Postdischarge Unplanned Care Events Among Commercially Insured Patients With an Observation Stay Versus Short Inpatient Admission

Amber K. Sabbatini, MD, MPH*; Brad Wright, PhD; Keith Kocher, MD, MPH; M. Kennedy Hall, MD, MHS; Anirban Basu, PhD

*Corresponding Author. E-mail: asabbati@uw.edu, Twitter: @asabbati1.

Study objective: Observation stays are composing an increasing proportion of unscheduled hospitalizations in the United States, with unclear consequences for the quality of care. This study used a nationally representative data set of commercially insured patients hospitalized from the emergency department (ED) to compare 30-day postdischarge unplanned care events after an observation stay versus a short inpatient admission.

Methods: This was a retrospective analysis of ED hospitalizations using the 2015 Truven MarketScan Commercial Claims and Encounters data set. Adult observation stays and short inpatient hospitalizations of 2 days or less were identified and followed for 30 days from hospital discharge to identify unplanned care events, defined as a subsequent inpatient admission, observation stay, or return ED visit. A propensity score analysis was used to compare rates of unplanned events after each type of index hospitalization.

Results: Among the propensity-weighted cohorts, patients with an index observation stay were 28% more likely to experience any unplanned care event within 30 days of discharge compared with those with a short inpatient admission (20.4% versus 15.9%; risk ratio 1.28; 95% confidence interval [CI] 1.21 to 1.34). Specifically, patients in the observation stay group had substantially higher rates of postdischarge observation stays (4.8% versus 1.9%; odds ratio 2.60; 95% CI 2.15 to 3.16) and ED revisits with discharge (11.1% versus 8.8%; odds ratio 1.26; 95% CI 1.21 to 1.44) compared with those in the inpatient group, but were less likely to be readmitted as inpatients (6.4% versus 7.2%; odds ratio 0.90; 95% CI 0.83 to 0.96).

Conclusion: Commercially insured patients with an observation stay from the ED have a higher risk of postdischarge acute care events compared with similar patients with a short inpatient admission. Additional research is necessary to determine the extent to which quality of care, including care transitions, may differ between these 2 groups. [Ann Emerg Med. 2019;74:334-344.]

Please see page 335 for the Editor's Capsule Summary of this article.

Readers: click on the link to go directly to a survey in which you can provide **feedback** to *Annals* on this particular article.
A **podcast** for this article is available at www.annemergmed.com.

0196-0644/$-see front matter

https://doi.org/10.1016/j.annemergmed.2018.10.002

INTRODUCTION

Background and Importance

Observation stays for patients hospitalized with acute, unscheduled illnesses have doubled in the past decade.[1-5] Hospital observation is an outpatient service intended to provide a period of treatment or monitoring for patients who do not clearly require inpatient admission but who are also too sick to be discharged after their emergency department (ED) evaluation. However, recent payer efforts to constrain costs associated with hospital care have led to policies discouraging short inpatient hospitalizations, with observation increasingly used as an alternative. As a result, more than 4 of 10 commercially insured patients who are kept in the hospital after an ED visit will now be hospitalized under an observation stay.[5]

Under current payer guidance, physicians must anticipate a patient's expected length of stay in conjunction with other medical-necessity criteria when deciding whether to admit a patient as an inpatient or place him or her in observation. For example, the Centers for Medicare & Medicaid Services Two-Midnight rule advises that an inpatient admission is generally warranted if a patient is expected to stay in the hospital for more than 2 midnights and observation if expected to stay less,[6] with a similar time-based criterion adopted by commercial payers. Yet admission decisions in the ED are often complicated by uncertainty about clinical course and dependent on local resources, leading to variability in observation practices across hospitals,[7] as well as a number of breakdowns in the current system. Patients initially judged to need inpatient care by an admitting physician may ultimately improve

Editor's Capsule Summary

What is already known on this topic

Observation stays are replacing short inpatient stays.

What question this study addressed

Is there a difference in unscheduled health care use after discharge between observation stays and short inpatient stays?

What this study adds to our knowledge

In this study of greater than 350,000 observation and inpatient admissions in a claims database, patients placed in observation status had higher rates of postdischarge unscheduled care than those with short inpatient stays.

How this is relevant to clinical practice

These findings could influence disposition decisions or observation protocols.

more rapidly and be discharged within 48 hours, exposing hospitals to audits and claims denials for these short inpatient admissions. Conversely, certain patients may not meet medical-necessity criteria for an inpatient admission in the ED but still require more than 48 hours of care in the hospital. Currently, between 5% and 7% of patients hospitalized under observation will have hospital stays of greater than 48 hours.[5,8]

To date, the effect of these shifting hospitalization practices on patient outcomes has not been well studied. Thirty-day readmissions, an important patient-centered outcome and measure of hospital quality, have been increasing among patients with observation stays[9,10] despite concurrent reductions in readmissions after inpatient hospitalization.[3,11] Although the reasons for these disparate trends are unclear, care pathways for observation patients can vary widely between hospitals, and even among patients within the same hospital.[12] Observation services may be delivered in an ED bed, observation unit, or general medical or surgical ward, each with its own clinical processes and care coordination resources, which may in turn have implications for patient outcomes and quality of care. Thus, it is currently unclear whether the decision to hospitalize a patient to observation versus inpatient status in the ED results in comparable clinical experiences and outcomes for patients with unscheduled illnesses. Furthermore, the majority of previous research on observation stays has been conducted with the Medicare population, with little attention to outcomes for observation patients in other, younger or less comorbid populations described in commercial insurance data sets.

Goals of This Investigation

As the population of observation stays continues to increase in both number and breadth of conditions treated, there is a need for contemporaneous studies examining outcomes related to the quality of observation care. In this study, we examined 30-day unplanned care events, including ED visits and repeated hospitalizations, among a nationally representative sample of commercially insured patients with observation stays and compared outcomes with those of similar patients with short inpatient admissions originating in the ED.

MATERIALS AND METHODS

Data Collection and Processing

This was a retrospective analysis of adult patients hospitalized after an ED visit in 2015, using the Truven Health Analytics MarketScan Commercial Claims and Encounters,[13] which is a nationally representative database of paid and adjudicated medical and pharmaceutic claims from more than 350 carriers, including large employers, commercial insurers, and third-party administrators, for beneficiaries with employer-sponsored health insurance. Similar to other claims data, the MarketScan Commercial Claims and Encounters database captures information on inpatient and outpatient use, expenditures, and enrollment, allowing the capture of complete episodes of care for approximately 50 million covered individuals annually. It is one of the largest repositories of commercial claims data available. The data are deidentified and the study was determined to be exempt from human subjects review by the institutional review board at the University of Washington.

We identified ED visits from outpatient claims that had an ED revenue code of 450 to 459, an ED Common Procedural Coding (CPT) system code of 99281 to 99285, or place of service listed as the ED, and from inpatient records listing admission source as the ED. Duplicate index events captured from both an outpatient claim and an inpatient claim resulting in the same index event were omitted. To characterize distinct episodes of care, an ED visit was defined as an index visit only if there was no previous ED visit or hospitalization in the past 30 days.

Index ED visits were flagged as having resulted in an observation stay, inpatient admission, or both. Inpatient claims with an admission date occurring within 1 day of an index ED visit were linked to outpatient claims for that ED visit. Observation stays were identified from outpatient

claims, using the following criteria: revenue code of 0762 or 0760 or CPT code of 99218 to 99220 (initial observation care), 99234 to 99236 (same-day observation admission and discharge codes), or 99224 to 99226 (subsequent observation care). We considered a unique patient with a hospital observation claim occurring on the same date or within 1 day of an index ED visit to have been placed in observation from the ED. We summed the total number of consecutive days in which observation services were present from the date of the index ED visit to determine the length of stay for an observation stay. The first day without evidence of observation services or consecutive observation services followed by an inpatient admission or new index ED event were characterized as the end of the observation period. Patients who were initially admitted to observation from the ED but subsequently converted to inpatient status during their hospitalization were considered to have failed observation and were identified as having observation service records and an inpatient admission on consecutive days. Finally, we excluded hospitalizations in which the patient died during the hospital stay, as well as those that were missing ED diagnosis codes or were missing length of stay from the characterization of index visits. Once all index hospitalizations were identified, we limited the sample to only those observation stays and inpatient hospitalizations lasting 2 days or less to compare outcomes for similar hospitalizations.

Outcome Measures

Our outcome of interest was 30-day unplanned acute care events after an index observation stay or short inpatient hospitalization. Unplanned care events was a composite outcome consisting of any ED treat-and-release visit or any rehospitalization, including an observation stay or inpatient admission, occurring within 30 days of discharge from the index hospitalization.[14] We assessed outcomes for the composite measure of unplanned care, as well as each type of event individually.

Primary Data Analysis

Statistical analyses were conducted with Stata (version 14; StataCorp, College Station, TX). To reduce confounding by severity, we used propensity score weighting to control for baseline imbalances in covariates. To create the propensity score, we chose variables associated with the outcome of interest, including age, sex, Elixhauser comorbidities,[15] baseline health care use variables (total number of ED visits, hospitalizations, outpatient visits, and unique prescription medications in the previous year), and hospital length of stay (<1 day, 1 day, or 2 days). To ensure similarity of diagnostic mix, we also included indicators for the top 50 most common observation diagnoses as grouped by Clinical Classifications Software[16] in the final model as main effects. Logistic regression was used to predict the likelihood of admission to observation versus inpatient for all patients who remained in the hospital after their ED evaluation, conditional on the above covariates. Propensity models were fully saturated and included all squares of variables and possible interactions between variables.[17]

After predicting propensity scores, we generated inverse probability of treatment weights and used these to assess the average treatment effect of an index observation stay versus short inpatient admission on 30-day unplanned care events.[18,19] The rationale for propensity weighting in this study was based on the assumption that admission practices vary among providers and an observation stay is often interchangeable with a short inpatient hospitalization, depending on local practice norms (ie, we expect significant overlap in the characteristics of patients with observation stays versus short inpatient admissions). We tested this assumption by ensuring adequate overlap across the range of propensity scores among the unweighted treatment groups. We examined covariate balance before and after propensity weighting to assess the performance of the propensity model, as expressed by the standardized mean difference.

Weighted logistic regression models using the inverse probability of treatment weights were used to determine the association between type of index hospitalization (observation stay versus inpatient) and 30-day unplanned care events. These models provided an estimate of the average treatment effect, comparing the expected number of unplanned care events had all patients in the analytic cohort (both inpatient and observation stays) been hospitalized to observation versus the expected number of events if all patients had been hospitalized as inpatients. Risk ratios (RRs) were calculated with a modified Poisson approach.[20] We included observation failures in the observation group for the purposes of analysis to approximate an intention-to-treat analysis (which also results in more conservative estimates). As a subgroup analysis, we compared the propensity-weighted risk of 30-day unplanned care events by clinical condition for the top 50 conditions (again grouped by Clinical Classifications Software) with the highest number of observation stays in our cohort.

To test the robustness of our main results, we conducted 2 sensitivity analyses. First, we compared outcomes for

all observation stays and inpatient hospitalizations, not just those limited to less than or equal to 2 days. Second, we assessed outcomes after excluding observation failures from the generation of propensity score weights. These analyses did not appreciably alter our results.[13] We also explored a propensity score analysis that used a caliper matching technique (radius <0.01); however, for many covariates, the standardized mean difference increased after matching, and thus using this method would have likely resulted in greater bias in our treatment effects.

RESULTS

Our analytic cohort included 222,218 observation stays and 126,400 short inpatient admissions. Derivation of these cohorts is represented in Figure 1. Characteristics of the analytic cohort before and after propensity weighting are listed in Table 1. There were significant imbalances in patient demographic and clinical characteristics at baseline. Observation patients were slightly older, were more likely to be women, had fewer comorbidities, and had lower rates of hospitalizations in the previous year. The 2 groups had similar rates of baseline ED use, clinician office visits, and prescription drugs, however. After propensity score adjustment, the groups were well balanced with respect to these characteristics.

Table 2 shows the results of our propensity score analysis examining 30-day unplanned care events. After propensity weighting, patients with an index observation stay were significantly more likely to have an unplanned care event compared with those with a short inpatient admission (20.4% versus 15.9%; RR 1.28; 95% confidence interval [CI] 1.21 to 1.34), having both higher rates of rehospitalization overall (11.2% versus 9.0%; RR 1.25; 95% CI 1.14 to 1.37) and return ED treat-and-release visits (11.1% versus 8.8%; odds ratio 1.26; 95% CI 1.21 to 1.44). However, patients with an observation stay were less likely to be rehospitalized as inpatients (6.4% versus 7.2%; OR 0.90; 95% CI 0.83 to 0.96). Rather, the higher rate of rehospitalization in the observation stay cohort resulted from a much higher incidence of repeat observation stays compared to that of the inpatient cohort (4.8% versus 1.8%; RR 2.60; 95% CI 2.15 to 3.19).

These differences also appeared to be the result of a relatively greater rate of events in the first 10 days after discharge for patients with an index observation stay, with little difference between the groups in event rates in the 11- to 20-day and 21- to 30-day windows (Figure 2).

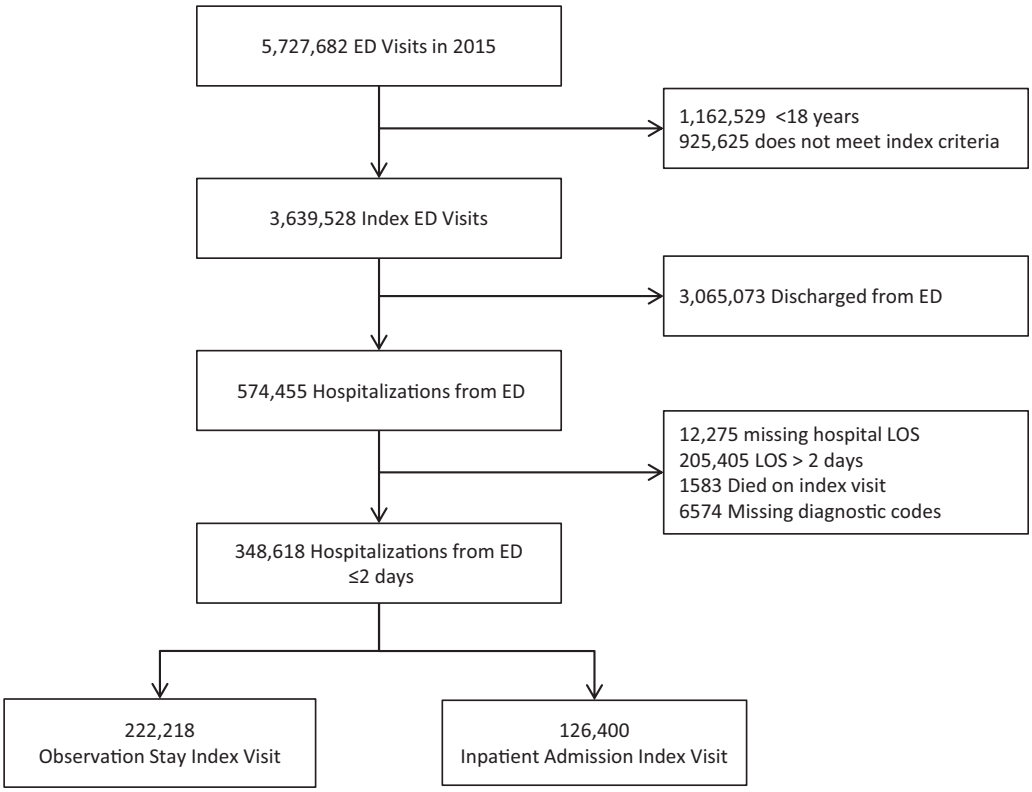

Figure 1. Derivation of cohorts. *LOS*, Length of stay.

Table 1. Characteristics of analytic cohorts before and after propensity score weighting.

	Before Weighting, %			After Weighting, %		
Characteristic	**Observation**	**Inpatient**	**SMD**	**Observation**	**Inpatient**	**SMD**
Age, y						
18–34	20.3	27.5	−0.169	22.4	22.1	0.023
35–49	29.0	24.8	0.096	27.2	27.6	−0.014
50–64	50.7	47.7	0.059	50.5	50.3	−0.007
Women	56.7	53.5	0.064	54.5	55.7	−0.022
Plan type						
Fee for service	3.8	3.3	0.028	3.6	3.4	0.021
HMO	9.3	10.0	−0.024	9.7	9.3	0.017
PPO	59.2	60.8	−0.033	59.8	60.7	−0.028
POS	8.9	7.9	0.035	8.5	8.3	0.008
CDHP/HDHP	15.7	14.7	0.027	15.1	15.3	−0.001
Other	0.9	1.0	−0.010	0.9	0.9	0.005
Hospital length of stay, days						
<1	50.1	7.5	1.067	33.0	31.4	0.035
1	42.3	35.1	0.149	39.5	40.4	−0.031
2	7.6	57.4	−1.257	27.6	28.2	0.002
Comorbidities, %						
Congestive heart failure	4.3	5.9	−0.071	5.3	5.4	−0.002
Valvular heart disease	6.7	6.3	0.018	6.8	7.1	−0.012
Pulmonary circulation disease	1.2	1.8	−0.055	1.4	1.5	−0.004
Peripheral vascular disease	4.0	4.6	−0.026	4.4	4.8	−0.020
Paralysis	1.2	1.8	−0.050	1.5	1.5	−0.001
Neurologic disease	9.3	10.4	−0.037	9.6	10.1	−0.017
Chronic pulmonary disease	16.6	16.2	0.009	16.5	16.9	−0.012
Diabetes mellitus	19.0	20.7	−0.043	20.4	20.5	−0.002
Diabetes mellitus, complicated	6.6	8.4	−0.066	7.8	7.7	0.004
Hypothyroid	12.1	11.0	0.034	11.8	12.2	−0.013
Renal failure	3.3	5.0	−0.084	4.2	4.0	0.005
Liver disease	5.1	6.5	−0.056	5.5	5.8	−0.010
Peptic ulcer disease	0.2	0.2	0.003	0.2	0.2	0.027
AIDS	0.3	0.5	−0.025	0.4	0.5	−0.014
Lymphoma	0.6	1.0	−0.043	0.7	0.9	−0.010
Metastatic cancer	1.3	2.7	−0.101	1.8	1.9	−0.001
Solid tumor	4.5	6.4	−0.083	5.1	5.8	−0.027
Rheumatic disease	4.4	3.9	0.023	4.2	4.3	−0.003
Coagulopathy	2.6	4.4	−0.102	3.3	3.4	−0.008
Obesity	19.7	18.4	0.033	19.5	20.3	−0.021
Weight loss	2.2	3.2	−0.063	2.5	2.7	−0.012
Electrolyte imbalance	16.7	22.6	−0.155	19.0	19.4	−0.008
Anemia caused by bleeding	1.3	2.4	−0.079	1.7	1.9	−0.014
Iron deficiency anemia	11.9	15.0	−0.095	13.0	13.8	−0.023
Alcohol abuse	3.8	6.4	−0.123	4.9	5.1	−0.011
Drug abuse	3.5	5.0	−0.074	4.1	4.3	−0.009
Psychosis	8.5	9.7	−0.043	8.9	9.3	−0.013
Depression	14.2	14.5	−0.01	14.3	14.5	−0.008

Table 1. Continued.

Characteristic	Before Weighting, %			After Weighting, %		
	Observation	Inpatient	SMD	Observation	Inpatient	SMD
Hypertension, complicated	48.2	43.5	0.091	47.4	48.5	−0.021
Total comorbidities (SD)	2.3 (2.3)	2.6 (2.1)	−0.121	2.5	2.5	−0.036
Health care use, past 1 y, mean No. (SD)						
ED visits	0.7 (1.7)	0.7 (1.7)	0.018	0.8 (1.8)	0.7 (1.8)	−0.026
Hospitalizations	0.2 (0.7)	0.3 (0.8)	−0.116	23.0 (0.7)	24.0 (1.7)	−0.013
Office visits	6.2 (7.2)	6.4 (7.9)	−0.011	6.3 (7.8)	6.5 (7.5)	−0.027
Prescription drugs	8.7 (9.4)	8.6 (9.5)	0.023	8.6 (9.4)	8.8 (9.4)	−0.021
ED diagnosis*						
Chest pain	27.2	2.7	0.754	16.8	16.8	−0.001
Appendicitis	4.0	3.3	0.040	3.2	2.0	0.061
Cardiac dysrhythmias	3.7	3.9	−0.071	4.3	4.6	−0.016
Abdominal pain	3.6	0.7	0.201	2.3	1.2	0.073
Syncope	3.5	0.8	0.192	2.3	2.6	−0.019
Calculus of urinary tract	2.1	1.5	0.045	1.7	1.3	0.031
Biliary tract disease	2.1	3.3	−0.073	2.2	2.0	0.009
Transient cerebral ischemia	1.8	1.2	0.064	1.5	1.8	−0.029
Fluid and electrolyte disorders	1.8	1.2	0.052	1.5	1.8	0.029
Pregnancy complications	2.1	2.0	0.012	1.8	1.4	0.029
Dizziness and vertigo	1.7	0.4	0.135	1.1	1.2	−0.008
Nervous system disorders	1.7	0.9	0.070	1.3	1.6	−0.022
Lower respiratory infections	1.7	0.3	0.141	1.1	0.9	0.019
Headache, including migraine	1.5	0.6	0.087	1.1	1.3	−0.014
Hypertensive disorders	1.7	1.5	0.015	1.7	1.8	−0.012

SMD, Standardized mean difference; *HMO*, health maintenance organization; *PPO*, preferred provider organization; *POS*, point-of-service; *CDHP/HDHP*, consumer directed health plan/high deductible health plan; *SD*, standard deviation.
*Only the top 15 most commonly observed conditions are listed.

Nearly three quarters (73.5%) of unplanned care events after an index observation stay occurred within the first 10 days compared with approximately two thirds (62.8%) of the events after an index inpatient admission. Patients with an observation stay were approximately 50% more likely to have an unplanned care event (15.0% versus 10.1%) in the first 10 days after hospital discharge. These differences became more pronounced when observation failures were excluded during our sensitivity analysis. However, although they had higher rates of rehospitalizations overall, observation patients with a rehospitalization spent fewer total days in the hospital in the 30 days postdischarge compared with inpatients with a rehospitalization (mean of 2.9 days versus 5.0 days,

Table 2. Thirty-day unplanned care events among the propensity-weighted sample of patients with an index observation stay versus short inpatient admission (≤2 days).

Outcome	Before Weighting			After Weighting		
	Observation Stay, N=226,118	Inpatient Admission, N=130,657	RR, (95% CI)	Observation Stay, N=226,118, %	Inpatient Admission, N=130,657, %	RRR, (95% CI)
Any unplanned event	22.7 (22.5–22.8)	14.4 (14.2–14.6)	1.57 (1.55–1.60)	20.4 (20.0–20.7)	15.9 (15.2–16.7)	1.28 (1.21–1.34)
Any hospital readmission	11.5 (11.4–11.6)	8.2 (8.1–8.4)	1.40 (1.37–1.43)	11.2 (11.0–11.5)	9.0 (8.4–9.6)	1.25 (1.14–1.37)
Inpatient admission	6.1 (6.0–6.2)	6.7 (6.5–6.8)	0.92 (0.89–0.94)	6.4 (6.2–6.6)	7.2 (6.7–6.7)	0.90 (0.83–0.96)
Observation stay	15.6 (14.9–16.3)	5.4 (5.3–5.5)	3.45 (3.29–3.62)	4.8 (4.6–5.0)	1.8 (1.5–2.2)	2.60 (2.15–3.19)
ED revisit	18.5 (18.4–18.7)	11.8 (11.6–11.9)	1.80 (1.76–1.86)	16.3 (16.0–16.6)	12.6 (11.9–13.3)	1.32 (1.21–1.44)

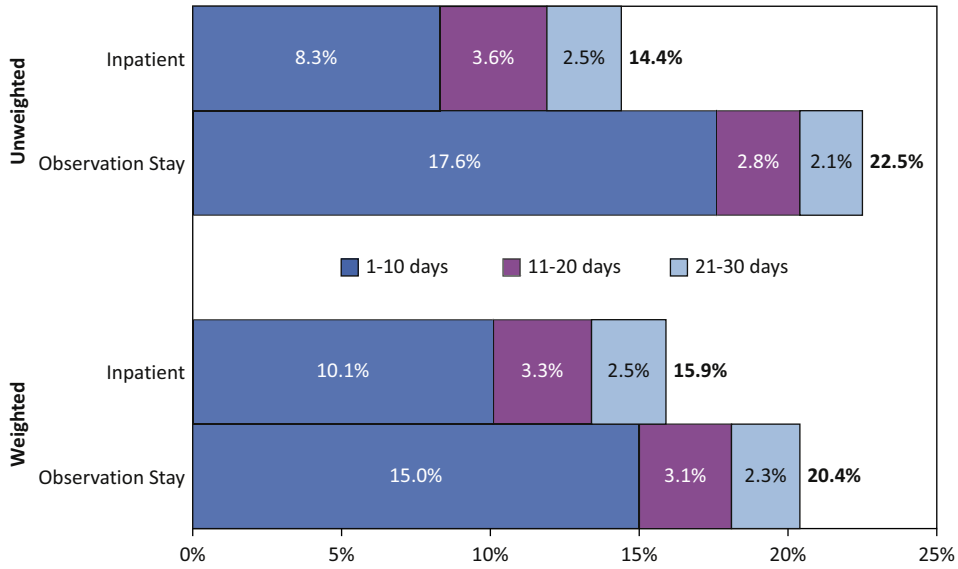

Figure 2. Timing of unplanned care events after discharge from a short inpatient admission and observation stay.

respectively) because they were more often rehospitalized to an observation stay.

Figure 3 shows the results of our subgroup analysis examining the risk of 30-day unplanned care events by clinical condition. We stratified conditions according to whether patients were more likely to be admitted to observation (observation >50% of total hospitalizations) versus more likely to be admitted as inpatients (observation <50% of total hospitalizations) for ease of interpretation. For most clinical conditions, patients with observation stays had a higher risk of 30-day unplanned care events compared with short stay inpatients. This effect was statistically significant for 21 of the top 50 conditions studied, with headache, nausea and vomiting, other diseases of the kidneys and ureters, appendicitis, and complications of pregnancy (including treated or missed first-trimester abortion) being the top 5 conditions with the highest RR of unplanned care events between observation stays and short inpatient admissions. There was a weak correlation (Pearson's correlation 0.34) between the proportion of patients admitted to observation and risk of postdischarge unplanned care events, with conditions more commonly treated in observation having somewhat higher rates of events.

LIMITATIONS

Our results must be interpreted in the context of several limitations. First, we compared outcomes among propensity-weighted samples. Propensity score methods can only account for observed covariates, and there may have been other unobserved variables contributing to the differences in adjusted rates of 30-day unplanned care events. However, our results are also likely to be conservative because we expect that unmeasured clinical severity (such as laboratory or vital sign abnormalities not captured in claims data) accounting for a clinician's decision to admit to inpatient versus observation would be the largest source of confounding and favor more adverse events in the inpatient cohort, thus, bias our results toward the null. This is also supported by the fact that the inpatient cohort had more comorbidities and higher rates of hospitalization at baseline. Second, observation care continues to be dynamic, with many hospitals initiating a number of protocols and other standardized services in an attempt to increase the quality and efficiency of care delivery. Given that we used 2015 data, it is possible that studies using a more contemporary data set would yield different results. Third, our data set did not have information in regard to the location of observation stays and whether they occurred in an observation unit, the ED, or a general medical ward, which may have affected 30-day outcomes. As a result, our data cannot be extrapolated to outcomes delivered by ED-based observation units, which generally treat a limited group of clinical conditions with protocol-driven care. Finally, MarketScan does not include hospital identifiers. Therefore, we could not assess whether the higher rates of unplanned care among observation patients were due to differences in hospital-specific effects. As a result, it is possible that our results were driven by a subset of poor-performing hospitals.

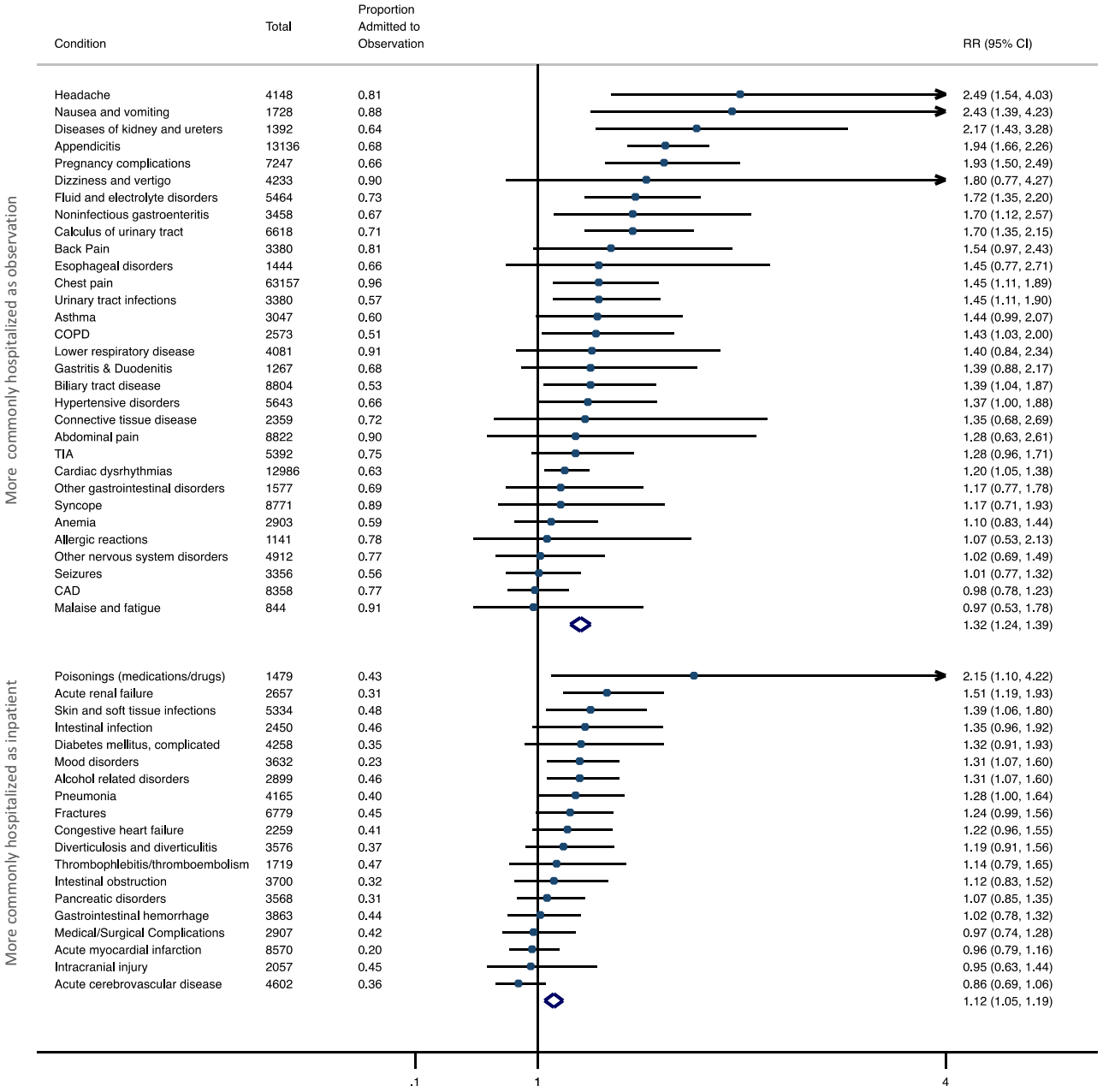

Figure 3. Weighted 30-day risk of unplanned care events by clinical condition. *COPD*, Chronic obstructive pulmonary disease; *TIA*, transient ischemic attack; *CAD*, coronary artery disease.

DISCUSSION

In this nationally representative data set of adult patients with commercial insurance who were hospitalized from the ED, we found that patients with an observation stay had higher rates of 30-day postdischarge unplanned care events compared with a similar group with a short inpatient admission. More than 1 in 5 patients (20.4%) with an unscheduled observation stay had a repeated ED visit or rehospitalization within 30 days of discharge versus 16% of those with a short inpatient hospitalization. Although they had somewhat lower rates of subsequent inpatient admissions, patients with an index observation stay were 2.6 times as likely to have a repeated observation stay within 30 days of discharge and 26% more likely to have an ED treat-and-release visit. In addition, this disparity was largely due to differential rates of unplanned care events within the first 10 days of hospital discharge, with similar rates between the 2 groups after 10 days.

Our study adds to previous work on hospital readmissions by directly comparing outcomes among patients with index observation stays and short inpatient admissions, recognizing that observation stays have increasingly substituted for short inpatient admissions. To date, only a handful of studies have examined comparative outcomes between observation stays and inpatient admissions, and these have been limited and conflicting. Three studies comparing outcomes for patients hospitalized for chest pain found that patients with observation stays had similar or somewhat lower rates of short-term adverse events, including 30-day readmissions and ED visits, compared with inpatients.[21-23] However, another study examining hospitalizations for heart failure found higher rates of all-cause and cardiac readmission at 1 year for patients discharged from an observation stay compared with inpatients.[24] Only 2 studies, both in the Medicare population, did not limit their analysis to a single condition. The first of these performed a descriptive analysis (no matching) and found that 20% of Medicare patients with an index observation stay had an ED revisit or rehospitalization within 30 days, only slightly less than the rate for inpatients.[9] These results were similar to the rates we observed in our commercially insured population. The second study also found lower rates of 30-day readmissions for observation stays compared with that of inpatients, but did not measure repeated observation stays, which we have demonstrated compose a significant proportion of rehospitalization events for these patients.[25] Furthermore, both of these analyses relied on Medicare data that are more than 7 years old, and since then, the population of observation stays has continued to increase in number and severity. Finally, studies that compared outcomes for specific groups of patients treated in an observation unit versus inpatient ward nearly uniformly showed no higher risk of adverse events, and often demonstrated favorable overall outcomes for observation patients when cost and patient experience measures were considered.[26]

Thus, our current study not only shows that postdischarge unplanned care events after an observation stay are common in the commercially insured population, but to our knowledge is also the first to demonstrate relatively poorer 30-day outcomes for patients with an observation stay compared with a short inpatient admission. In addition, many of these postdischarge events will be captured only if repeat observation stays are tracked as hospitalization events, which is likely the predominant reason that our study has results different from those of previous studies.

From a clinical perspective, it is not immediately apparent why observation stays should have worse 30-day outcomes. In many cases, an observation stay is simply a billing designation for patients who do not meet payer criteria for inpatient status, but still require some period of hospital treatment after their ED visit. Most hospitals do not use designated care pathways for observation patients, such as observation units.[12] Thus, across a national sample like the one used in this analysis, the majority of observation stays will occur on a general medical or surgical ward, and these patients otherwise receive clinical care that is indistinguishable from that for a short inpatient stay.

Despite this, there may be important and nuanced differences in care delivery for observation stays and short inpatient admissions that could account for our results. Transitional care strategies can include a range of care processes such as comprehensive discharge planning, postdischarge support, and facilitated follow-up appointments.[27] It is possible that these resources are not equally available to patients with an outpatient observation stay versus an inpatient hospitalization. For example, patients with an observation stay may not meet with a discharge coordinator or may not leave the hospital with a scheduled follow-up appointment as frequently as those with inpatient hospitalizations. In addition, resources available to patients treated in an observation unit are likely to differ from those for observation patients admitted to an inpatient setting, which can be reflected in outcomes. Furthermore, given that the expectation is for observation stay patients to be discharged within 24 hours, and certainly after no longer than 48 hours, it is also possible that relative to inpatients, those with an observation stay are being discharged at an earlier stage of their illness, or even prematurely discharged.

As a result, our findings have important implications for the quality of care delivered for patients hospitalized with acute, unscheduled illnesses. Higher rates of ED visits and hospitalizations can be a marker of severe disease and morbidity. However, when they occur shortly after hospital discharge, some of these unplanned care events are thought to be preventable with high-quality transitions of care.[28,29] For example, several studies have demonstrated that interventions that strengthen care coordination and discharge planning among inpatients can result in measurable reductions in 30-day readmissions,[30,31] although others have found no effect.[32-34] There is no reason to believe that high-quality care transitions would not be equally important for preventing rehospitalizations and ED visits after discharge from an observation stay.

To date, there have been no policy levers that have given hospitals incentive to focus on outcomes for observation patients. Observation stays are not included in readmission quality measures either as index hospitalizations or readmissions, which are a key component of public and private value-based purchasing programs. This sets up a mechanism in which hospitals could be shunting resources

toward preventing readmissions for certain inpatient stays (eg, inpatient stays for specific conditions tracked in readmission quality programs) at the expense of other types of hospitalizations, including observation stays. In addition, we find that because patients discharged from an observation stay are more likely to be rehospitalized for an observation stay, they spend fewer days in the hospital postdischarge. Although the question was not examined here, fewer days spent in the hospital likely translate to lower episode costs for payers because length of stay is a major determinant of costs.[35] Thus, there may be little impetus for payers and hospitals to improve the care delivery for observation patients even though these repeat observation stays are meaningful events for patients, who do not discriminate between inpatient and outpatient status when they are hospitalized. As a result, our data raise questions about whether, in the current payer climate, patients hospitalized for observation stays are receiving a quality of care similar to that of their inpatient counterparts or whether misaligned incentives may be creating unintended consequences for patients requiring hospital-based care.

Observation stays represent an increasing and unique group of patients hospitalized with acute, unscheduled illnesses. Commercially insured patients with an observation stay from the ED have a higher risk of 30-day unplanned acute care events compared with similar patients with an inpatient admission, an effect that is not explained by demographics, clinical condition, or baseline health care use. Additional research is necessary to determine the extent to which quality of care may differ between these 2 groups.

Supervising editor: Brendan G. Carr, MD, MS. Specific detailed information about possible conflict of interest for individual editors is available at https://www.annemergmed.com/editors.

Author affiliations: From the Department of Emergency Medicine (Sabbatini, Hall) and Departments of Health Services and Center for Comparative Health Outcomes, Policy, and Economics (Basu), University of Washington, Seattle, WA; the Department of Health Management and Policy, University of Iowa, Iowa City, IA (Wright); and the Department of Emergency Medicine and Institute for Health Policy and Innovation, University of Michigan (Kocher).

Author contributions: AKS and AB conceived the study and designed and executed the analysis. AB acquired the data and provided programmer support for the study. AKS drafted the article. BW, KK, and MKH contributed substantially to the interpretation of the data and critical revisions of the article. AKS takes responsibility for the paper as a whole.

All authors attest to meeting the four ICMJE.org authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

Publication dates: Received for publication April 27, 2018. Revision received August 22, 2018. Accepted for publication October 1, 2018.

REFERENCES

1. Venkatesh AK, Geisler BP, Gibson Chambers JJ, et al. Use of observation care in US emergency departments, 2001 to 2008. *PLoS One*. 2011;6:e24326.
2. Feng Z, Wright B, Mor V. Sharp rise in Medicare enrollees being held in hospitals for observation raises concerns about causes and consequences. *Health Aff (Millwood)*. 2012;31:1251-1259.
3. Zuckerman RB, Sheingold SH, Orav EJ, et al. Readmissions, observation, and the hospital readmissions reduction program. *N Engl J Med*. 2016;374:1543-1551.
4. Nuckols TK, Fingar KR, Barrett M, et al. The shifting landscape in utilization of inpatient, observation, and emergency department services across payers. *J Hosp Med*. 2017;12:443-446.
5. Sabbatini AK, Wright B, Hall MK, et al. The cost of observation care for commercially insured patients visiting the emergency department. *Am J Emerg Med*. 2018;36:1591-1596.
6. Department of Health and Human Services, Office of Inspector General. Vulnerabilities remain under Medicare's 2-midnight policy. Available at: https://oig.hhs.gov/oei/reports/oei-02-15-00020.pdf. Accessed April 18, 2017.
7. Schuur JD, Venkatesh AK, Bohan JS. Variation in the use of observation status evaluation in Massachusetts acute care hospitals, 2003-2006. *Int J Emerg Med*. 2010;3:367-372.
8. Wright B, Zhang X, Rahman M, et al. Informing Medicare's Two-Midnight rule policy with an analysis of hospital-based long observation stays. *Ann Emerg Med*. 2018;72:166-170.
9. Dharmarajan K, Qin L, Bierlein M, et al. Outcomes after observation stays among older adult Medicare beneficiaries in the USA: retrospective cohort study. *BMJ*. 2017;357:j2616.
10. Sabbatini AK, Wright B. Excluding observation stays from readmission rates—what quality measures are missing. *N Engl J Med*. 2018;378:2062-2065.
11. Nuckols TK, Fingar KR, Barrett ML, et al. Returns to emergency department, observation, or inpatient care within 30 days after hospitalization in 4 states, 2009 and 2010 versus 2013 and 2014. *J Hosp Med*. 2018;13:296-303.
12. Ross MA, Hockenberry JM, Mutter R, et al. Protocol-driven emergency department observation units offer savings, shorter stays, and reduced admissions. *Health Aff (Millwood)*. 2013;32:2149-2156.
13. Truven Health Analytics MarketScan Research Databases. Commercial claims and encounters and Medicare supplemental, 2015 user guide. Available at: https://marketscan.truvenhealth.com/marketscanuniversity/userguide/2015%20MarketScanCCAE-MDCRUserGuide.pdf. Accessed April 18, 2018.
14. Baier RR, Gardner RL, Coleman EA, et al. Shifting the dialogue from hospital readmissions to unplanned care. *Am J Manag Care*. 2013;19:450-453.
15. Elixhauser A, Steiner C, Harris DR, et al. Comorbidity measures for use with administrative data. *Med Care*. 1998;36:8-27.

16. Healthcare Cost and Utilization Project. *Clinical Classifications Software, 2015*. Rockville, MD: Agency for Healthcare Quality & Research; 2016.
17. Basu A, Polsky D, Manning WG. Use of propensity scores in non-linear response models: the case for health care expenditures. National Bureau of Economic Research Working Paper Series. Working Paper 14086. Available at: http://www.nber.org/papers/w14086. Accessed August 12, 2018.
18. Curtis LH, Hammill BG, Eisenstein EL, et al. Using inverse probability-weighted estimators in comparative effectiveness analyses with observational databases. *Med Care*. 2007;45(10 suppl 2):S103-S107.
19. Austin PC, Stuart EA. Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. *Stat Med*. 2015;34:3661-3679.
20. Zou G. A modified Poisson regression approach to prospective studies with binary data. *Am J Epidemiol*. 2004;159:702-706.
21. Abbass IM, Virani SS, Michael Swint J, et al. One-year outcomes associated with using observation services in triaging patients with nonspecific chest pain. *Clin Cardiol*. 2014;37:591-596.
22. Wright B, O'Shea AMJ, Glasgow JM, et al. Outcomes associated with observation versus short-stay admission among chest pain patients in the Veterans Health Administration. *BMC Emerg Med*. 2016;16:38.
23. Cafardi SG, Pines JM, Deb P, et al. Increased observation services in Medicare beneficiaries with chest pain. *Am J Emerg Med*. 2016;34:16-19.
24. Masri A, Althouse AD, McKibben J, et al. Outcomes of heart failure admissions under observation versus short inpatient stay. *J Am Heart Assoc*. 2018;7:e007944.
25. Wright B, Zhang X, Rahman M, et al. Evidence of racial and geographic disparities in the use of Medicare observation stays and subsequent patient outcomes relative to short-stay hospitalizations. *Health Equity*. 2018;2:45-54.
26. Ross MA, Aurora T, Graff L, et al. State of the art: emergency department observation units. *Crit Pathw Cardiol*. 2012;11:128-138.
27. Burke RE, Coleman EA. Interventions to decrease hospital readmissions: keys for cost-cffectiveness. *JAMA Intern Med*. 2013;173:695-698.
28. Krumholz HM, Wang K, Lin Z, et al. Hospital-readmission risk: isolating hospital effects from patient effects. *N Engl J Med*. 2017;377:1055-1064.
29. Sheingold SH, Zuckerman R, Shartzer A. Understanding Medicare hospital readmission rates and differing penalties between safety-net and other hospitals. *Health Aff (Millwood)*. 2016;35:124-131.
30. Coleman EA, Parry C, Chalmers S, et al. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med*. 2006;166:1822-1828.
31. Rosen BT, Halbert RJ, Hart K, et al. The enhanced care program: impact of a care transition program on 30-day hospital readmissions for patients discharged from an acute care facility to skilled nursing facilities. *J Hosp Med*. 2017;13:229-236.
32. Rennke S, Nguyen OK, Shoeb MH, et al. Hospital-initiated transitional care interventions as a patient safety strategy: a systematic review. *Ann Intern Med*. 2013;158:433-440.
33. Englander H, Michaels L, Chan B, et al. The care transitions innovation (C-TraIn) for socioeconomically disadvantaged adults: results of a cluster randomized controlled trial. *J Gen Intern Med*. 2014;29:1460-1467.
34. Chan B, Goldman LE, Sarkar U, et al. The effect of a care transition intervention on the patient experience of older multi-lingual adults in the safety net: results of a randomized controlled trial. *J Gen Intern Med*. 2015;30:1788-1794.
35. Cortoos P-J, Gilissen C, Laekeman G, et al. Length of stay after reaching clinical stability drives hospital costs associated with adult community-acquired pneumonia. *Scand J Infect Dis*. 2013;45:219-226.

IMAGES IN EMERGENCY MEDICINE

(continued from p. 332)

DIAGNOSIS:

Massive pulmonary embolism. The emergency team initiated venoarterial extracorporeal membrane oxygenation. Digital subtraction angiography confirmed embolism in the left and right main pulmonary arteries (Figure 2). After failure of catheter embolectomy, large emboli were surgically extracted (Figure 3). The patient was discharged from the hospital at day 15, with good neurologic function.

In our case, bedside ultrasonography was instrumental in obtaining a timely diagnosis.[1] Although massive pulmonary emboli may be treated with hemodynamic and respiratory support, systematic anticoagulation, and reperfusion or clot extraction,[2] in select cases venoarterial extracorporeal membrane oxygenation is a promising salvage therapy.[3,4]

Author affiliations: From the Department of Emergency Medicine (Li, Mei, Chen, Zhang) and the Department of Cardiac Surgery (Shao), The First Affiliated Hospital of Nanjing Medical University, People's Hospital of Jiangsu Province, Nanjing, China.

REFERENCES

1. Volpicelli G, Elbarbary M, Blaivas M, et al. International evidence-based recommendations for point-of-care lung ultrasound. *Intensive Care, Med*. 2012;38:577-591.
2. Konstantinides SV, Torbicki A, Agnelli G, et al. ESC guidelines on the diagnosis and management of acute pulmonary embolism. *Eur Heart J*. 2014;35:3033-3069.
3. Fukuda I, Daitoku K. Surgical embolectomy for acute pulmonary thromboembolism. *Ann Vasc Dis*. 2017;10:107-114.
4. Minakawa M, Fukuda I, Miyata H, et al. Outcomes of pulmonary embolectomy for acute pulmonary embolism. *Circ J*. 2018;82:2184-2190.