

A Hospitalist-Run Short-Stay Unit: Features that Predict Length-Of-Stay and Eventual Admission to Traditional Inpatient Services

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BACKGROUND: Short-stay units (SSUs) provide an alternative to traditional inpatient services for patients with short anticipated hospital stays. Yet little is known about which patient types predict SSU success.

OBJECTIVE: To describe patients admitted to our hospitalist-run SSU and explore predictors of length-of-stay (LOS) and eventual admission to traditional inpatient services.

DESIGN: Prospective observational cohort study.

SETTING: Large public teaching hospital.

PATIENTS: Consecutive admissions (n = 755) to the SSU over 4 months.

INTERVENTION: Hospitalist attending physicians prospectively collected data from patients' histories, physical exams, and medical records upon admission and discharge.

MEASUREMENTS: Risk assessments were made for patients with our most common provisional diagnoses: possible acute coronary syndrome (ACS) and heart failure. Patient stays were considered successful when LOS was less than 72 hours and eventual admission to traditional inpatient services was not required.

RESULTS: Of 738 eligible patients, 79% (n = 582) had successful SSU stays. In a multivariable model, the provisional diagnosis of heart failure predicted stays longer than 72 hours ($P = 0.007$) but risk assessments were unimportant. Patients who received specialty consultations were most likely to need eventual admission (odds ratio [OR], 13.1; 95% confidence interval [CI], 6.9-24.9), and the likelihood of long stays was inversely proportional to the accessibility of diagnostic tests.

CONCLUSIONS: In our hospitalist-run SSU, the inaccessibility of diagnostic tests and the need for specialty consultations were the most important predictors of unsuccessful stays. Designs for other SSUs that care for mostly low-risk patients should focus on matching patients' diagnostic and consultative needs with readily accessible services. *Journal of Hospital Medicine* 2009;4:276-284. © 2009 Society of Hospital Medicine.

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Short-stay units (SSUs) are common alternatives to traditional inpatient services.¹ When defined broadly to include observation units for low-risk chest pain patients, SSUs exist in one-third of hospitals in the United States.² Amidst growing demands for inpatient services, SSUs have recently developed beyond "observation medicine" to provide more complex inpatient services in locations commonly adjacent to emergency departments (EDs).¹ Hospitalists are well-positioned to staff these emerging SSUs because of their expertise in managing complex inpatient services.³

Despite this, we found only 3 reports of hospitalist-run SSUs designed for general medical inpatients (2 from Spain and 1 from Canada).⁴⁻⁶ Whereas these early reports introduce hospitalist-run SSUs, they provide limited data to make firm conclusions about their usefulness or appropriate design. For example, none of these reports assessed patients' characteristics upon admission. Nor did they provide details about the services that the SSUs provided. Yet evaluation of both types of patient-level data—descriptions of patients' needs upon admission and how these needs are

met during their stays—determine whether or not hospitalist-run SSUs meet their potential to efficiently care for backlogs of patients who otherwise await admission to traditional inpatient services.

In order to further explore these issues, we first sought to characterize our SSU patients upon admission and record what services they received during their stays. To help interpret our results, we then investigated associations between these characteristics and measures of successfully caring for patients in our SSU.

Patients and Methods

Design and Setting

In this prospective cohort study, we included all patients admitted to the hospitalist-run SSU of Cook County Hospital, a 500-bed public teaching hospital in Chicago, Illinois, from January through April of 2006. Our 14-bed SSU opened in 2002 to reduce overcrowding on the traditional inpatient wards by admitting adult patients who require inpatient care but might be eligible for discharge within 3 days. The unit is geographically part of the ED but is staffed by resident physicians and a rotating group of hospitalist attending physicians from the Department of Medicine. At least 1 attending and resident physician are available throughout the day, including weekend days and holidays; evenings are covered by a resident who presents overnight admissions to an attending physician the following morning.

ED physicians admit general medical patients to the SSU 24 hours per day, 7 days per week. Though admissions do not require prior approval from SSU physicians, the Departments of Medicine and Emergency Medicine have collaboratively promoted 5 suggested admission-location guidelines to admitting ED physicians (Figure 1). For candidate SSU patients, these 5 guidelines are not intended to be restrictive but to provide a framework for the complex decision-making process that our ED physicians encounter, particularly during periods of extreme overcrowding.⁷ First, patients should have an anticipated stay shorter than 72 hours. Second, patients should not have an eventual need for admission to traditional inpatient services such as the general medicine wards or intensive care units; this guideline is intended to improve patient safety by reducing unnecessary handoffs between physicians.⁸ Third, patients with provisional cardiovascular diagnoses should be preferentially admitted to the SSU over the general medical wards; this guideline is intended to improve hospital-wide efficiency because our SSU is equipped with continuous telemetry monitors, an exercise treadmill testing (ETT) laboratory, and other reserved cardiac tests (see Admission Characteristics and Services Received section, below). Fourth, patients' risk should be no higher than intermediate level. Admitting ED physicians are encouraged to use posted risk estimators for patients with provisional diagnoses of possible acute coronary syndrome (ACS), decompensated heart failure, asthma exacerbation, and out-of-control diabetes. Finally, patients

should not need advanced ancillary services; these include bedside procedures (eg, central venous catheter insertions), time-intensive nursing (eg, regular dressing changes), and complex social-services (eg, long-term care facility placements).

Subjects

The study subjects were all patients admitted to the SSU during the 4-month study period. Patients were excluded from the entire study if they refused verbal consent to participate. All patients who consented were included in the description of patient admission characteristics. Thirteen patients who prematurely left the SSU against medical advice, however, were neither included in the descriptions of services received nor in the analyses of predictors of successful SSU stays. We excluded these patients because they needed services that they did not receive—including these patients in our analysis would tend to overestimate the efficiency of our SSU by shortening the length-of-stay (LOS) without adding diagnostic tests or treatments.

Data Collection

After receiving approval from the institutional review board, attending physician investigators conducted an interview, physical examination, and review of medical records for each enrolled patient within 12 hours of admission to the SSU. When ED attending physicians' provisional primary diagnoses included possible ACS or decompensated heart failure, which we knew from earlier pilot data were our 2 most common provisional diagnoses, investigators gathered patient data to be applied in validated models of risk after the study period (Figure 2).^{9,10} Some of the clinical predictors required for these models are based on patients' findings on presentation to the ED. For example, Goldman's risk model for major cardiac events uses patients' initial systolic blood pressures on presentation to the ED.⁹ In such cases, investigators gathered needed data from electronic and paper charts generated in the ED. Upon discharge from the SSU, investigators reviewed patients' medical records a second time. All data were entered by investigators and instantly committed into an online database.

Admission Characteristics and Services Received

Patients were grouped according to the provisional diagnoses of ED attending physicians upon admission to the SSU (Figure 2). We chose to group patients by the provisional diagnoses of ED—not SSU—attending physicians to better understand how ED physicians, the physicians who make the admission-location decisions in our hospital, were using the SSU. Patients were first grouped as having possible ACS or heart failure, because patients with these provisional diagnoses were preferentially admitted to the SSU (Figure 1). When neither diagnosis was listed, patients were grouped according to ED attending physicians' first-listed diagnoses. At the end of the study period, relevant risk models were

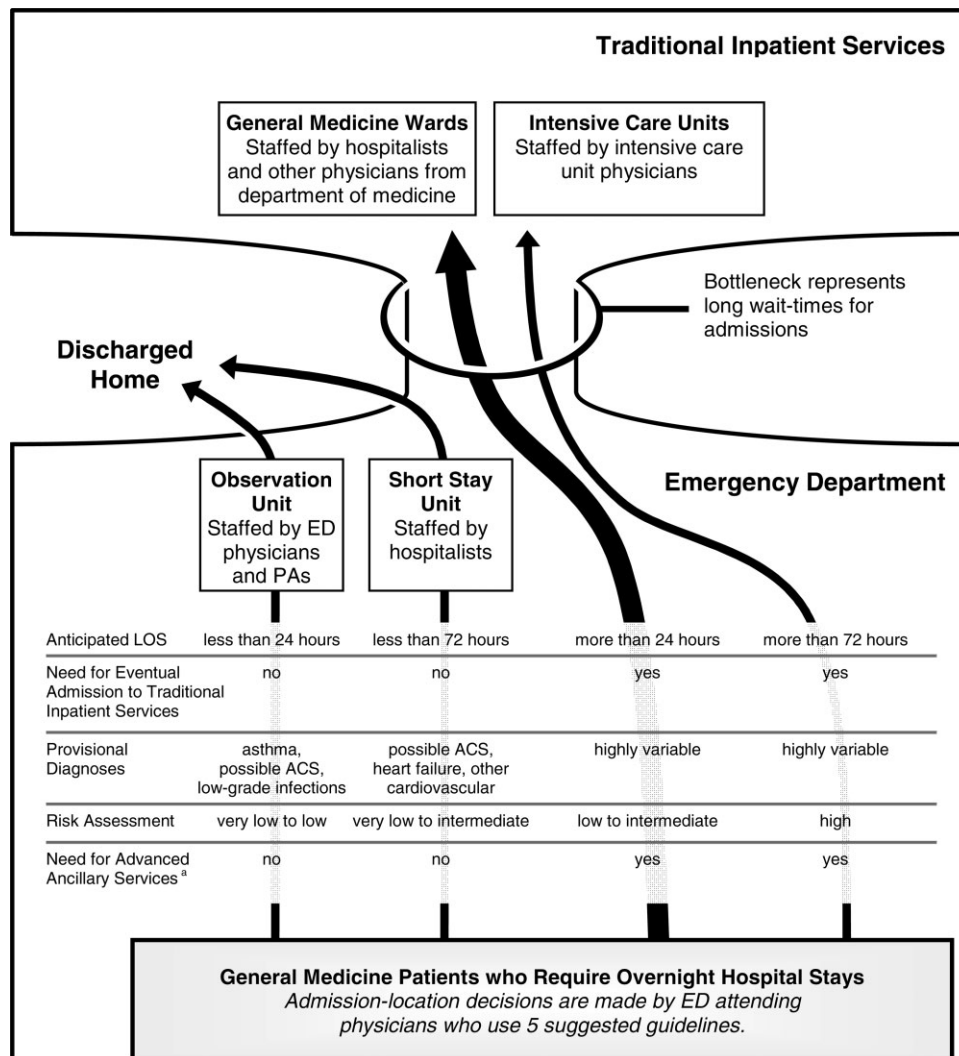


FIGURE 1. Flow diagram and suggested admission-location guidelines for general medicine patients who require overnight hospital stays. Flow begins at the base of the figure, which represents the major point-of-entry for 90% of our patients in to the hospital: the emergency department. Widths of arrows are approximately proportional to the flow of patients from the ED to other patient care units. ^aAdvanced ancillary services include bedside procedures (eg, central venous catheter insertions), time-intensive nursing (eg, regular dressing changes), and complex social-services (eg, long-term care facility placements). **Abbreviations:** ACS, acute coronary syndrome; ED, emergency department; LOS, length-of-stay; PAs, physician assistants.

applied to patients with possible ACS or heart failure and stratified as very low, low, intermediate, or high risk.^{9,10} Patients with both possible ACS and heart failure were grouped according to the diagnosis with the highest corresponding risk assessment; if both risk assessments were the same, then the first-listed diagnosis was used. Though developed to predict different clinical outcomes during different time periods, risk strata from the corresponding risk models were pooled across both diagnoses to develop a risk summary.

Upon discharge, investigators recorded which advanced diagnostic tests, specialty consultations, and acute care treatments patients received while in the SSU. Diagnostic

tests were considered advanced if they were not routinely performed within 2 hours of being ordered. Advanced diagnostic tests were grouped into 2 types by their accessibility to ordering SSU physicians. Open access tests included echocardiograms and ETTs, which were reserved for SSU patients 6 days per week. Though the availability of open access tests was not unlimited, ordering physicians' needs for them rarely exceeded the immediate supply. On the other hand, limited access tests included both cardiac stress imaging studies, which were reserved for SSU patients on a very limited basis 4 or 5 days per week, and other tests that were not reserved for SSU patients, such as endoscopy, magnetic resonance imaging, or ultrasonography. Ordering

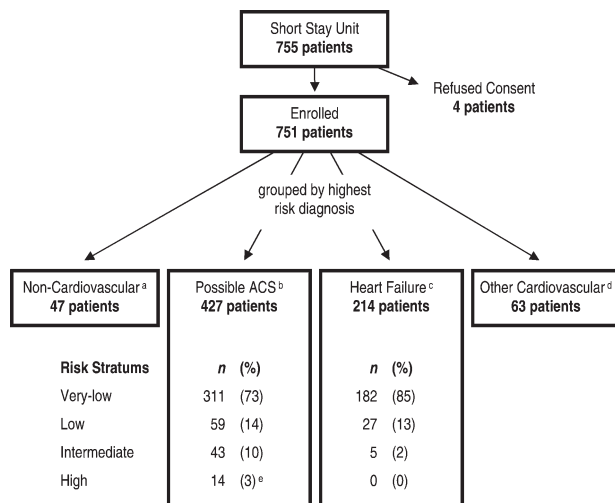


FIGURE 2. Provisional diagnostic groupings and risk assessments upon admission to the SSU during the 4-month study period. ^aNoncardiovascular diagnoses were asthma, chronic obstructive pulmonary disease, cellulitis, pneumonia, anemia, allergic reaction, chronic vomiting syndrome, gross hematuria, headache, hypokalemia, psoas hematoma, and pyelonephritis. ^bThe validated risk model of Goldman et al.⁹ predicts major cardiac events in 72 hours. Major cardiac events include ventricular fibrillation, cardiac arrest, new complete heart block, insertion of a temporary pacemaker, emergent cardioversion, cardiogenic shock, use of an intraaortic balloon pump, endotracheal intubation, and recurrent ischemic chest pain requiring urgent coronary angiography and urgent revascularization. ^cThe validated risk model of Fonarow et al.¹⁰ predicts in-hospital mortality rate. The original model classified patients into 5 risk stratums. We modified the model by combining their lowest intermediate risk stratums (“intermediate 3” and “intermediate 2”), which had similar crude mortality rates in their validation cohorts, in to a single “low-risk” stratum. ^dOther cardiovascular diagnoses were syncope, arrhythmia, hypertension, positive stress test with high-risk features, and possible cerebrovascular disease. ^eThe 14 patients with possible ACS who were high risk all had electrocardiographic findings that were both not known to be old and were suggestive of ST-segment elevation myocardial infarction. Yet upon admission to the SSU, all of these 14 patients had 2 negative serum troponin I tests that were drawn 8 hours apart (data not shown), suggesting that their electrocardiographic findings were in fact old. **Abbreviation:** ACS, acute coronary syndrome.

physicians’ needs for limited access tests often exceeded their immediate supply; in such cases, SSU patients were placed without priority into queues that included patients from the entire hospital.

Investigators recorded when patients received advanced diagnostic tests that were ordered by specialists. These tests, however, were not included in analyses of how services received by SSU patients affected SSU success, because SSU

TABLE 1. Admission Characteristics of Enrolled Short-Stay Unit Patients

Mean age, years (SD) (25th-75th percentiles)	58 (12) (49-66)
Men	389 (52)
Lacking a primary care provider	256 (34)
Non-English speaking	217 (29)
Ethnicity is Hispanic or Latino	105 (14)
Race is Black or African-American	480 (64)
Hospitalized within the preceding year	322 (43)
Insulin-requiring diabetes mellitus	83 (11)
Previous coronary artery revascularization	89 (12)
Provisional diagnosis*	
Possible acute coronary syndrome	427 (57)
Heart failure	214 (29)
Other cardiovascular [†]	62 (8)
Noncardiovascular [‡]	48 (6)

NOTE: n = 751. Values are n (%) unless otherwise indicated.

*Emergency department physicians listed an additional provisional diagnosis for 186 patients (25% of 751).

[†]Other cardiovascular diagnoses were syncope, arrhythmia, hypertension, positive stress test with high-risk features, and possible cerebrovascular disease.

[‡]Noncardiovascular diagnoses were asthma, chronic obstructive pulmonary disease, cellulitis, pneumonia, anemia, allergic reaction, chronic vomiting syndrome, gross hematuria, headache, hypokalemia, psoas hematoma, and pyelonephritis.

attending physicians were only indirectly involved in whether or not patients received these tests. Treatments were considered acute care treatments if they were commonly administered only in acute care settings, such as heparin for unstable angina or intravenous furosemide for pulmonary edema.

SSU Success

The SSU was designed to care for patients during brief stays and without eventual admission to traditional inpatient services. Therefore, we used patients’ LOS and whether or not patients were admitted to traditional inpatient services as measures of SSU success. LOS was calculated from the time patients arrived in the SSU until the time they left. Therefore, neither time spent in the ED before admission to the SSU nor time spent on traditional inpatient services (if needed) contributed to our definition of LOS. Individual SSU patients were considered successfully cared for in the SSU if their LOS was less than 72 hours and they were discharged directly home from the SSU. We explored associations between these outcomes and provisional diagnoses, risk assessments, and services received.

Data Analysis

LOS data were right-skewed; therefore, we used the Mann-Whitney test for comparisons between 2 groups and the Kruskal-Wallis test for comparisons among 3 or more groups. To test for trends of median LOS among ordered groupings, we used the method of Cuzick.¹¹ We used Pearson’s chi-square test to compare proportions of patients grouped into categories and the chi-square test for trends

TABLE 2. Services Received by Provisional Diagnosis

Service received	Possible ACS n = 418 (%)	Heart Failure n = 211 (%)	Other Cardiovascular n = 61 (%)	Noncardiovascular n = 48 (%)	Total n = 738 (%)
Open access test*	37	59	56	13	43
Resting					
Echocardiography	29	59	56	13	39
ETT	12	0	5	0	7
Limited access test †	24	8	10	8	17
Stress imaging‡	21	5	7	2	14
Acute care treatment§	22	78	5	60	39
Specialty consultation	24	12	20	8	19
Any above service	68	93	67	69	75

NOTE: n = 738. Does not include 13 patients who prematurely left the SSU against medical advice. *P* values for Pearson's chi-square test for differences in proportions across all four groups were all <0.001.

Abbreviations: ACS, acute coronary syndrome; ETT, exercise treadmill test.

* Eighteen patients received both a resting echocardiogram and an ETT.

† Two patients received both a stress imaging test and another limited access test. Other limited access tests included esophagogastroduodenoscopy, colonoscopy, brain or spine magnetic resonance imaging, abdominal ultrasonography, carotid artery ultrasonography, cardiac multiple gated acquisition scan, bone scintigraphy, cardiac pacemaker interrogation, pulmonary angiography, and ventilation-perfusion scan; 6 patients received 2 such tests.

‡ Stress imaging tests included myocardial perfusion imaging and stress echocardiography; 3 patients received 2 stress imaging studies.

§ Acute care treatments included intravenous furosemide, nebulized albuterol or ipratropium, treatment doses of heparin, intravenous antibiotics, and intravenous insulin; 10 patients received 2 or more acute care treatments.

|| Additional diagnostic tests that required arrangement by specialty consultants were not considered open or limited access tests. They included coronary angiography, transesophageal echocardiography, cardiac electrophysiology study, and electroencephalography.

with equal scoring to test for trends among ordered groupings.

We performed multiple logistic regression to explore which variables were associated with SSU success. The following 5 demographic variables from Table 1 were insignificant in all single-variable and multiple-variable regression models that we tested and were, therefore, removed from further analyses to create more parsimonious models: gender, language, ethnicity, race, and whether or not patients had a primary care provider. Our multiple logistic regression models were fitted by maximum likelihood methods. In all of these models, odds ratios (ORs) were adjusted for patient characteristics that included age (in years), insulin-requiring diabetes mellitus (yes or no), SSU attending physician, day of the week of SSU admission (weekday or weekend), and hospitalization during the preceding year. Confidence intervals (CIs) for predicted probabilities were computed using the delta method. All analyses were conducted with Stata Statistical Software, Release 9 (StataCorp, College Station, TX).

Results

Subjects

During the 4-month study period, 755 patients were admitted to the SSU. Among these patients, 4 were excluded from our study because they refused verbal consent. In the remaining study sample of 751 patients, all were included in the descriptions of patients' admission characteristics (Table 1), but 13 patients who left prematurely were excluded in both the descriptions of services received (Table 2) and the analyses of SSU success (Tables 3 and 4).

Admission Characteristics and Services Received

A narrow range of provisional diagnoses were listed by ED attending physicians and 641 patients (85% of 751) were grouped as having possible ACS or heart failure (Figure 2). Patients with these diagnoses were later risk-stratified and, when pooled across risk strata, only 14 patients (2% of 641) exceeded the suggested admission-location criterion for the SSU of lower than high risk. Despite the array and frequency of diagnostic and treatment services that patients received, SSU physicians worked mostly independently, requesting specialty consultations for only 19% of patients (141/738; Table 2).

SSU Success

The median LOS for all patients was 42 hours (interquartile range [IRQ] 22-63) and 156 patients (21% of 738) had unsuccessful SSU stays (Table 3). The most common reason for an unsuccessful stay was a stay longer than 72 hours (71% of 156). Among the 66 patients who required admission to traditional inpatient services, nearly one-half (48%) were admitted expressly to receive treatments not available in the SSU after having a specialty consult.

Patients' provisional diagnoses were associated with unsuccessful stays in bivariate analyses (Table 3). In addition, when patients were grouped into 3 risk strata (very-low, low, and intermediate-and-high), unsuccessful stays increased with increasing risk. For example, in patients with possible ACS, the proportion of unsuccessful stays increased from 17% of 306 very-low risk patients to 27% of 55 intermediate-and-high risk patients (*P* value for trend = 0.012). Similarly, in patients with heart failure, the proportion of

TABLE 3. Patient Outcome by Provisional Diagnosis and Services Received

Provisional Diagnosis and Services Received	n	Median LOS [hours (IQR)]	Stay Longer than 72 Hours (%)	Admission to Traditional Inpatient Service (%)	Stay Longer than 72 Hours or Admission to Traditional Inpatient Service (%)
All patients	738	42 (22-63)	15	9*	21
Possible ACS	418	37 (20-57)	13	10	20
Heart failure	211	47 (34-69)	21	9	27
Other CV	61	40 (21-49)	10	5	11
Non-CV	48	40 (22-60)	10	2	13
P value [†]		<0.001 [‡]	0.04	0.18	0.01
Open access test					
Yes	320	46 (31-67)	17	9	23
No	418	33 (20-52)	13	9	20
P value		<0.001 [§]	0.15	0.87	0.43
Limited access test					
Yes	128	51 (42-82)	31	6	33
No	610	38 (21-55)	12	10	19
P value		<0.001 [§]	<0.001	0.24	<0.001
Acute care treatment					
Yes	287	46 (34-69)	21	12	29
No	451	32 (20-50)	11	7	16
P value		<0.001 [§]	<0.001	0.01	<0.001
Specialty consultation					
Yes	141	63 (40-92)	38	28	52
No	597	38 (21-50)	10	5	14
P value		<0.001 [§]	<0.001	<0.001	<0.001
Any above service					
Yes	554	46 (29-68)	19	10	26
No	184	22 (16-32)	2	5	7
P value		<0.001 [§]	<0.001	0.03	<0.001

NOTE: n = 738. Does not include 13 patients who left prematurely against medical advice. P values are for Pearson's chi-square test unless otherwise indicated.

Abbreviations: ACS, acute coronary syndrome; CV, cardiovascular; IQR, interquartile range; LOS, length-of-stay.

* Among the 9% of patients (66/738) who were admitted to the traditional inpatient services, SSU attending physicians' reasons for admission for 74% of patients (49/66) were to provide treatments (n = 32), diagnostic tests (n = 14), and ancillary services (n = 3) not provided in the SSU or because prolonged treatment courses were anticipated on the current therapies (n = 17). Prior to admission to traditional inpatient services, 21 patients (32% of 66) had received no advanced diagnostic tests, and 9 patients (14% of 66) had received no advanced diagnostic tests, acute care treatments, or specialty consultations.

[†] P values are for differences among provisional diagnostic groupings.

[‡] Nonparametric Kruskal-Wallis test.

[§] Nonparametric Mann-Whitney test.

^{||} Among the 184 patients who did not receive any of the above services, 172 (23% of 738) stayed less than 72 hours and did not require admission to traditional inpatient services. Provisional diagnoses for these 172 patients included very-low risk possible ACS (n = 106), higher-than-very-low risk possible ACS (n = 20), noncardiovascular diagnoses (n = 19), heart failure (n = 13), and other cardiovascular diagnoses (n = 14).

unsuccessful stays increased from 25% of 181 very-low risk patients to 100% of 3 intermediate-and-high risk patients (*P* value for trend = 0.004).

However, in multiple variable models that simultaneously included patients' characteristics upon admission with services received during their SSU stay, only the provisional diagnosis of heart failure was associated with unsuccessful stays (OR, 1.9; 95% CI, 1.12-3.18); risk assessments for possible ACS (*P* = 0.29) and heart failure (*P* = 0.32) were unimportant predictors of unsuccessful stays (Table 4). On the other hand, whether or not patients received diagnostic tests, acute care treatments, or specialty consultations were important predictors. In particular, patients who received specialty consultations were much more likely to require admission to traditional inpatient services than those patients who did not (OR, 13.1; 95% CI, 6.9-24.9) and had a 52% chance of having an unsuccessful stay (95% CI, 42-61%; Figure 3). In addition, the

accessibility of a diagnostic test was inversely proportional to the chance of having a long stay; patients who received an open access test had a 12% chance of a long stay (95% CI, 8-16%) whereas those who received a limited access test had a 29% chance of a long stay (95% CI, 20-39%). Receiving acute care treatments was also a significant, though less important, predictor of an unsuccessful stay (Table 4).

Discussion

We found that the types of services received by patients during their SSU stays were stronger predictors of long stays and eventual admissions to traditional inpatient services than patients' characteristics upon admission to the SSU. This suggests that SSUs should be focused toward matching patients' anticipated needs with readily accessible services. For example, in our SSU, which cares for over 2,250 patients annually, more than 1,200 patients will receive diagnostic

TABLE 4. Factors Associated with Stays Longer than 72 Hours or Admissions to Traditional Inpatient Services: Multivariable Models

	Stay Longer than 72 Hours		Admission to Traditional Inpatient Service		Either Outcome	
	OR*	P value [†]	OR*	P value [†]	OR*	P value [†]
Heart failure	2.3	0.01	1.1	0.77	1.9	0.02
Service received						
Open access test	1.5	0.10	1.0	0.89	1.2	0.32
Limited access test	5.1	<0.001	0.4	0.03	2.5	<0.001
Acute care treatment	1.7	0.07	1.4	0.31	1.6	0.05
Specialty consultation	6.1	<0.001	13.1	<0.001	8.1	<0.001

NOTE: Models include all enrolled patients who did not leave prematurely against medical advice (n = 738).

Abbreviation: OR, odds ratio; SSU, short-stay unit.

*All ORs are adjusted for age, insulin-requiring diabetes mellitus, whether or not patients were hospitalized during the last year, SSU attending physician, day of the week of SSU admission, and all other variables listed. For dichotomous variables, the OR represents a ratio of the odds for the group with the specified characteristic versus the odds for the group without that characteristic.

[†]P values are Pearson's chi-square test.

tests in a given year. Among these patients, those who receive a limited access test will be more than twice as likely to have long stays than those who receive an open access test (Figure 3). Though our conclusions may not be applicable to other settings, this study is the most comprehensive description of patients admitted to a hospitalist-run SSU. In addition, our study is the first to demonstrate that diagnostic and consultative services are the most important predictors of successful stays in SSUs. This promotes the practical strategy that hospitalists who staff SSUs should focus administratively toward gaining access to these services.

Very few of our SSU patients did not fulfill the suggested requirements of our admission location guidelines. For example, only 2% of 691 patients with either possible ACS or heart failure were high risk (Figure 2). Despite this, 21% of our patients had stays longer than 72 hours or were admitted to traditional inpatient services. The paradoxically high proportion of unsuccessful stays among mostly very-low and low risk patients simply reflects how the clinical risk models that we used were not designed to predict unsuccessful stays. Moreover, as our multiple variable models suggest, improvements in the selection process of candidate SSU patients are more likely to come from an ability to incorporate assessments of what services patients will receive rather than from assessments of their clinical risk (Table 4). Therefore, the immediate plans of the accepting SSU physicians, the physicians who will determine what services patients eventually receive, should be incorporated in the admission-location decision process.

Three of our findings highlight how input from accepting SSU physicians—conveyed to ED physicians before their

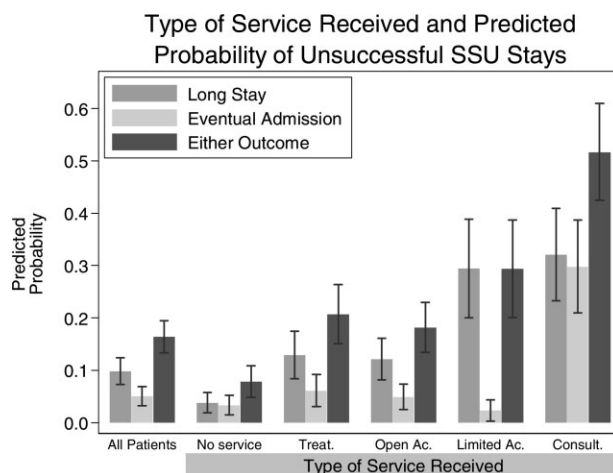


FIGURE 3. Predicted probabilities of unsuccessful SSU stays from type of service received while in the SSU. The multivariable regression models used to generate these probabilities are described in Table 3. These models were constructed using all enrolled patients who did not leave prematurely against medical advice (n = 738) and were adjusted for age, insulin-requiring diabetes mellitus, hospitalization during the last year, SSU attending physician, day of the week of SSU admission, provisional diagnosis of heart failure, and services received. The probability represents a patient's likelihood of a long stay, an eventual admission to traditional inpatient services, or either outcome having received a listed service. The vertical capped lines represent 95% confidence intervals for the probability estimates. **Abbreviations:** Consult., specialty consultation; Limited Ac., limited access test; Open Ac., open access test; Treat., acute care treatment.

final admission-location decisions are made—may improve the SSU patient selection process. First, 23% of our patients were discharged home after brief stays with no advanced tests, specialty consultations, or acute care treatments (Table 3). Though some of these patients may have required inpatient services other than the ones we recorded, most were admitted with very-low risk possible ACS; if they required overnight stays at all, many of them may have been better cared for in the ED observation unit (Figure 1). Second, 74% of the patients who required admission to traditional inpatient services were admitted for services not readily available to patients in the SSU (Table 3). Among these patients, nearly one-third (21/66) received no advanced diagnostic tests in the SSU. This suggests that these patients should have been admitted directly to the general medical wards; doing so may have improved efficiency and quality of care by reducing unnecessary handoffs between physicians. Both types of patients—those with minimal inpatient needs and those with more needs than the SSU can provide—highlight how incorporating accepting SSU physicians' plans may improve the SSU patient selection process. After all, those best equipped to determine if

the SSU will meet (or exceed) the needs of candidate patients are the SSU physicians themselves.

Third, we found that whether or not SSU physicians required assistance from specialists was the strongest predictor of unsuccessful stays: when an accepting physician determined that a patient should receive a specialty consultation, that patient's chance of having an unsuccessful stay was over 50% (Figure 3). Our study was not designed to determine *how* specialty consultations were associated with unsuccessful stays. We did not, for example, record whether or not hospitalists changed their diagnostic, treatment, or admission plans because of specialists' recommendations.¹² Therefore, we cannot conclude that specialty consultations actually *caused* long stays or traditional admissions. Nevertheless, when our SSU physicians did not manage patients independent of specialty consultations, we observed a high likelihood of unsuccessful stays. Because accepting SSU physicians are the ones who will determine whether or not they need assistance from specialists, weighing their immediate plans for specialty consultations into the admission-location decision process may improve the efficiency of SSUs. Others have recognized the importance of specialty consultations in SSUs by directly incorporating specialists as coattending physicians.¹³

Our study had several limitations. First, we studied mostly patients with cardiovascular diagnoses. Predictors of success in SSUs that admit patients with different diagnostic profiles may be different. In particular, SSUs that admit patients with a wide array of diagnoses may find that matching patients' needs with readily accessible services is impractical, because these needs may be too wide-ranging. Second, our study design was observational. However, other than seasonal variations in admission patterns, there was little room for selection bias because we enrolled all consecutive admissions over the 4-month study period, which gives us more confidence in our results. Third, our study did not record whether or not ED physicians knowingly overrode the suggested admission-location guidelines because of limited bed availability. Yet, if shortages of beds on traditional inpatient services were driving patients who were otherwise candidates for the general medical wards in to the SSU, then we would have expected higher-risk patients and greater needs for limited access tests. Finally, our descriptions of patients' needs were based on what diagnostic, consultative, and treatment services patients actually received; yet these needs did not include diagnostic tests that were ordered but never performed. However, any missed needs would bias our results toward no association with unsuccessful stays, because unsuccessful stays would generally increase while patients await needed services.

Future research could address these limitations through an experimental trial of traditional admissions versus admission to a hospitalist-run SSU. And, because hospitals are complex systems of health care delivery where changes in one patient care unit often affect others in unanticipated ways,¹⁴ the impact of SSUs on other patient care units that are closely con-

nected to SSUs, such as EDs and the general medical wards (Figure 1), should be simultaneously observed. For example, though our findings suggest that the accessibility of diagnostic tests should parallel ordering SSU physicians' needs for those tests, making all diagnostic tests "open" to SSU physicians may result in shortsightedly lengthening the stays of patients in other care units. Future research should also observe the decision-making process of both the physicians who make admission-location decisions (ED physicians) and those who determine the eventual plans for patients in the SSU (hospitalists). Accepting physicians from other patient care units have found improved outcomes of efficiency when they were involved in the complex process of deciding where to admit patients.^{15,16} After an initial evaluation of a candidate SSU patient in the ED, a hospitalist who staffs both the general medical wards and the SSU would be uniquely well-positioned to help an ED physician decide where a patient's needs would be best met. Although ED physicians will rightly be concerned that consulting SSU hospitalists may slow "patient flow," hands-on consultations of candidate SSU patients, who have a narrow range of diagnoses and low-risk profiles, would likely be brief. In addition, because many SSUs are conveniently adjacent to EDs, the burden of communication may be minor.¹ To address these questions, hospitalists who staff SSUs must continue the observed trend of working collaboratively with ED physicians.^{15,17,18}

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