

are most frequently associated with adverse drug reactions,⁶ with minocycline being the most frequent drug responsible for DRESS, which can rarely result in GCM.

In a multicenter study with 63 cases of idiopathic GCM, Cooper et al⁷ found that the mean survival in patients treated with a double immunosuppressive treatment was 12.6 months, and it was only 3.8 months if the treatment was exclusively steroid based. The performance of a cardiac transplant could be the only way to treat it, with a 74% chance of survival. This is a better result compared with other treatments, although the GCM recurs in transplanted hearts within a mean of 3.0 years after the intervention, according to this study, and the immunosuppressive drugs probably have to be continued as lifelong treatment.

In our patient's case, intravenous thymoglobulin was administered in addition to double immunosuppressive treatment based on some case reports with positive outcomes for this treatment,^{8–10} but the drugs did not manage to provide a clinical improvement.

Although the first symptoms and the clinical manifestation of a GCM are nonspecific, its progression is very fast, and heart transplant is the only efficacious treatment. It is very important that the patient is in the best clinical condition at the time of intervention to obtain a successful result and limit all possible complications. For this reason, in case of an adverse drug reaction with fever, eosinophilia, and prolonged rash, early ECG, echocardiography, and cardiac enzymes tests have to be performed to recognize an early diagnosis of cardiac involvement and to perform cardiac transplant, when it is essential, and under the best clinical conditions.

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Health care utilization by patients with common variable immune deficiency defined by *International Classification of Diseases, Ninth Revision* code 279.06



Common variable immunodeficiency (CVID) is the most common treatable primary immune deficiency disorder, yet it is underdiagnosed.^{1,2} Diagnostic delays are common and are associated with end-organ damage.^{3,4} Various efforts have been made to identify patients sooner and begin treatment to improve quality of life, but many patients will never see an immunologist and immune deficiencies are not common among other subspecialty practices, leading to a lack of familiarity with the phenotype and treatment. A dearth of clinical immunologists often means that patients receive care for a complication of CVID without overall management of CVID. Specialists who see few patients with CVID might not be familiar with the diagnostic criteria and management guidelines. Reaching these specialists is a key outreach need and this study was designed to identify specialists who see patients with CVID to tailor educational efforts.

Efforts are evolving to identify a computable phenotype to allow sooner diagnosis, but the heterogeneity of the disease represents a challenge.^{5,6} Multiple studies in the past 10 years have better defined the phenotype and the outcomes for this

disease; however, all these studies have examined cohorts of patients seen at tertiary care centers.^{7–9} This study was designed to examine the types of physicians seeing patients with CVID using an unbiased ascertainment method to better capture the landscape of CVID health care usage across the country. The goal was to understand the types of specialists involved in care using a patient identification strategy that did not rely on a referral base.

The Patient Centered Outcomes Research Institute recently funded 29 health data networks across the country to establish a national clinical research infrastructure. Eleven clinical data networks, each comprising multiple health systems, securely collect health information during the routine course of patient care. We used data from the Louisiana Clinical Data Research Network (LaCDRN) on the types of specialty encounters associated with the *International Classification of Diseases, Ninth Revision* diagnosis code 279.06 for CVID. The LaCDRN comprises the Louisiana State University Health System, Tulane University, Ochsner Health System (which is the largest private health system in the state), and a network of community-based clinics and hospitals that participate in the Greater New Orleans Health Information Exchange. The overall demographics of the study cohort were 43% male, 49% white, 33% African American, 3% other, and 15% unknown. Visit data from a 2-year time frame were extracted and visit data for each patient were compiled. Data were extracted in a

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Table 1

Specialists seen by patients with common variable immunodeficiency across the Louisiana Clinical Data Research Network

Specialist	Total visits, %
Radiology	8.14
Allergy	7.19
Hematology and oncology	6.72
Internal medicine	6.05
Dermatology	5.30
Pediatric hematology	4.82
Pediatric pulmonology	4.45
Infectious diseases	4.26
Pediatric allergy immunology	4.07
Pediatrics	3.41
Pathology	3.03
Pulmonary disease	3.03
Immunology	2.74
Family medicine	2.55
Laboratory	2.55
Otolaryngology	2.55
Cardiology	2.37
General surgery	2.27
Orthopedic surgery	2.18
Neurology	2.08
Endocrinology	1.51
Pediatric gastroenterology	1.51
Hematology	1.42
Obstetrics and gynecology	1.42
Anesthesiology	1.32
Obstetrics	1.14
Gastroenterology	0.95
Pediatric critical care	0.95
Hospitalist	0.85
Rheumatology	0.85
Urology	0.66
Pediatric cardiology	0.57
Psychiatry	0.57
Transplantation	0.57
Genetics	0.47
Intensive care	0.47
Emergency medicine	0.38
Gynecology	0.38
Optometry	0.38
Pediatric otolaryngology	0.38
Oncology	0.28
Ophthalmology	0.28
Spine surgery	0.28
Allergy and immunology	0.19
Bone marrow transplantation	0.19
Colon and rectal surgery	0.19
Nephrology	0.19
Pediatric infectious disease	0.19
Pediatric nephrology	0.19
Pediatric neurology	0.19
Podiatry	0.19
Addiction medicine	0.09
Cardiothoracic surgery	0.09
General practice	0.09
Hospice and palliative medicine	0.09
Neurosurgery	0.09
Nutrition	0.09
Pain medicine	0.09
Pediatric surgery	0.09
Physical medicine and rehabilitation	0.09
Plastic surgery	0.09
Sleep medicine	0.09
Urgent care	0.09

validation of patients was performed owing to the structure of the study, the demographics are consistent with known epidemiologic features of CVID.

The 223 patients with CVID were found across all health care systems (Tulane University, 41; Greater New Orleans Health Information Exchange, 4; Louisiana State University, 18; Ochsner Health System, 160). This yields an estimated population prevalence of 1.6 per 10,000. Visit data were not available for 8 patients: 4 patients were seen in community health centers, 2 were from Louisiana State University, and 2 were from Tulane University. The 215 patients with encounter data had a total of 1,189 visits to LaCDRN partner health systems. The most common subspecialist visits were for radiology (8.1%), allergy (7.2%), hematology oncology (6.7% of all visits), dermatology (5.3%), infectious diseases (4.3%), pulmonary (3%), immunology (2.7%), and ear, nose, and throat (2.6%). Pediatric subspecialties accounted for approximately 20% of all visits collectively. Among primary care visits, 3.4% were with pediatrics, 3.5% were with a family practice physician, and 6% were with internal medicine physicians (Table 1).

Consistent with other reports demonstrating that some patients with CVID lead healthy lives with relatively few complications, whereas others exhibit significant end-organ inflammatory or autoimmune disease, we found significant variation in the number of physician visits. More than half the patients saw only 1 or 2 types of physicians, whereas a small number of patients had seen as many as 17 different types of physicians.

The true prevalence of CVID is not known. Estimates range from 1:47,000 to 185,000 in Europe, 1:53,000 in Australia, and 1:7,000 to 127,000 in the United States.¹⁰ It is known to occur more frequently in whites but there has been very limited analysis of race and ethnicity in terms of population prevalence. One of the challenges in obtaining a clear picture of the landscape of CVID has been the lack of unbiased data. Previous reports of prevalence have relied on patient reports and tertiary care center referral bases, yet many patients in the United States do not have access to tertiary care centers and are followed locally. This is the first study designed to use an unbiased ascertainment method to identify the physicians involved in the care of patients with CVID. The prevalence identified by our study is high and could reflect overdiagnosis. Although the demographics of the catchment cohort were largely non-white, the finding of patients with CVID with demographics of white race, female sex, and the expected age range suggest that most patients did have true CVID; however, the subjects identified in this study were not validated using accepted diagnostic criteria because laboratory information was not available using this study mechanism. This represents a weakness in our study as does the potential of bias in health care access. Nevertheless, these data represent an important perspective in focusing educational efforts. Regardless of whether the patients fulfill the accepted diagnostic criteria for CVID, this study defines a cohort of specialists who can be targeted for educational efforts related to the disease. Within this CVID cohort, there was a highly diverse set of specialists involved in clinical management. This suggests educational efforts will need to be broadly based. Outreach efforts might require novel technologies to reach the breadth of specialists required.

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de-identified manner and this study was exempted by the institutional review board.

The characteristics of the CVID cohort derive from a patient base of approximately 1.4 million seen during the 2-year capture period. Patients with CVID were 69.1% female, 90.6% white, and had a median age of 51 to 60 years (range 1–>80 years). Although no

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Omalizumab, an additional therapy for allergic bronchopulmonary aspergillosis



Allergic bronchopulmonary aspergillosis (ABPA) has been considered a long-term management illness that affects more than 4 million people worldwide.¹ Often the disease is poorly controlled, resulting in prolonged corticosteroid treatment and rarely surgical intervention. This case study reviews an example of ABPA refractory to traditional treatments and surgical management. With the introduction of a new management plan, the medication requirements for this patient decreased with a complementary improvement in the patient's symptoms. Omalizumab, classically used to benefit patients with severe asthma, also has been shown to be effective for patients with ABPA.² This approach is reasonable and should be considered for other patients with refractory ABPA.

A 32-year-old woman diagnosed with asthma at 2 years of age experienced a recent worsening of symptoms. She recalled being hospitalized for asthma exacerbations 5 times as a child. Her symptoms showed improvement in high school, but at 20 years old she had developed persistent dyspnea and cough. Her condition was partly controlled with a moderate dose of inhaled corticosteroids combined with long- and short-acting β -agonists. At 26 years of age, she was diagnosed with ABPA based on elevated serum IgE, serum precipitins, skin test reactivity to *Aspergillus fumigatus*, and predominantly central bronchiectasis. Despite oral steroid and antifungal medications, she had an increasing consolidation for which she underwent a right lower lobectomy. Histopathologic examination showed fungal morphology consistent with *A fumigatus*; however, fungal culture and stain were negative. For 5 years after surgical intervention, her medication regimen included high-dose inhaled corticosteroids, long-acting β -agonists, montelukast, and oral antihistamines. Despite this intensive regimen, she needed oral steroid courses annually. Her steroid courses started at 0.6 to 0.75 mg/kg daily and began to taper after 14 days. Depending on the course, the taper was completed over 3 to 5 months. She had 2 courses of itraconazole, each lasting 16 weeks. Her overall health suffered from steroid-induced insomnia and she had gained 25 lb during this period. At the time of evaluation in our clinic, she complained of a chronic cough with brown sputum, occasional scant hemoptysis, dyspnea with minimal activity, and rhinorrhea. A physical examination

showed that her lungs were clear to auscultation bilaterally with good air movement and a normal respiratory depth. Laboratory evaluation showed a peak serum IgE concentration of 22,893 IU/mL, with elevated *A fumigatus* IgG and IgE indices. Given the severity of her bronchiectasis, an immunodeficiency workup was pursued. Human immunodeficiency virus antibody was negative. CH50 complement, IgM, IgA, and IgG levels and flow cytometry results were normal. Postvaccination pneumococcal, diphtheria, and tetanus titers were normal, as were anergy skin test reactions. A sweat chloride test was indeterminate and the cystic fibrosis transmembrane regulator probe was negative. Skin testing demonstrated hypersensitivity to *A fumigatus*. Computed tomogram of the lungs displayed prior lobe resection, increasing bilateral bronchiectasis in the central, posterior, and upper lobes with mucoid impaction, and ill-defined opacities (Fig 1). The patient did not meet criteria for hyperimmunoglobulin E syndrome owing to a lack of extrapulmonary involvement. Because of her persistent symptoms and worsening bronchiectasis despite prolonged corticosteroids, the patient was started on 375 mg of omalizumab biweekly. After 1 year on omalizumab, the patient has not required any oral steroids and has experienced a sustained resolution of her symptoms, including exertional dyspnea, productive cough, and rhinorrhea. Her pulmonary functional tests

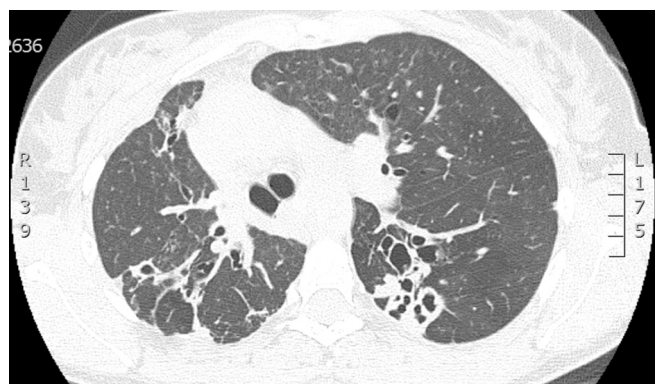


Figure 1. High-resolution computed tomogram of the chest 5 years after right lower lobectomy.