skilled nursing facilities or inpatient rehabilitation hospitals.<sup>2–5</sup> In the absence of guidelines, the main factors driving selection of the post-acute care

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setting include provider opinion of patient needs, local practice patterns or traditions, availability of post-acute care resources, and financial incentives.<sup>1,6</sup> Unfortunately, this leads to substantial hospital-level variation in whether patients are discharged home with home health, or whether they are sent to skilled nursing facilities or inpatient rehabilitation after surgery. Our previous work has shown that the likelihood of patients being discharged home versus placement in skilled nursing facilities or inpatient rehabilitation is strongly influenced by which hospital performs the surgery.<sup>5,7</sup> These findings indicate that patients with similar comorbidities and postoperative outcomes frequently receive very different care after discharge. Additionally, recent studies from the Medicare Payment Advisory Commission demonstrate that 73% of regional variation in Medicare spending stems from differences in how hospitals choose post-acute care settings for their patients.<sup>1</sup>

When hospitals take an inconsistent approach to post-acute care, there is considerable potential for poor outcomes, inefficiency, and increased healthcare costs. Skilled nursing facilities and inpatient rehabilitation are more costly than treatment at home, and home therapy is typically preferred by patients and families.<sup>1</sup> Underutilization of home health relative to skilled nursing or inpatient rehabilitation can, therefore, increase costs and decrease quality of life without necessarily enhancing postoperative recovery. At the same time, overutilization of home health at the expense of skilled nursing facilities or inpatient rehabilitation means that some individuals who might benefit from more intensive skilled therapy are not receiving it, and this could delay recovery. Recent data from Medicare indicate that up to 50% of patients referred for post-acute care could potentially have been treated in an alternate setting, with similar outcomes and lower costs.<sup>8</sup> The authors also found that home health was significantly underutilized and many patients discharged to skilled nursing facilities or inpatient rehabilitation could have been candidates for home therapy. However, these populations mostly consisted of patients with medical conditions (heart failure, stroke) or hip fractures, with relatively few abdominal surgery patients.

The purpose of this study is to determine if patients discharged to either of the post-acute care facilities (skilled nursing facilities or inpatient rehabilitation) after abdominal surgery were similar to patients sent home with home health. If the two patient groups are largely indistinguishable in terms of their clinical characteristics and postoperative course, this would provide evidence for potential over- or underutilization of home health relative to skilled nursing facilities and inpatient rehabilitation after surgery. Either conclusion would indicate an urgent need to improve our approach to post-acute care.

## 2. Methods

### 2.1. Study population

We utilized *International Classification of Diseases, Ninth Revision, Clinical Modification* procedure codes to identify patients having colectomy, pancreatectomy, or hepatectomy from the 2008–2011 Nationwide Inpatient Sample. The dataset represents a 20% stratified sample of US community hospitals, excluding Veterans Affairs hospitals and federal facilities. We included patients age 18 and older who were discharged with post-acute care services after surgery. Patients who came from facilities were excluded because they were highly likely to return to those facilities regardless of surgical outcomes or other characteristics. We excluded patients with metastatic cancer because their use of post-acute care may be palliative in nature rather than reflecting decisions about postoperative recovery.

### 2.2. Primary outcome

The primary outcome was discharge to a post-acute care facility (skilled nursing facility, inpatient rehabilitation, intermediate care) versus discharge home with home health. Discharge destination was determined according to the uniform disposition indicator variable (DISPUNIFORM).

### 2.3. Secondary outcome

We estimated potential cost savings that would result from shifting patients in skilled nursing facilities or inpatient rehabilitation to home health. Since the Nationwide Inpatient Sample does not contain data on costs from post-acute care, potential savings were calculated from the Clinically Appropriate and Cost-Effective Placement Study commissioned by the Medicare Payment Advisory Committee.<sup>8</sup> This study used a 5% sample of Medicare claims data from 2007 to 2009 to calculate average Medicare costs for a 60-day episode of care following discharge to each post-acute care setting. Because the Nationwide Inpatient Sample does not reliably distinguish between discharge to skilled nursing facilities and inpatient rehabilitation hospitals, we calculated potential cost savings using a two-way sensitivity analysis that varied the percentage of patients shifted to home health and the range of cost differences between home health and either skilled nursing facilities or inpatient rehabilitation.

### 2.4. Covariates

Demographic information including age, gender, Elixhauser comorbidities, insurance status, estimated mortality risk, and type of admission were obtained from the Nationwide Inpatient Sample data files. Complications were identified using previously validated diagnostic codes.<sup>5</sup> Hospital characteristics came from the Nationwide Inpatient Sample Hospital File which contains data from the American Hospital Association survey. Hospital procedure volume was calculated from the number of procedures performed during the study period. Since not all hospitals appear in the data set every year, the volume represents a weighted average based on the number of years each hospital participated.

### 2.5. Propensity score matching to compare patient characteristics

We used propensity matching to determine overlap in clinical characteristics between patients discharged to post-acute care facilities and those discharged home.<sup>9</sup> Since the validity of propensity score analysis depends on accurately specifying the score, we used two separate and complementary methods (logistic regression and Classification and Regression Trees) to determine which variables to include and which functional forms to use (data not shown). For the propensity matching, we used a nearest neighbor approach with calipers set to 0.01 x logit. Typically, calipers are set at ~0.1 x logit, but we chose a more conservative range in order to minimize any artefactual similarity between the patient groups that might result from a wider interval for matching. Given the nature of our study question, we felt that it was better to have a more conservative estimate of similarity between patients using home health and those discharged to skilled nursing facilities or inpatient rehabilitation. Specification of the propensity score was evaluated by comparing the balance of covariates over the strata of the propensity score, and by comparing the standardized difference between matched and unmatched populations. This was done over several iterations adding interaction and higher-order terms as needed to achieve an adequate balance as determined by a standardized difference <10% for all variables.<sup>10,11</sup>

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