

Patient, hospital, and local health system characteristics associated with the use of observation stays in veterans health administration hospitals, 2005 to 2012

Brad Wright, PhD^{a,b,*}, Amy M.J. O'Shea, PhD^{c,d}, Justin M. Glasgow, MD, PhD^e, Padmaja Ayyagari, PhD^a, Mary Vaughan-Sarrazin, PhD^{c,d}

Abstract

Recent studies have documented that a significant increase in the use of observation stays along with extensive variation in patterns of use across hospitals.

The objective of this longitudinal observational study was to examine the extent to which patient, hospital, and local health system characteristics explain variation in observation stay rates across Veterans Health Administration (VHA) hospitals.

Our data came from years 2005 to 2012 of the nationwide VHA Medical SAS inpatient and enrollment files, American Hospital Association Survey, and Area Health Resource File. We used these data to estimate linear regression models of hospitals' observation stay rates as a function of hospital, patient, and local health system characteristics, while controlling for time trends and Veterans Integrated Service Network level fixed effects.

We found that observation stay rates are inversely related to hospital bed size and that hospitals with a greater proportion of younger or rural patients have higher observation stay rates. Observation stay rates were nearly 15 percentage points higher in 2012 than 2005.

Although we identify several characteristics associated with variation in VHA hospital observation stay rates, many factors remain unmeasured.

Abbreviations: RUCA = rural urban commuting area, SAS = statistical analysis software, VHA = veterans health administration, VISN = Veterans Integrated Service Network.

Keywords: hospitals, longitudinal analysis, observation stays, practice variation, veterans health administration

1. Introduction

Observation stays provide clinicians with the time and space to further evaluate a patient, undertake diagnostic work up, or

ensure sustained response to therapy, which helps decongest emergency departments, avoid unnecessary inpatient admissions, and avoid potentially hazardous discharges.^[1–5] Although observation stays can be advantageous for both providers and patients, there is growing concern that observation status use is increasingly being driven by nonclinical factors (e.g., Medicare billing and audits) with adverse consequences for patients.^[6–9]

Regardless, there has been a steady increase in the prevalence of patients admitted to observation status. For example, in Medicare where observation stays have been most widely studied, the ratio of observation stays to inpatient admissions has increased by 34% from 2007 to 2009, and substantial interhospital variation in observation rates has been reported.^[6,9,10] A recent study on Veterans Health Administration (VHA) hospitals shows a similar rise in observation stays and considerable inter-hospital variation in observation stay rates.^[11]

In Medicare, this variation has been linked to both patient and hospital characteristics such as age, race, sex, size of facility, and geographical location.^[10] However, very little is known about the extent to which the variation in VHA hospital observation stay rates is driven by patient, hospital, and local health system characteristics, and we cannot assume that the findings on variation in the Medicare population will necessarily apply to VHA, because significant differences exist in the organizational structure and reimbursement policies for hospitals serving VHA and Medicare patients. For example, unlike most hospitals, VHA hospitals are owned and operated by the federal government, pay VHA physicians capitated salaries, and do not receive Medicare

Editor: Danny Chu.

Funding: This work was funded by the Department of Veterans Affairs Office of Rural Health (ORH). Drs. Vaughan Sarrazin and O'Shea were also supported by the Health Services Research and Development Service (HSR&D) of the Department of Veterans Affairs.

Declaration: The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

The authors have no conflicts of interest to disclose.

^a Department of Health Management and Policy, ^b Public Policy Center, University of Iowa, ^c Iowa City Veterans Affairs Healthcare System, The Comprehensive Access and Delivery Research and Evaluation Center (CADRE), ^d Department of Internal Medicine, Carver College of Medicine, University of Iowa, Iowa City, IA, ^e Christiana Care Health System Department of Internal Medicine and Christiana Care Health System Value Institute, Wilmington, DE.

* Correspondence: Brad Wright, Department of Health Management and Policy, College of Public Health, University of Iowa, Iowa City, IA (e-mail: brad-wright@uiowa.edu).

Copyright © 2016 the Author(s). Published by Wolters Kluwer Health, Inc. All rights reserved.

This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially.

Medicine (2016) 95:36(e4802)

Received: 13 May 2016 / Received in final form: 11 August 2016 / Accepted: 12 August 2016

<http://dx.doi.org/10.1097/MD.0000000000004802>

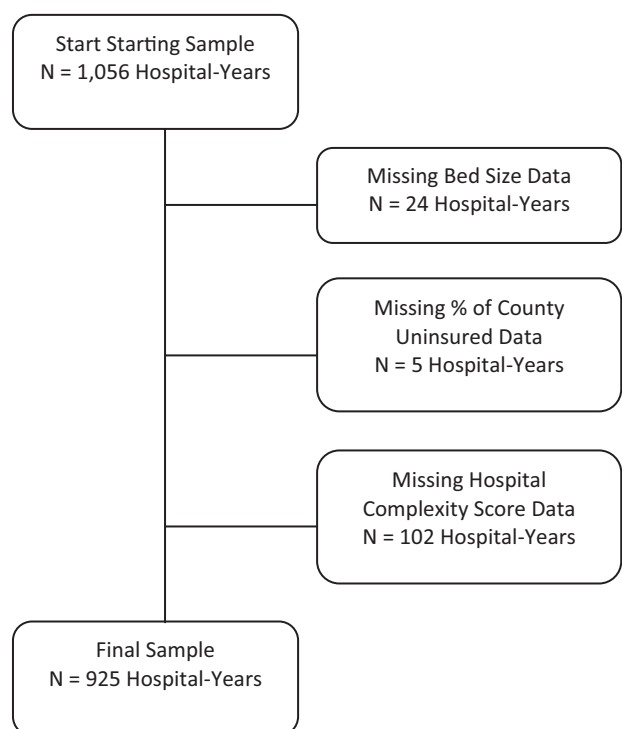


Figure 1. Sample selection.

reimbursement. Similarly, non-VHA hospitals may use observation stays to avoid payment denials for short inpatient stays deemed disallowable by Medicare auditors, whereas VHA hospitals are not subject to these audits and are unlikely to substitute observation stays for inpatient admissions for financial reasons.^[9,11] Thus, this study examines the extent to which patient, hospital, and local health system characteristics explain the variation in the use of observation stays across VHA hospitals. Identifying the drivers of variation in provision of observation stays is important because it could provide useful information on some of the health disparities and differences in facility-level quality of care reported in the VHA health care system.^[12]

2. Methods

Our retrospective analyses used VHA Medical SAS inpatient and enrollment data from 2005 to 2012 available through the VHA Austin Automation Center. This provided us with information on service dates, diagnoses, provider type, and location, for all beneficiaries who used VHA hospital services in this period and the beneficiary age, gender, basis of eligibility, and date of death, for all beneficiaries enrolled. We obtained hospital bed size data from the 2005 to 2012 American Hospital Association Survey, and the uninsured rate and the supply of physicians per 1000 population from the 2005 to 2013 Area Health Resource File. We excluded VHA facilities that provided only long-term, rehabilitation, or psychiatric care or had neither any direct placements in observation status nor any acute admissions, leaving a starting sample of 1056 hospital-year observations. Sample selection is shown in Fig. 1. This longitudinal observational study was approved by the University of Iowa Institutional Review Board on June 4, 2014, with a waiver of informed consent.

First, we generated hospital-level summary statistics, which we stratified according to whether or not the hospital provided any observation stays during the calendar year. For this study, we defined observation stays as one where a veteran's initial bed section (a VHA classification denoting type of care) was medical observation irrespective of a subsequent transfer to other bed sections. Next, we modeled a hospital's observation stay rate—defined as the total number of observation stays divided by the total number of acute (i.e., inpatient and observation) admissions—as a function of several hospital, patient, and area characteristics. Specifically, to control for hospital size and patient volume, we used a categorical measure of hospital bed size and a continuous measure for total acute admissions (which includes both observation stays and other inpatient admissions). To control for organizational differences between VHA hospitals, we included a categorical measure of hospital complexity score, which is a VHA-specific measure that captures a variety of factors including patient characteristics, the scope of services provided, teaching and research activity, and administrative complexity. The measure ranges from 1a (most complex) to 3 (least complex).^[12]

We also included several patient characteristics, aggregated to the hospital level. These included a categorical measure of patient age, and the proportion of the patient population that was male or homeless. To control for patient acuity, we used the average count of Quan comorbidities.^[13] Because prior research has shown disparities in observation stay rates by rurality, we included a categorical measure of patient rurality using Rural Urban Commuting Area (RUCA) categories.^[10,14] Finally, because copayment amounts differ between observation and other inpatient admissions within VHA hospitals, we include a categorical measure of the proportion of a hospital's patients that are subject to different copayment requirements. Other covariates included the supply of primary care physicians per 1000 county population, and the proportion of the county population that is uninsured as proxies for veterans' access to care in the community outside of the VHA. We also included a set of variables to control for a general time trend and capture Veterans Integrated Service Network (VISN) fixed effects. VISNs are geographically defined regions designed to improve the health of veterans by ensuring efficient and effective integration of healthcare resources.^[15]

Of the 925 hospital-year observations with complete data in our sample, 5.8% had an observation stay rate of zero. We attempted to estimate a 2-part model, but due to perfect prediction by the bed size and VISN variables, 453 hospital-year observations were dropped from the model. Running the model on the remaining 472 hospital-year observations yielded extremely unstable estimates. Instead, we ran the ordinary least squares regression model on the conditional sample of VHA hospitals that provided some observation stays. To account for correlation between repeated observations of VHA hospitals in each year, we clustered standard errors at the VHA hospital level. The final model was run on 871 hospital-year observations, representing 116 unique hospitals with each hospital having multiple years of data included. We used seemingly unrelated estimation followed by a Chow test ($\chi^2 [54]=59.51; P=0.28$) to confirm that the coefficients do not systematically differ between the conditional and unconditional linear models. All analyses were conducted using the SAS software.

Table 1
Hospital-level descriptive statistics by provision of any observation stays, 2005–2012.

Variable	No observation stays	Any observation stays
% Age 18–55	21.6	19.7*
% Age 56–61	20.9	19.9
% Age 62–67	17.0	19.6*
% Age 68–77	20.0	20.0
% Age 78–116	20.5	20.8
% Male	95.4	95.5
% Homeless	0.7	0.9
Average number of Quan Comorbidities	1.7	1.6*
% Nonrural area	68.7	68.4
% Large rural area	16.1	14.2
% Small rural area	7.5	9.1*
% Isolated rural area	7.7	8.3*
% Copay	88.3	87.7
% Reduced Copay	1.4	2.1*
% Copay exempt	9.7	9.5
% Copay unknown	0.6	0.7
% 6–24 beds	0.0	0.7*
% 25–49 beds	0.0	0.5*
% 50–99 beds	11.1	19.2*
% 100–199 beds	22.2	25.9
% 200–299 beds	11.1	20.0*
% 300–399 beds	24.1	13.8
% 400–499 beds	16.7	6.7*
% ≥ 500 beds	14.8	13.2
Total acute admissions	3728.2	3889.1
% Complexity score 1A	29.6	25.1*
% Complexity score 1B	25.9	15.5*
% Complexity score 1C	7.4	14.0*
% Complexity score 2	1.9	28.9*
% Complexity score 3	35.2	16.5*
Physicians per 1000, county	2.5	2.4
% Uninsured, county	14.6	16.5*
	N=54	N=871

* $P < 0.05$ (for 2-sample t tests with unequal variances).

3. Results

Sample summary statistics are shown in Table 1, by provision of any observation stays. The VHA patient population is overwhelmingly (~95%) male, over two-thirds are urban residents, and most (~88%) are subject to full copayments. On average, VHA hospitals with no observation stays tended to have a younger, more urban patient population with slightly more comorbid conditions. The hospitals themselves tended to be larger and more complex.

As shown in Table 2, our model explains ~46% of the variation in hospital-specific observation stay rates over the study period. We find that hospitals with a greater proportion of younger patients (ages 18–55) have higher average observation stay rates. The results do not necessarily indicate a linear trend, but there appears to be a distinction between patients 55 and younger and those 56 and older. The results of an F -test indicate that the construct of patient age is statistically significant ($F[4, 115] = 3.37, P = 0.01$). Patient rurality was also significant. Each 10 percentage point change in a VHA hospital’s population from nonrural to the small rural area of residence is associated with an average 4.2 percentage point increase in the hospital’s observation stay rate. None of the other patient characteristics, measured at the hospital level, are statistically significant.

Table 2
Results of linear regression model of VHA hospital observation stay rates, 2005–2012.

Variable	Coefficient (SE)
% of Patients by age category (vs 18–55)	
56–61	−0.60* (0.27)
62–67	−0.85* (0.34)
68–77	−0.56* (0.24)
78–116	−0.66** (0.22)
% of Patients male	0.81 (0.48)
Average number of Quan Comorbidities	2.96 (3.61)
% of patients homeless	0.22 (0.69)
Total acute admissions	0.002** (0.0003)
Hospital bed size (vs 100–199)	
6–24	2.34 (6.39)
25–49	19.95** (5.32)
50–99	4.45* (2.01)
200–299	−2.69 (1.59)
300–399	−3.42 (1.90)
400–499	−5.96* (2.30)
500 +	−2.22 (1.88)
% of patients by rurality of residence (vs nonrural)	
Isolated rural	0.07 (0.17)
Small rural	0.42** (0.12)
Large rural	−0.03 (0.08)
Primary care MDs/1000 in county	0.10 (0.79)
% County population Uninsured	−0.15 (0.17)
% of patients by copayment status (vs exempt)	
Copayment required	0.30 (0.29)
Reduced copayment Required	1.14 (0.76)
Unknown copayment status	−0.06 (0.91)
Hospital complexity score (vs Level 2)	
Level 1a	−4.70 (2.95)
Level 1b	−4.45 (2.54)
Level 1c	−0.09 (2.31)
Level 3	4.11* (1.88)
Year (vs 2005)	
2006	2.94 (1.80)
2007	4.94* (2.39)
2008	6.05* (2.86)
2009	7.95* (3.19)
2010	9.36* (3.68)
2011	11.23** (4.17)
2012	14.74** (4.56)
VISN fixed effects	
Constant	−50.46 (48.09)
Observations	871
R-squared	0.46
Robust standard errors in parentheses * significant at 5%; ** significant at 1%	

SE=standard error, VISN=Veterans Integrated Service Network.

At the hospital level, bed size and volume of acute admissions were significant. Specifically, hospitals with between 25 and 49 beds have, on average, an observation stay rate nearly 20 percentage points higher than hospitals with between 100 and 199 beds. By contrast, hospitals with between 400 and 499 beds have, on average, an observation stay rate ~6 percentage points lower than hospitals with between 100 and 199 beds. Although the other bed size coefficients are not significant, the results of an F -test indicate that the overall construct of hospital bed size is statistically significant ($F[7, 115] = 4.07, P < 0.001$). Taken as a whole, the coefficients for hospital bed size generally seem to indicate that smaller hospitals have higher observation stay rates, whereas larger hospitals have lower observation stay rates. For each 1000 additional acute admissions, a hospital’s observation

stay rate is expected to increase by 2 percentage points. Despite the apparent trend that VHA hospital complexity and observation stay rates are inversely related, the results of an *F*-test indicate that the construct of VHA hospital complexity is not statistically significant ($F[4, 115]=2.15, P=0.07$).

At the county level, neither the supply of physicians nor the proportion of the population uninsured was significant. However, the results of an *F*-test indicate that the VISN fixed effects (which we do not report here) are jointly significant ($F[20, 115]=2.87, P<0.001$), demonstrating that there are important unobserved time-invariant factors associated with the provision of observation stays operating at the VISN level. Finally, we observe a strong linear time trend from 2006 to 2012 ($F[7, 115]=4.27, P<0.001$). Over the study period, hospital observation stay rates increased between 1 and 3.5 percentage points annually, such that average rates in 2012 were nearly 15 percentage points higher compared to 2005.

4. Discussion

We modeled VHA hospital observation stay rates as a function of several patient, hospital, and local health system characteristics to better understand the previously reported inter-hospital variability in VHA observation stay rates. Our results suggest that observation is used more frequently at smaller VHA hospitals that treat a larger proportion of young veterans residing in urban areas. We also found a very strong increase in observation stay use over time across all VHA hospitals and unobserved time-invariant characteristics at the VISN-level associated with observation stay use.

We found that the greater a hospital's proportion of patients under age 56, the higher the percentage of their admissions that were initially placed in observation status. This may reflect a tendency to use observation more often for lower acuity patients, assuming that younger patients are lower acuity. By contrast, physicians may decide to admit older, sicker individuals as inpatients without observing them first, with the belief that there is very little chance of them going home within 24 hours. While the statistical insignificance of the Quan comorbidity scores seems to contradict this notion, we cannot conclude that patient acuity is unassociated with observation status without conducting event-level analyses.

Similarly, hospitals with a greater proportion of patients from small rural areas (compared to urban areas) also had higher observation stay rates. Given extensive travel times and the lack of local providers in rural areas, perhaps clinicians prefer to observe these patients until there is greater certainty about their diagnosis or health prior to discharging them home. A similar argument could be made regarding homeless patients, but we saw no such effect. If there is a difference for individual patients, the fact that < 1% of patients were recorded as homeless might explain why we do not see any impact on observation stay rates.

One patient characteristic that is notable precisely because it was not significantly associated with observation stay rates is a hospital's patient mix by copayment status. In VHA, being placed in observation costs the patient \$1210 less than being admitted. Thus, each time a veteran is placed in observation instead of admitted as an inpatient, it saves the veteran \$1210, but the VHA hospital foregoes the same amount in revenue. However, not all veterans are required to make copayments, because of their income and service-connected conditions. We hypothesized that VHA hospitals with a larger proportion of patients subject to making full copayments would be more prone to admit rather

than observe patients to generate more revenue. Consequently, we would expect those hospitals to have a lower observation stay rate. The finding that copayment status did not impact observation stay rates suggests that providers can determine the best patient disposition without feeling pressured to make a decision for the financial health of the hospital. However, this raises the question of why VHA hospitals would not simply place all patients in observation initially, to maximize the financial benefit to patients who can be discharged home within 24 hours, whereas other patients can easily be converted to a full inpatient admission (and subjected to the higher copayment).

Among the hospital characteristics we examined, we found that hospitals with <100 beds had higher observation stay rates, whereas hospitals with >200 beds had lower observation stay rates compared to hospitals with 100 to 199 beds. This suggests that hospitals may use observation stays to improve patient flows, especially where capacity is limited. In hospitals with fewer beds, physicians may be wary of tying these beds up with inpatient admissions and may prefer to place patients in observation status and discharge many of them home within 24 hours. Conversely, in hospitals with many beds, the need for rapid patient turnover is less likely to be a concern, which may prompt physicians to admit more veterans as inpatients.

At the health system level, the results showed that observation stay rates were not associated with the number of doctors or uninsured population in the county. Although we were concerned with controlling for these factors because of the potential for dual use among veterans, which might conceivably affect their health in ways that would subsequently influence observation stay rates, we are not necessarily surprised by these findings. Despite our initial concerns, VHA is less likely to be impacted by these broad population measures given the different provider and insurance arrangements within the VHA system.

By contrast, we observed strong regional variation between VISNs and a steady annual increase in the use of observation stays over time across VHA, which we attribute to overall health policy and practice patterns. Although the data do not allow us to speak to the impact of specific policies, the strong time trend we observed would suggest that VHA providers were not insulated from national discussions about observation stays in other contexts and that this may have influenced their own practice patterns within VHA. It may also reflect the general shift from longer inpatient stays to shorter inpatient stays and more outpatient care that have characterized the last few decades of American healthcare.^[16,17] Similarly, the significant variation between VISNs is perhaps attributable to regional differences in practice patterns or VISN-specific policies with which we are unfamiliar. For example, individual VISN leadership may have chosen to emphasize or de-emphasize observation stays as they felt appropriate.

As with any study, our work is subject to limitations. Foremost among these is our inability to determine precisely how and why physicians (or perhaps even administrators) within VHA hospitals decide to place patients in observation status rather than admitting them. Future research should explore this decision at the patient and provider levels to better understand how observation is being used. Similarly, although we control for the average number of Quan comorbidities, we cannot be certain that we have adequately controlled for patient acuity or that patients are being appropriately observed or admitted. Finally, given sample size and data limitations, we were unable to estimate a 2-part model, which may limit the generalizability of our findings as it prevented us from understanding which factors might

explain why some VHA hospitals did not place any patients in observation status. Clearly, more work is needed in this area.

A myriad of observed and unobserved factors influenced observation stay rates at VHA hospitals. Among the observed factors, we found that observation stay rates were higher at smaller VHA hospitals that treated a larger proportion of young veterans residing in urban areas, reflecting concerns about patient flows, patient acuity, and patient travel time to the hospital. We also found that financial considerations did not appear to drive inappropriate use of observation stays. Among the unobserved factors, we found that observation stay rates generally increased over time at VHA hospitals along with geographic variation in observation stay rates between VISNs, suggesting policy effects and differences in practice patterns. Clearly, there are many factors that remain unmeasured and warrant further investigation to help understand which patients are admitted to observation and how hospitals choose to utilize observation status.

References

- [1] 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;32:2149–56.
- [2] Helderman M, Kraemer YL, Dyer J, et al. Reducing unnecessary admissions related to 1-day stays: a collaborative effort. *Prof Case Manag* 2008;13:318–28.
- [3] Aston G. Observation units: a tightrope act. *Hosp Health Netw* 2012;86:32–4.
- [4] Baugh CW, Bohan JS. Estimating observation unit profitability with options modeling. *Acad Emerg Med* 2008;15:445–52.
- [5] Baugh CW, Venkatesh AK, Bohan JS. Emergency department observation units: a clinical and financial benefit for hospitals. *Health Care Manage Rev* 2011;36:28–37.
- [6] Sheehy AM, Caponi B, Gangireddy S, et al. Observation and inpatient status: clinical impact of the 2-midnight rule. *J Hosp Med* 2014;9:203–9.
- [7] Tejedor-Sojo J. Observation status—a name at what cost? *Hosp Pediatr* 2014;4:321–3.
- [8] Wachter RM. Observation status for hospitalized patients: a maddening policy begging for revision. *JAMA Int Med* 2013;173:1999–2000.
- [9] 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;31:1251–9.
- [10] Wright B, Jung HY, Feng Z, et al. Hospital, patient, and local health system characteristics associated with the prevalence and duration of observation care. *Health Serv Res* 2014;49:1088–107.
- [11] Wright B, O’Shea AM, Ayyagari P, et al. Observation rates at veterans’ hospitals more than doubled during 2005–13, similar to Medicare trends. *Health Aff (Millwood)* 2015;34:1730–7.
- [12] Veterans Health Administration. 2010 VHA Facility Quality and Safety Report. Department of Veterans Affairs. October 2010. Available at: <http://www.va.gov/health/docs/HospitalReportCard2010.pdf> Accessed August 11, 2016.
- [13] Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care* 2005;43:1130–9.
- [14] Wright B, Jung HY, Feng Z, et al. Trends in observation care among Medicare fee-for-service beneficiaries at critical access hospitals, 2007–2009. *J Rural Health* 2013;(suppl1):s1–6.
- [15] We Honor Veterans. Healthcare & Working with VA. National Hospice and Palliative Care Organization. 2016. Available at: <http://www.wehonorveterans.org/va-veteran-organizations/about-va/healthcare-working-va>. Accessed August 11, 2016.
- [16] Davis K, Russell LB. The substitution of hospital outpatient care for inpatient care. *Rev Econ Stat* 1972;54:109–20.
- [17] Sloan FA, Valvona J. Why has hospital length of stay declined? an evaluation of alternative theories. *Soc Sci Med* 1986;22:63–73.