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Use of In-Laboratory Sleep Studies in the Veterans Health Administration and Community Care

To the Editor:

The Veterans Health Administration (VA) is an integrated healthcare system whose mission is to provide high-quality care that meets veterans' needs in a resource-conscious manner (1). When the VA cannot achieve predefined access standards, veterans are eligible for referral to non-VA providers (i.e., community care) under a fee-for-service reimbursement model. Historically, community care was managed via direct "Fee Basis" relationships between VA facilities and private providers. However, a fundamental shift in these relationships began with the Veterans Choice Program. In an attempt to streamline referrals, "Choice" used third-party administrators to contract with outside providers and coordinate care on the VA's behalf (2). Over time, Choice referrals expanded and now comprise ∼10% of the VA's budget, with annual costs exceeding $5 billion (3). Given these large investments, it is essential to understand the efficiency and value of community care.

The challenges of providing care for obstructive sleep apnea (OSA) are representative of those seen with many specialty services.

Table 1. Sample Characteristics and Sleep Study Use

	VA (*n* = *113,266*)	Traditional Fee Basis (*n* = *31,321*)	Choice (*n* = *13,089*)
Demographics			
Age, yr, mean (SD)	51.5 (14.8)	50.9 (14.6)	51.5 (14.7)
Sex, M	102,310 (90.3)	28,490 (91.0)	11,725 (89.6)
Race			
White	73,986 (65.3)	21,023 (67.1)	8,557 (65.4)
Black	27,749 (24.5)	6,158 (19.7)	2,650 (20.3)
Native American	840 (0.7)	320 (1.0)	151 (1.2)
Asian	2,658 (2.4)	1,001 (3.2)	641 (4.9)
Multiracial and other	8,033 (7.1)	2,819 (9.0)	1,090 (8.3)
Hispanic	10,031 (8.9)	3,804 (12.2)	1,460 (11.2)
Distance from VA facility, km*	34.4 (15.9–71.1)	52.5 (19.6–110.7)	51.8 (20.3–120.9)
Region			
Northeast	15,470 (13.7)	1,863 (6.0)	268 (2.1)
Midwest	22,505 (19.9)	6,834 (21.8)	1,621 (12.4)
Southeast	51,198 (45.2)	14,357 (45.8)	6,984 (53.4)
West	24,093 (21.3)	8,267 (26.4)	4,216 (32.2)
Medical comorbidities and history			
Body mass index, kg/m^2, mean (SD)	32.8 (6.1)	32.8 (6.2)	32.9 (6.2)
Charlson score ⩾2	18,958 (16.7)	4,696 (15.0)	2,154 (16.5)
Hypertension	44,893 (44.1)	13,236 (42.3)	6,073 (46.4)
Diabetes	23,178 (20.5)	6,736 (21.5)	2,841 (21.7)
Sleep study used			
In-laboratory polysomnogram	70,575 (62.3)	25,381 (81.0)	12,555 (95.9)
Home sleep apnea test	42,691 (37.7)	5,940 (19.0)	534 (4.1)
Sleep study cost per 100 patients, $, mean (SD)†	46,659 (23,028)	55,491 (18,449)	62,473 (9,486)

Definition of abbreviation: VA = Veterans Health Administration.
Data are shown as *n* (%) unless otherwise specified.
*Data are shown as median (interquartile range) due to skewed distribution.
†Average costs obtained from National 2016 Medicare Pricing Data for each sleep study Current Procedural Terminology code, including technical and professional fees.

Almost half of veterans are at high risk for OSA (4), and community sleep programs represent an opportunity to improve access to care. Traditionally, laboratory-based polysomnography was necessary to diagnose OSA, but portable home sleep apnea tests (home tests) provide an efficient patient-centered option. Home tests have equivalent accuracy among patients for which they are appropriate (5) and cost ∼74% less than polysomnography ($170 vs. $663 per test) (6). We compared relative polysomnography use among veterans tested by VA, Fee Basis, and Choice providers.

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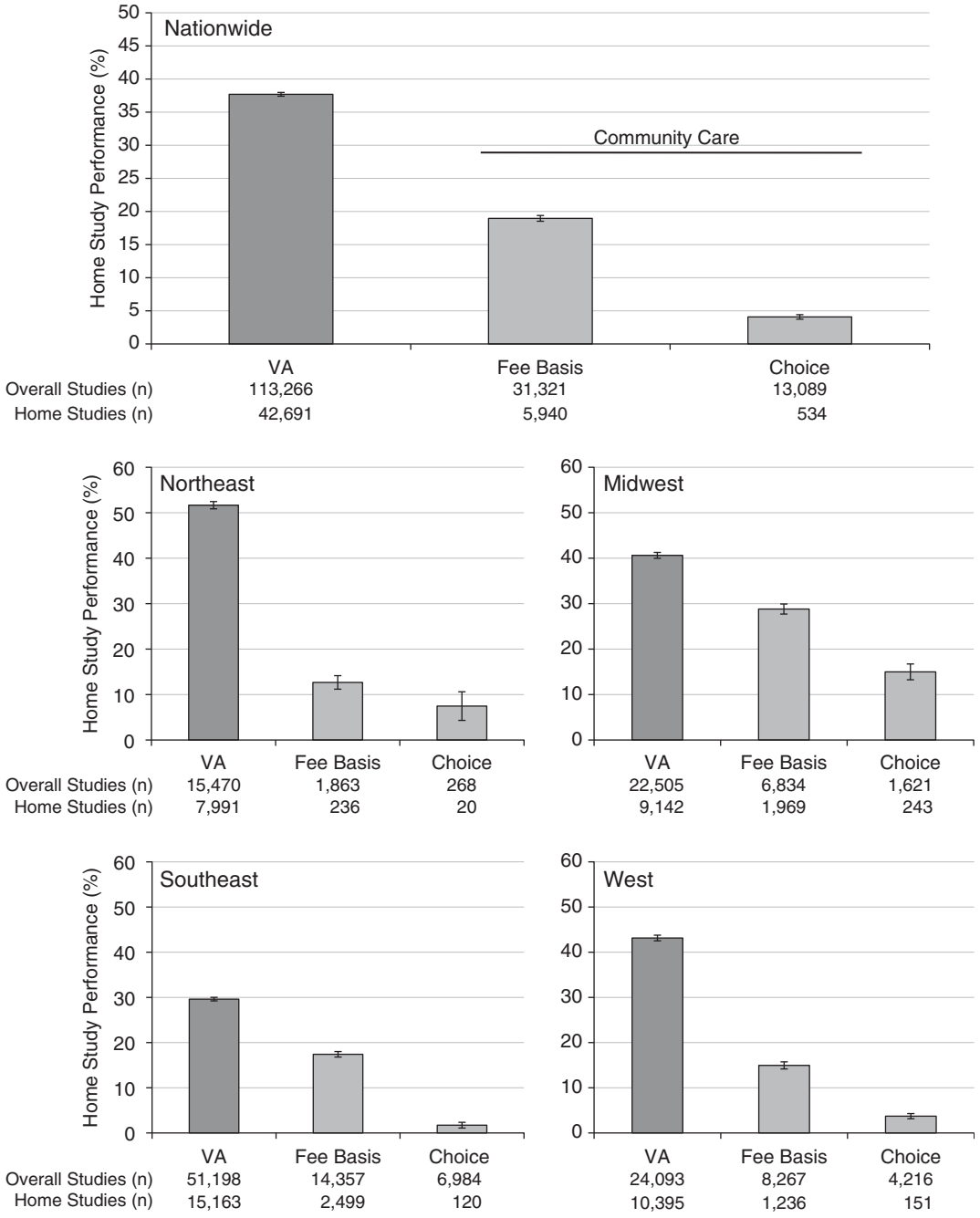

Figure 1. Use of home studies by Veterans Health Administration (VA), traditional Fee Basis, and Choice providers nationwide, stratified by region. Error bars represent the 95% confidence interval of each proportion. Northeast refers to medical centers in Veterans Integrated Service Networks (VISNs) 1–4; Midwest refers to VISNs 10, 11, 12, 15, and 23; Southeast refers to VISNs 5–9 and 16–17; and West refers to VISNs 18–22.

Methods

We obtained national VA administrative data for veterans' first sleep studies performed during October 2014 to July 2016, a period of transition from Fee Basis to Choice for community care. This operational evaluation project was sponsored by the VA Office of Veterans Access to Care, Department of Veterans Affairs, Washington, DC. The activities were undertaken in support of a VA operational project and did not constitute research, in whole or in part, in compliance with VA Handbook 1058.05. Therefore, institutional review board approval was not required. We collected information regarding demographics, diagnoses, medications, and sleep studies performed within the VA and community care, using Current Procedural Terminology (CPT) codes to identify polysomnograms (CPT 95808, 95810, and 95811) or home tests (CPT 95800, 95801, and 95806). Because of divergent relationships with the VA, we chose *a priori* to stratify community care by Fee Basis

and Choice. We excluded patients with home test contraindications, such as congestive heart failure, chronic obstructive pulmonary disease, stroke, neuromuscular weakness, and chronic opioid use (5). We also present testing by region.

Because home tests are appropriate for patients with a moderate–high OSA risk (5), we recorded confounders that have been hypothesized to track with pretest OSA risk and medical complexity: body mass index, age, sex, race, ethnicity, hypertension, diabetes, and Charlson Comorbidity Index in the year before testing (5, 7). We included distance from the nearest VA Medical Center (VAMC) to account for likelihood of community care referral. We performed logistic regression to account for potential confounding and performed multiple imputation to address the 8% missing body mass index values using 25 imputed datasets. We calculated adjusted ratios of home testing, with regression clustered by VAMC of service (VA), contracting VAMC (Fee Basis), or nearest VAMC (Choice). To contextualize resource use, we used Medicare reimbursement rates to estimate the average VA costs per 100 patients (6). Analyses were performed using Stata (StataCorp).

Results

Among 203,371 patients undergoing sleep testing, we identified 157,676 (77.5%) without a home testing contraindication. Most of these patients had undergone VA studies (71.8%), followed by Fee Basis (19.9%) and Choice (8.3%). Regardless of where testing occurred, the patients had similar characteristics across age, demographics, and comorbidities (Table 1). VA providers performed 37.7% of studies as home tests, compared with 19.0% in Fee Basis and 4.1% in Choice (Figure 1). Because of lower home testing, every 100 veterans referred to Fee Basis represented $8,831 (95% confidence interval [CI], $8,587–9,076) greater costs than those treated by VA providers, and every 100 veterans referred to Choice represented $15,814 (95% CI, $15,603–16,024) greater costs than those treated by VA providers (Table 1).

In adjusted models, both Fee Basis (adjusted risk ratio [aRR], 0.50; 95% CI, 0.26–0.75) and Choice (aRR, 0.11; 95% CI, 0.05–0.17) providers remained less likely to use home tests than VA providers. Compared with Fee Basis providers, Choice providers were less likely to use home tests (aRR, 0.22; 95% CI, 0.11–0.32). Despite regional variation in home testing, the overall pattern of reduced home testing in community care persisted (Figure 1).

Discussion

Home tests were performed in only a minority of patients, although there was a marked difference in the use of home tests between community care and the VA (5). Our results suggest that substantial cost savings could be achieved if the VA were to reduce its reliance on community care or encourage more efficient testing practices, particularly in certain regions. Community providers' avoidance of home testing may relate to greater fee-for-service reimbursements for polysomnograms or to a number of other factors (8). For example, community providers may receive incomplete medical records, leading them to choose polysomnograms over home testing given the frequency of comorbidities (e.g., heart failure) in veterans (9). Community providers may also have less infrastructure to support home testing or be unaware of its equivalence in select populations (10).

Differences between Fee Basis and Choice suggest that care varies based on the nature of the VA's arrangements with community providers. Direct Fee Basis relationships between VA facilities and community providers may reinforce communication and mutual knowledge of practice patterns. The Choice program, by contrast, was administered indirectly through third-party administrators, limiting contact between the VA and community providers (2). Our results have particular relevance given the planned expansion of patients' eligibility for community care under the Maintaining Internal Systems and Strengthening Integrated Outside Networks (MISSION) Act (11). Our results suggest that the VA will need to focus on developing communication and coordination with community care providers during this expansion.

This study has some potential strengths and limitations. Our use of nationwide administrative data limits systemic bias and captures generalizable practice patterns of real-world practice. Although our approach did not ascertain symptoms that influence home test suitability (e.g., snoring) (5), we have no reason to believe the patients' symptoms differed between groups. In addition, although numerous trials have suggested comparable outcomes with community care and home testing, we did not measure or compare patient outcomes (e.g., treatment adherence) (5). Finally, our average cost model likely underestimates the cost difference between community care and the VA. Although community care reimbursements are tied to Medicare rates (12), VA services typically cost less than Medicare (13). Additionally, our model did not incorporate added costs from community care clinic visits.

Our results suggest that there is a substantial opportunity to improve the value of sleep testing within the VA and raise concerns regarding the efficiency of community care. Our work suggests that as community care evolves under new appropriations, the VA should carefully build relationships and contract for services in a way that encourages patient-centered, value-based care. ■

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Vocal Cord Dysfunction in Patients Hospitalized with Symptoms of Acute Asthma Exacerbation

To the Editor:

Vocal cord dysfunction (VCD), also called inducible laryngeal obstruction, is characterized by inspiratory closure of the vocal cords associated with paradoxical vocal cord movement. During expiration, closure of the vocal cords is a normal phenomenon precluding a reliable diagnosis of VCD (1). Diagnosis is made by laryngoscopy upon detection of paradoxical vocal cord movement and a diamond-shaped "chink" during inspiration (2). VCD was initially considered exclusively as a mimic of asthma, but subsequent studies suggested that it frequently coexists with asthma. Newman and coworkers detected VCD in more than 50% of subjects with severe asthma (3), and in a previous study we detected VCD in approximately 35% of patients with severe symptomatic asthma and almost 20% of patients with milder disease (4).

To date, studies of VCD have been conducted almost exclusively in subjects with stable asthma, and there has been only one report detailing investigations during acute asthma exacerbations. In a study by Jain and colleagues, patients were assessed during emergency department (ED) admission (5). A confident diagnosis of VCD could be made in only one out of 48 cases (2%), and the authors suggested that VCD may be an uncommon factor that either mimics an exacerbation or impacts a coexisting asthma exacerbation.

There are several reasons why VCD can be expected to occur more readily during asthma exacerbations. Airway obstruction can provoke abnormal laryngeal responses leading to VCD (6), and VCD is more common in patients with severe asthma, who in turn are known to be more prone to exacerbations (4). Additionally, dysfunctional breathing with activation of laryngeal reflexes may be an important element of the pathogenesis of VCD, and this breathing pattern may be provoked during periods of unstable asthma (4, 7). We therefore postulated that VCD may be occurring silently in patients presenting with symptoms of acute asthma exacerbation, and that it can be detected noninvasively using a recently developed technique: dynamic computed tomography (CT) of the larynx (8).

Studies were conducted in the Emergency Department of Monash Medical Centre, a tertiary care hospital in Melbourne, Australia. The investigations were approved by the Monash Health Human Research Ethics Committee and all patients provided signed

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