Surgery 166 (2019) 489–495

Contents lists available at ScienceDirect

Surgery

journal homepage: www.elsevier.com/locate/surg

Discharge disposition to skilled nursing facility after emergent general surgery predicts a poor prognosis

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ARTICLE INFO

Article history:
Accepted 8 April 2019
Available online 18 July 2019

ABSTRACT

Background: Emergency general surgery can have a profound impact on the functional status of even previously independent patients. The role and influence of discharging a patient to a skilled nursing facility, however, remains largely unknown.

Methods: We queried the American College of Surgeons National Surgical Quality Improvement Program for community-dwelling adults who underwent 1 of 7 emergency general surgery procedures and were discharged home or to a skilled nursing facility from 2012 to 2016. Propensity score matching and multivariable regression analyses were performed to determine the relationship between discharge disposition and outcomes.

Results: Overall, 140,922 patients met the inclusion criteria. The majority were discharged home (95.9%). After applying 1:1 propensity score matching, in comparison to patients discharged home, individuals discharged to a skilled nursing facility had a greater odds of respiratory (odds ratio 2.32; 95% confidence interval, 1.59–3.38) and septic complications (odds ratio 1.63, 95% confidence interval 1.12–2.36) after discharge. Furthermore, following surgery, individuals discharged to a skilled nursing facility had a greater odds of 30-day readmission (odds ratio 1.14; 95% confidence interval, 1.01–1.29), and death within 30 days of the procedure (odds ratio 2.07; 95% confidence interval, 1.65–2.61).

Conclusion: After accounting for patient severity and perioperative course, discharge to a skilled nursing facility is an independent risk factor for death, readmission, and postdischarge complications.

Introduction

More than 3 million people are hospitalized annually owing to a condition requiring emergency general surgery (EGS), exceeding the yearly incidence of both new-onset diabetes and cancer.[1–3] These patients, plagued by unforeseen emergencies, represent a complex population posing a substantial public health burden.[3,4] As such, EGS has been associated with a high risk of death and postoperative complications.[5] Specifically, older age, male sex, and comorbidities, such as chronic obstructive pulmonary disease and current smoking, have been associated with considerable morbidity after EGS.[6] Furthermore, postoperative complications, such as stroke and major bleeding, have been associated with death after EGS.[7] Unlike other populations, patient optimization before operative intervention is not feasible. Despite the known morbidity and mortality issues after EGS, the effect of discharge disposition on postdischarge outcomes remain poorly understood.

Previous studies have estimated that 10% to 40% of EGS patients will require assistance once discharged, including either the use of home health care or a postacute care facility, such as a skilled nursing facility (SNF) or intermediate care facility.[8,9] Furthermore, recent studies have demonstrated that the quality of a SNF has a marked impact on occurrence of complications and readmission rates after pancreatectomy.[10] The effect of discharge to a SNF in the setting of EGS has not been explored fully. In this context, the objective of the current study was to characterize disposition after EGS using the database of the American College

Presented at the Central Surgical Association Annual Meeting, Palm Harbor, FL, March 2019. Selected best paper by a new member.

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https://doi.org/10.1016/j.surg.2019.04.034
0039-6060/

of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP). Specifically, we sought to explore and compare the impact of discharge to a SNF versus home on 30-day readmissions, the incidence of postdischarge complications, and postdischarge 30-day mortality among a group of community-dwelling individuals facing an unexpected emergency operation. We hypothesize that a patient's postdischarge course will vary based on discharge destination.

Methods

Acquisition of data and study population

Using the ACS-NSQIP database, we identified patients ≥18 years old who between 2012 to 2016 underwent 1 of the 7 previously defined EGS procedures (appendectomy, cholecystectomy, laparotomy, colectomy, small bowel resection, peptic ulcer repair, or lysis of adhesions) that account for 80% of the operative volume, mortality, complications, and cost of EGS nationally (Supplemental Table I).[11,12] This database is a collection of operative data on over 150 variables, including patient demographics, intraoperative variables, and 30-day postoperative mortality and morbidity for patients undergoing operative intervention. Data were gathered by surgical clinical reviewers who have undergone extensive training to ensure accurate data extraction.[13,14]

To identify individuals who were community-dwellers before presentation, patients who were transferred from an acute care hospital, nursing home, chronic care facility, intermediate care facility, outside emergency department, or unknown or other facility were excluded. Patients who underwent an elective operation, had operative intervention more than 48 hours after presentation, or who died during the index admission were also excluded. Disposition to either home or a SNF was necessary for inclusion in the final cohort.

Study variables and outcomes

Clinical and demographic data reflect the patient's status on admission to the hospital. Abstracted data included age, sex, race or ethnicity, classification according to the American Society of Anesthesiology (ASA), and preoperative functional status (independent, partially dependent, totally dependent, unknown). Functional status was determined by the surgical clinical reviewers based on the functional status 30 days before the operation. Independent was defined as "does not require assistance from another person for any activities of daily living, including one who functions independently with the use of prosthetics, equipment, and/or devices."[15] Partially dependent patients "require some assistance from another person for activities of daily living," whereas someone who is totally dependent "requires total assistance for all activities of daily living."[15] The comorbid conditions of interest included >10% body weight loss in last 6 months, diabetes mellitus, dyspnea, current smoker within 1 year, preoperative ventilator use, history of severe chronic obstructive pulmonary disease, presence of ascites, congestive heart failure, hypertension, preoperative renal failure, dialysis dependence, history of disseminated cancer, preoperative septic conditions (sepsis, septic shock, and septic inflammations), preoperative wound infection, chronic steroid use, and the history of a bleeding disorder. Similar to other studies, operative interventions were categorized as high-risk (laparotomy, colectomy, small bowel resection, peptic ulcer repair, lysis of adhesions) or low-risk (appendectomy, cholecystectomy).[12,16] Complications including wound, sepsis (sepsis or septic shock), respiratory (unplanned intubation, pneumonia, or postoperative ventilator use >48 hours), thromboembolic disorders (deep venous thrombosis or pulmonary embolism), renal failure (progressive renal insufficiency or acute renal failure), and cardiac abnormalities (myocardial infarction or cardiac arrest) were characterized into a pre- or postdischarge complication based on duration of stay and days from operation until date of complication. If the complication occurred after the discharge date, the complication was considered a postdischarge complication.

Statistical analysis

The cohort was subdivided based on discharge destination (home versus SNF). Demographics, patient characteristics, and clinical characteristics were compared between discharge destinations. To account for possible confounding between the 2 groups, a 1:1 propensity score-matching was performed based on age, sex, race, ASA class, body mass index, functional health status, comorbidities, wound class, type of operation (high-risk versus low-risk), and predischarge complications. Continuous variables were described using measures of central tendency and the Wilcoxon rank-sum test. Categorical variables were compared using proportions and the χ^2 or Fisher exact test as appropriate. Multivariable logistic regression models were constructed adjusting for demographics, comorbidities, predischarge clinical characteristics, and type of operation (high-risk versus low-risk) to evaluate the association between discharge disposition and postdischarge morbidity, 30-day readmission, and 30-day mortality. All analyses were performed using SPSS version 24 (IBM, Armonk, NY) other than propensity matching which was performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

Patient characteristics

A total of 140,922 patients who underwent EGS from 2012 to 2016 and met inclusion criteria were identified in the ACS-NSQIP database. Median patient age was 43 years (IQR 29–59); approximately half of the patients were female (n = 72,536; 51.5%). Most patients were white (n = 100,420; 71.3%), and an overwhelming majority had an independent functional health status before EGS (n = 137,923; 97.9%). One in 3 patients was diagnosed with a septic condition (n = 46,885; 33.3%) preoperatively. Most patients underwent a low-risk operation (n = 110,445; 78.4%). The most common in-hospital complications included sepsis (n = 9,507, 6.8%) and respiratory (n = 5,127, 3.6%). Within 30 days of operation, 5.5% were readmitted and 0.4% (n = 592) died after discharge.

Among the 5712 patients (4.1%) discharged to SNF, most were older (median age: 75, [IQR 66–82] vs 41 [IQR 28–57]) and more commonly totally dependent (n = 102, 1.8% vs n = 194, 0.1%) before admission. Additional comparison of demographics and clinical characteristics among patients who were discharged home or to a SNF is shown in Table I. Patients who were discharged to a SNF were more likely to have been admitted with sepsis (59.4% vs 32.1%, P < .001). A greater proportion of patients discharged to an SNF underwent high-risk operations in comparison to patients discharged home (87.1% vs 18.9%, P < .001; Table II). In addition, patients discharged to a SNF were more than 6 times as likely to have experienced a predischarge complication (60.5% vs 9.3%, P < .001).

Comparison of outcomes based on discharge destination

Given the drastic differences in demographic and preoperative characteristics between patients discharged to an SNF versus home and to minimize the potential for confounding, a 1:1 analysis

Table I
Baseline demographic and preoperative characteristics of community-dwelling patients undergoing emergency general surgery based on discharge destination after operation

	Home (n = 135,210)		SNF (n = 5,712)		*P* value
	n	%	n	%	
Age (y)					<.001
18–40	65,276	(48.3%)	146	(2.6%)	
41–65	51,030	(37.7%)	1,103	(19.3%)	
66–80	14,968	(11.1%)	2,240	(39.2%)	
>80	3,936	(2.9%)	2,223	(38.9%)	
Sex					<.001
Male	66,187	(49%)	2,199	(38.5%)	
Female	69,023	(51%)	3,513	(61.5%)	
Race					<.001
White	95,855	(70.9%)	4,565	(79.9%)	
Black	11,560	(8.4%)	744	(13.0%)	
Other	8,150	(6.0%)	165	(2.9%)	
Unknown	19,645	(14.5%)	238	(4.2%)	
ASA grade					<.001
I–II	103,866	(76.8%)	572	(10%)	
>II	31,444	(23.2%)	5,140	(90%)	
Functional status					<.001
Independent	133,023	(98.4%)	4,900	(85.8%)	
Partially dependent	883	(0.7%)	641	(11.2%)	
Totally dependent	194	(0.1%)	102	(1.8%)	
Unknown	1,110	(0.8%)	69	(1.2%)	
BMI (kg/m^2)					<.001
<25.0	45,804	(33.9%)	2,381	(41.7%)	
25.0–29.9	45,251	(33.5%)	1,596	(27.9%)	
30.0–34.9	25,238	(18.7%)	906	(15.9%)	
≥35.0	18,917	(14%)	829	(14.5%)	
>10% body weight loss in last 6 m	965	(0.7%)	238	(4.2%)	<.001
Diabetes mellitus					<.001
Insulin-dependent	3,391	(2.5%)	483	(8.5%)	
Not insulin-dependent	5,695	(4.2%)	676	(11.8%)	
Dyspnea					<.001
At rest	233	(0.2%)	120	(2.1%)	
With moderate exertion	2,137	(1.6%)	429	(7.5%)	
Current smoker	25,582	(18.9%)	923	(16.2%)	<.001
Preoperative ventilator use	1,039	(0.8%)	382	(6.7%)	<.001
COPD	2,541	(1.9%)	781	(13.7%)	<.001
Ascites	713	(0.5%)	206	(3.6%)	<.001
CHF	372	(0.3%)	230	(4.0%)	<.001
Hypertension	29,647	(21.9%)	3,943	(69.0%)	<.001
ARF	179	(0.1%)	176	(3.1%)	<.001
Dialysis-dependent	577	(0.4%)	157	(2.2%)	<.001
Malignancy	1,407	(1.0%)	382	(6.7%)	<.001
Preoperative septic condition	43,492	(32.1%)	3,392	(59.4%)	<.001
Preoperative wound infection	532	(0.4%)	213	(3.7%)	<.001
Corticosteroid use	2,986	(2.2%)	594	(10.4%)	<.001
Bleeding disorder	3,690	(2.7%)	1,034	(18.1%)	<.001

ARF, acute renal failure; *BMI*, body mass index; *CHF*, congestive heart failure; *COPD*, chronic obstructive pulmonary disease; SIRS, systemic inflammatory response syndrome.

involving propensity score matching was completed. Patients were matched based on age, sex, race, ASA class, body mass index, functional health status, comorbidities, wound class, type of operation, and specific in-hospital complications. After matching, 4,872 (50%) patients were discharged home, and 4,872 (50%) individuals were discharged to a SNF. Between these new cohorts, only ASA grade and preoperative ventilator use remained different ($P < .05$, Supplemental Table II). A multivariable regression analysis was performed adjusting for baseline clinical and demographic characteristics, type of operation, operative time, and postoperative morbidity (Table III). Individuals discharged to a SNF had 63% greater odds having a septic complication (OR 1.63; 95% CI, 1.12–2.36) and more than 2 times the odds of developing a respiratory complication after discharge (OR 2.32; 95% CI, 1.59–3.38). Discharge to a SNF was predictive of readmission within 30 days (OR 1.14, 1.01–1.29). Lastly, patients discharged to a SNF had considerably greater odds of dying within 30 days of operation compared with patients discharged home (OR 2.07; 95% CI, 1.65–2.61). Rate of death after the 30 days discharge time point could not be determined because of the restriction of the ACS-NSQIP database only recording 30-day post discharge data.

Discussion

Annually, millions of people in the United States face unforeseen EGS.[3] For some, the operative intervention can catalyze a tragic course of events. The postdischarge period including occurrence of complications, readmission, and mortality for EGS patients discharged to a SNF remains unknown. In the present study among a group of community-dwelling individuals who survived the index hospitalization, 4.1% were discharged to a SNF after EGS. Not surprisingly, patients discharged to a SNF were more likely to have multiple comorbidities, undergo high-risk surgery and have at least one perioperative complication. To enable the analysis of the association of discharge to a SNF and postdischarge outcomes of interest while controlling for confounding as fully as possible, we

Table II
Perioperative and postoperative characteristics of community-dwelling patients EGS based on discharge destination after an operation

	Home (n = 135,210)		SNF (n = 5,712)		*P* value
	n	%	n	%	
Type of operation					<.001
Low risk	109,707	(81.1%)	738	(12.9%)	
High risk	25,503	(18.9%)	4,974	(87.1%)	
Wound classification					<.001
Clean	5,616	(4.2%)	310	(5.4%)	
Clean/contaminated	38,266	(28.3%)	1,417	(24.8%)	
Contaminated	59,607	(44.1%)	1,080	(18.9%)	
Dirty	31,721	(23.5%)	2,905	(5.9%)	
Total operative time (min)					<.001
0–60	85,913	(63.5%)	1,351	(23.7%)	
61–120	38,120	(28.2%)	2,530	(44.3%)	
>120	11,177	(8.3%)	1,831	(32.1%)	
Duration of stay (d)					<.001
0–2	99,347	(73.5%)	230	(4%)	
≥3	35,863	(25.5%)	5,482	(96.0%)	
Any predischarge complication	12,599	(9.3%)	3,455	(6.5%)	<.001
Readmission	6,998	(5.2%)	784	(13.7%)	<.001
Postdischarge mortality	251	(0.2%)	341	(6.0%)	<.001

Table III
Results of multivariable logistic regression analysis for evaluating the association of SNF discharge versus home for outcomes of interest after EGS

Postdischarge outcomes	Adjusted OR (95% CI)
Wound complications	0.87 (0.71–1.06)
Respiratory complications	2.32 (1.59–3.38)
Thromboembolic complications	1.32 (0.89–1.98)
Renal complications	1.17 (0.66–2.05)
Cardiac complications	1.42 (0.8–2.51)
Septic complications	1.63 (1.12–2.36)
Readmissions	1.14 (1.01–1.29)
Mortality	2.07 (1.65–2.61)

included a propensity adjustment for key demographic and clinical characteristics. Holding clinical and perioperative characteristics equal, the present study found that the odds of death, readmission, and complications after discharge are increased in patients discharged to a SNF compared wtih those discharged home. To our knowledge, this is the first study to consider the differential experiences and outcomes of EGS patients by discharge destination.

These findings expand important prior work characterizing the field of EGS. Havens et al reported that EGS itself is an independent risk factor for death and postoperative complications.[5] Specifically among EGS patients, they found that one-third experienced a complication, and 1 in 8 died.[5] In our current study, the morbidity rate was 11%. One possible reason for the disparate results may be secondary to differences in the underlying population. The present study sought to measure differences between community dwellers presenting from home who underwent 1 of 7 procedures shown to account for the most admissions, deaths, complications, and inpatient costs. In contrast, Havens et al included patients from both EGS and emergency vascular surgery populations and patients transferred from outside facilities whose community-dwelling status was unknown.[5,11] Although the present study noted that patients discharged to an SNF were older and more likely to have endured a complicated hospital course, we found that after utilizing 1:1 propensity matching and maintaining clinical and operative characteristics similar between both cohorts, patients discharged to a SNF still had >2 times the odds of dying within the first month postoperatively once discharged in comparison to patients discharged home. In addition, they were more likely to experience septic and respiratory complications. Unlike other studies, the present study additionally highlights the substantial mortality that is independently associated with discharge to a SNF. Collectively, these data have important implications in the discharge planning after EGS and the close monitoring that may be needed especially for patients not discharged home.

The effect of discharge to a SNF on outcomes is debated, but as may be suspected, the outcomes depend on the underlying population and the postacute care needs of the patient. Patient optimization, including discharge timing and increasing patient complexity, has been attributed by SNF providers as a major challenge in meeting the needs of their residents.[17] Furthermore, optimization of resources available at SNFs may also be a contributing factor in the results noted in the present study. For example, among patients undergoing a pancreatectomy, patients discharged to a SNF rated as below-average quality as determined by The Centers for Medicare and Medicaid Services ratings, were more likely to be readmitted compared to patients discharged to an above-average SNF.[10] In a different study, Ogunneye et al did not find an association between the quality of the SNF and patient outcomes among patients with decompensated heart failure.[18] Given that 2019 will mark the start of the SNF value-based purchasing program that will penalize or reward SNFs based on 30-day all cause readmission, however, our data support the need for improvements in patient selection and the transition of care from acute hospitalization to a SNF. To this end, Schoenfeld et al found that patients who were discharged to a SNF that cared for a larger proportion of surgical patients had a decreased likelihood of rehospitalization.[19] Perhaps future directions by The Centers for Medicare and Medicaid Services should also focus on designing and designating SNF centers with expertise in various conditions in order to optimize the quality of care delivered to patients too healthy for a long-term acute care hospital but too complex to return to home directly.

Our findings should be considered in the context of several limitations. First, similar to other retrospective cohort studies, the present study is subject to information bias. To limit information bias, the ACS-NSQIP database was selected owing to the rigorous and validated methods of data abstraction.[13,14] In addition, although ACS-NSQIP contains data that have been found to be more accurate than data obtained from administrative claims data sources, data is limited to 30 days after operation, which may be insufficient to capture all complications especially of patients discharged to SNF.[20] Also, the ACS-NSQIP database does not contain information on patient's insurance, socioeconomic status,

functional status at time of discharge, or the quality of SNF. Another important limitation to this study is the effect of confounding. We attempted to address this potential limitation by using a 1:1 propensity score matching, including variables predictive of the outcomes of interest, which has been shown to limit the amount of residual imbalance while maximizing the power to detect a difference between the groups.[21]

Despite these limitations, this study has important findings of interest to patients, families, providers, and policymakers. Although the cause of a complex, postdischarge course requiring SNF discharge is multifactorial, the challenges may stem from a lack of specialized resources needed to care for these critical patients that have survived an unexpected insult. In addition, future studies using institutional data are needed to capture the social factors and motivators that contribute to the decision to be discharged to a SNF. Future initiatives that seek to improve the transition from hospital to SNF while incentivizing quality of care are necessary to give the opportunity for previous community-dwelling individuals to return home. In the absence of such approaches, a worsening of present findings could be possible in the future.

In conclusion, although only a minority of community dwelling patients were discharged to a SNF after EGS, this discharge is in itself an independent risk factor for death and postdischarge complications. Future studies and care remodeling techniques should focus on attenuating this disparity in outcomes. Such techniques might focus on discussing the increased morbidity and mortality with the patient early in the planning phase, restructuring discharge planning, and increasing provider follow-up after discharge.

Funding/Support

The authors have indicated that they have no conflicts of interest (or funding) regarding the content of this article.

Conflict of interest/Disclosures

The ACS NSQIP and hospitals participating in the ACS NSQIP are the source of the data used. They have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors. We acknowledge H.P.S has received grant support from the Agency for Healthcare Research and Quality (R01HS022694). She is a paid consultant by the Johnson & Johnson Company on a fragility fracture advisory board. The submitted work is not related to this topic. No other disclosures.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.1016/j.surg.2019.04.034.

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Discussion

Dr Juan Asensio (Omaha, NE): This is an interesting retrospective large database 5-year study utilizing the National Quality Improvement Program (NSQIP) of the American College of Surgeons (ACS). The authors have clearly defined their objective, which is to characterize disposition of patients following emergency general surgery (EGS) utilizing NSQIP data, specifically to explore the impact of discharge to a Skilled Nursing Facilities (SNF) on 30-day readmissions, as well as to examine the incidence of post discharge complications and post discharge 30-day mortality. Their hypothesis being that the patients' post discharge course and outcomes will vary based on discharge destination.

The authors also focused on comorbidities present in this patient population, as well as postoperative complications stratified to 2 different patient groups. Those that underwent what was deemed high risk surgical procedures such as: laparotomy, colectomy, small bowel resection, peptic ulcer repair and lysis of adhesions versus those that underwent what was defined as low risk procedures such as appendectomy and cholecystectomy.

Their results are clearly presented with great detail. Surprising, was the median age of 43, not surprising was that the majority of patients underwent low risk procedures (78.4%) and most were discharged home—95.9%. Of the 5,127 (4.1%) patients transferred to a skilled nursing facility (SNF) their readmission, rate postoperative complications and mortality were higher.

A review of their outcomes reveals that for all parameters tested there was statistical significance for both univariate and stepwise logistic regression, so that the data does support the conclusions. Thus, the authors have proven what is intuitively predicted and in concordance with other data available in the literature.

However, there are a number of questions for the authors:

1. Can you describe the entire list of high risk versus low risk procedures? Missing from the list, for instance, are soft tissue infections requiring debridement and drainage and possibly others.
2. The authors chose propensity score analysis, which since its description in 1983 appears to be used more and more frequently, but in my opinion, not well understood in terms of it applicability. What are the drastic differences you allude to between patients discharged home versus those discharged to a SNF?
3. What are the confounding variables that you needed to control for, by choosing propensity score matching. In my review of the data provided in supplemental Table I, only 2 of the predictors of outcome achieved statistical significance—the dichotomous ASA risks I to II versus greater than ASA II and preoperative ventilator usage. Can you explain this?
4. Beyond what is obvious, can you describe the real and tangible applications to the conclusions of your study.

In summary, the data supports conclusions of this study, the statistics are sound, and the study is solid. All that remains for the authors is to explain from the results of this study how can this be applied to the population at large?

I would like to congratulate Dr Paredes for her excellent presentation, and the colleagues from Ohio State University.

I thank the Central Surgical Association for the privilege of being able to discuss this paper.

Dr Anghela Paredes: Thank you, Dr Asensio. The benefit of propensity analysis is that it allows researchers to control for confounding on several variables. What ultimately we want to do with propensity matching, or multivariable regression analysis is limit the effect that confounders can have on the outcomes. What we specifically want to study is whether SNF as a variable affects the odds of having a post-discharge complication, a readmission, or a mortality.

In order to account for the differences that we saw between the patients that were discharged home and discharged to a SNF, as we have found that they were older, they were more likely to have complications, and have multiple comorbidities we matched for those variables, thus creating as similar as possible group of individuals that were in this data set. Additionally, what propensity score matching does is it assigns the probability of a person to be assigned to 1 of the 2 groups, and then matches that probability to another person, and so one gets randomized to being in the home group versus the other equivalent person with the equivalent probability to be assigned to the SNF discharge group.

We matched for the multiple differences that were seen, but additionally what we did is we performed multi-variable regression analysis in order to be able to determine the relationship taking into account all of the matched variables to determine whether the association was still present.

Despite matching, there was still sufficient power to be able to detect the differences between the groups in regards to ASA class and in regards to the preoperative ventilator use, but in order to account for those differences, multivariable regression analysis was performed.

Despite having a similar cohort, patients that were discharged to a SNF had higher odds of these complications, had higher odds of readmission, and had higher odds of mortality. What's important for us to take home is that when we decide that a patient should be discharged to a SNF, this represents a population that is at high risk. There's something that happens during this postoperative period, this post discharge period, that we need to watch over. Maybe this population is one that we need to have a greater coordination of care so that we improve the quality of care that these individuals are receiving.

Like I mentioned, we don't have all of the information in regards to what drives the decision-making process. This is a complex decision, and although we are looking at the association of discharge to a SNF and the outcomes of interest, it highlights the importance of future studies to examine what is happening and what resources are needed for practitioners to equip individuals caring for these patients in order to optimize their care.

Dr Steven De Jong (Maywood, IL): Congratulations on a very well analyzed study, database, and a very well-presented study.

I may have misinterpreted one of your slides, but it seemed that the group discharged home had a longer operative time compared to patients discharged to a SNF was significantly longer. Could this be another significant conclusion from your study? Secondly, did the time interval the patients stayed in the SNF or the long-term care facility affect the expected outcome?

Dr Anghela Paredes: Thank you, Dr DeJong. In regards to the operative time, we did not match for operative time, more so because we matched for the complexity of the procedure. So we would hope that the complexity of the procedure would capture the operative time, and that the high-risk operations were more likely to be longer operations that would be equally distributed between the 2 groups.

In regards to how long these individuals were at a SNF, unfortunately, the information regarding SNF length of stay or even SNF quality is available on a Medicare database which is not able to be merged with the ACS NSQIP database. So in regards to how long these individuals were at a SNF and whether that affected these outcomes, it's not able to be performed with the current data set, but further follow-up would be important and needed to be done in order to examine this relationship.

Dr Robert C.G. Martin (Louisville, KY): One question about your matching. Did you match these patients who had their surgical procedures already inpatient, or were these all elective surgeries that then had this problem?

The second part is that the immediacy of readmission is really kind of bi-modal effect. There's usually within the first 4, 5 days of discharge, which ultimately really is not a SNF issue, it's probably a discharge management issue—they should not have been discharged—and then it is after that 7 to 10 days, then out to 30 days, which is obviously what NSQIP gives you. Did you look at any of those types of variables for readmissions?

Dr Anghela Paredes: In regards to looking at the variables for readmission in regards to the timing of readmission, we did not specifically look at whether these were readmissions that were close to the discharge date, and further studies are needed to see whether patients are being readmitted from these facilities because maybe they weren't ready to be discharged, and maybe an extra day or 2 days within the hospital would have prevented that readmission. Studies have shown up to 33% of readmissions are preventable. So further studies would be needed to examine exactly the date of readmission and whether that at all had an influence.

Sorry if I didn't make myself clear, for patients to be included in the cohort, they had to have undergone an emergent procedure, meaning that the operation had to be done within 48 hours of admission.