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TACKLING HEALTH CARE DISPARITIES: HOW TO BUILD A SARCOIDOSIS CENTER

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ABSTRACT. Sarcoidosis is a multi-organ system inflammatory disease of unknown etiology that disproportionately affects women and black patients in the United States. In addition, woman and minority patients have worse outcomes. In 2015, sarcoidosis physicians in cardiology, pulmonary medicine and rheumatology joined forces to create a multidisciplinary sarcoidosis at Virginia Commonwealth University. In 2019, the clinic was recognized as a World Association of Sarcoidosis and Other Granulomatous Disorders (WASOG) Center of Excellence. We identify four pillars of a patient-centered sarcoidosis clinic: clinical care, research, teaching, and community outreach. We detail how each of these facets plays a critical role in improving the health of individual patients, creating a strong infrastructure to improve the future of sarcoidosis treatment, and developing community-based resources that can empower patients. Most importantly, we highlight how a multidisciplinary clinic can help identify and combat healthcare disparities.

KEY WORDS: sarcoidosis, health care disparities, multidisciplinary

INTRODUCTION

Sarcoidosis is a multi-organ system inflammatory disease of unknown etiology that most often affects the lungs but can involve nearly any organ. Sarcoidosis disproportionately affects women and black patients in the United States. In addition, minority patients have worse outcomes in the United States, including higher in-hospital mortality rates.[1] Patients with sarcoidosis can experience decreased quality of life related to both sarcoidosis and its treatments. Successful diagnosis and effective treatments for sarcoidosis are essential to reducing the disparities that exist in sarcoidosis related health outcomes. However, effectively managing sarcoidosis patients presents multiple challenges. Multi-organ system disease often requires interdisciplinary care and communication in order to optimize outcomes. Diagnosing sarcoidosis is complicated because symptoms may overlap those observed with many other infectious, neoplastic, autoimmune, and cardiovascular diseases.

Virginia Commonwealth University (VCU) is an academic medical center in Richmond, Virginia that serves a large urban community, including a diverse patient population with sarcoidosis. Recognizing the importance of multidisciplinary care, in 2015, sar-

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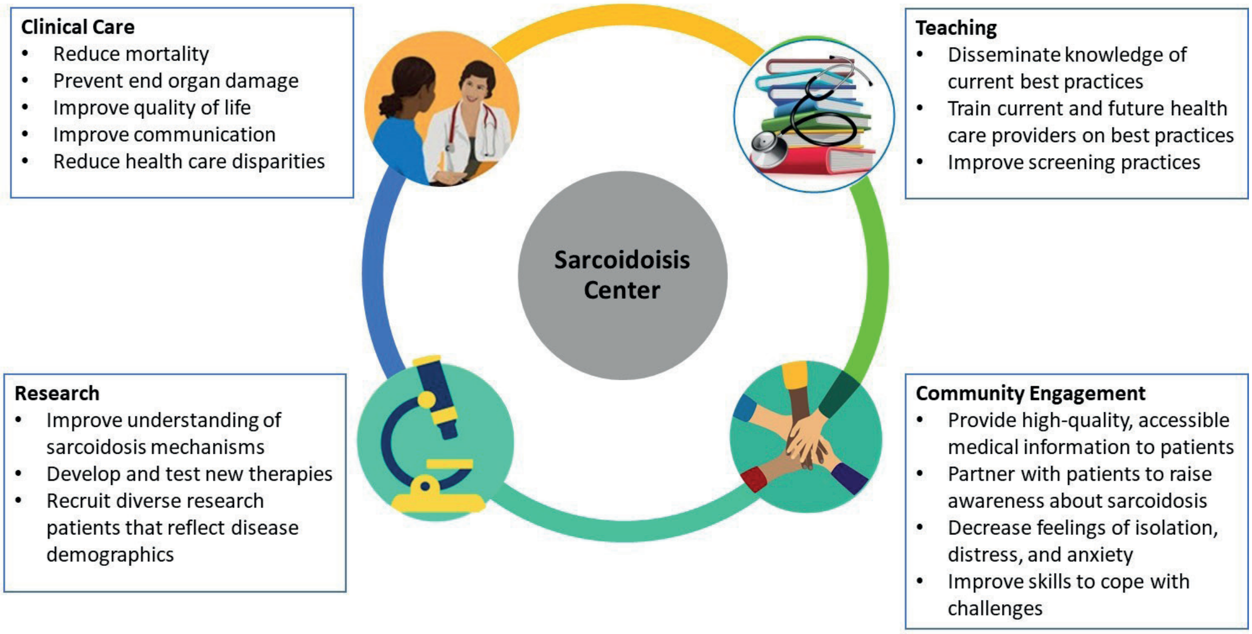
coidosis physicians from Cardiology, Rheumatology, and Pulmonary medicine created a clinical center to address many of the challenges faced by patients with sarcoidosis. In 2019, the clinic was recognized as a World Association of Sarcoidosis and Other Granulomatous Disorders (WASOG) Center of Excellence. Since its inception, the VCU Sarcoidosis Clinic has expanded its team to include additional specialists partnering to improve intra-physician communication and between the care team and patients, with the ultimate goal of improving patient care, outcomes and quality of life. Through our experience, we have determined that successful delivery of patient-centered care is based on four pillars: clinical care, research, teaching, and community outreach (Figure 1). Each of these components are integral to improving the health of individual sarcoidosis patients, providing infrastructure to expand options for sarcoidosis treatment, and developing community-based resources that can empower patients and improve overall quality of life.

CLINICAL CARE

Though sarcoidosis care has historically been centered around the pulmonologist, there is an urgent need to establish holistic, personalized care that addresses multi-organ system involvement, adverse events, and patient preferences. The objectives of sarcoidosis treatment include limiting end organ damage, lessening symptom burden, and improving health-related quality of life (HRQoL). The ABCDE model has been proposed as a rubric by which to structure sarcoidosis management and highlights the need for multidisciplinary care.[2] The following elements are included: assessment of symptoms and patient's needs, backing patients with support and education, treatment of symptoms and co-morbidities, and instituting disease-modifying treatment by extrapulmonary specialists. Many factors influence HRQoL in sarcoidosis including duration of disease, disease burden, older age, female sex, fatigue, dyspnea, pain, depression, cough, small fiber neuropathy, and corticosteroid use.[3]

Access to diverse expert providers should improve HRQoL, which can be especially impacted in sarcoidosis related to wide-ranging systemic manifestations and frequent use of corticosteroids. The interdisciplinary team should comprise the necessary physicians, potentially including pulmonary, dermatology, ophthalmology, rheumatology, cardiology and car-



Clinical Care
- Reduce mortality
- Prevent end organ damage
- Improve quality of life
- Improve communication
- Reduce health care disparities

Teaching
- Disseminate knowledge of current best practices
- Train current and future health care providers on best practices
- Improve screening practices

Research
- Improve understanding of sarcoidosis mechanisms
- Develop and test new therapies
- Recruit diverse research patients that reflect disease demographics

Community Engagement
- Provide high-quality, accessible medical information to patients
- Partner with patients to raise awareness about sarcoidosis
- Decrease feelings of isolation, distress, and anxiety
- Improve skills to cope with challenges

FIGURE 1. The four pillars of a sarcoidosis center include clinical care, research, teaching, and community engagement.

diac electrophysiology, neurology, and endocrinology (Figure 2). This comprehensive approach improves the efficiency of patient care ("one-stop shopping"), improves communication between providers, and increases cost-effectiveness. By coordinating provider clinic visits and testing, the financial and time costs of health care can be decreased, reducing important barriers for low-income patients and those with limited transportation.

Access to multidisciplinary care is urgently needed to reduce health care disparities including differential mortality rates in minorities. The highest age-adjusted death rates occurs among black females (17 per 1,000,000) and black males (12.4 per 1,000,000).[4] Other studies have replicated the finding that sarcoidosis-related deaths are highest in females and non-Hispanic blacks.[5] Race-specific trends of higher mortality at younger ages in black patients may be attributed to increased severity and incidence of disease, higher likelihood of pulmonary fibrosis and pulmonary hypertension, and long-standing health and social inequities.[6] Identification and resolution of risk factors like socioeconomic status, lack of insurance and financial barriers may lead to improved outcomes.

Data supports that multidisciplinary care can improve outcomes and reduce disparities in other diseases. One study evaluated the effect of a multidisciplinary clinic (MDC) on the outcomes of patients with pancreatic cancer, stratifying patients into quintiles based on socioeconomic status (SES).[2] They found that low SES correlated with inferior survival for the non-MDC patients (17 vs 32 months; $p<0.001$), but not for the MDC patients (24 vs 25 months ; $p=0.33$). In an analysis of 4451 men with prostate cancer, black men with intermediate-risk and high-risk disease treated in a MDC were more likely to receive definitive therapy than white men, but the opposite was true when compared to a database of US national trends.[3] This study suggests that when presented with treatment options by a multidisciplinary team, -black men may opt for more definitive treatment choices. While the benefits of a MDC in sarcoidosis have not been studied, research suggests that such clinics can impact outcomes and minimize disparities.

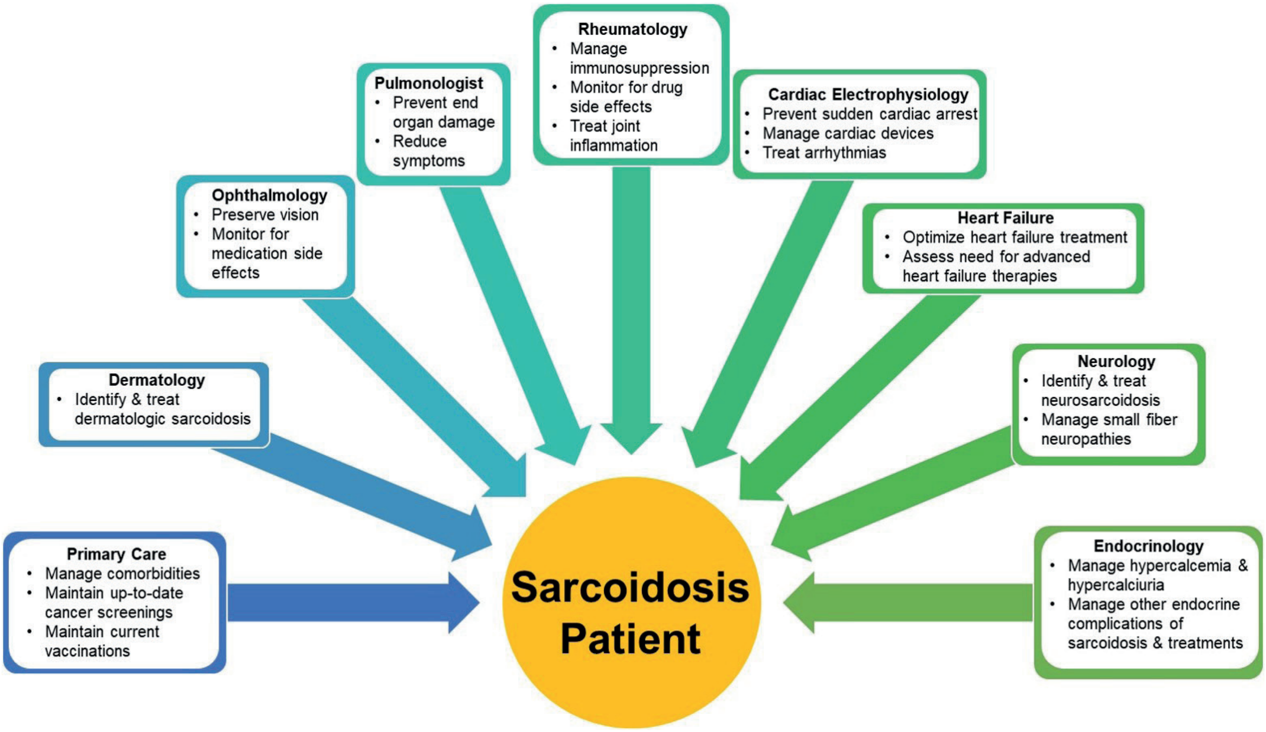


Figure 2. The members of the interdisciplinary team that may care for a sarcoidosis patient are shown.

Managing Comorbidities

Managing co-morbidities in sarcoidosis patients may help to improve quality of life and survival. A case-control study in Sweden showed that patients with sarcoidosis are at higher risk of co-morbidities and mortality than matched controls as well as the general population. [4] In a cohort study of 557 patients with histologically-confirmed sarcoidosis, the mean number of co-morbidities was significantly higher in the groups of non-survivors compared with survivors.[5] Co-morbidities also have significant negative influence on exercise tolerance and daily physical activity.[6] Data from the international Cardiac Sarcoidosis Consortium showed that traditional risk factors including hypertension, diabetes, chronic kidney disease, coronary artery disease, emphysema, and advanced heart failure are associated with poor outcomes in cardiac sarcoidosis (CS) patients.[7] Corticosteroids, the most common therapy for sarcoidosis can cause a myriad of side effects that can worsen a patient's metabolic profile, including hypertension, diabetes, and weight gain. Multidisciplinary teams can work to optimize medical management of comorbid conditions in sarcoidosis. Future research is needed to determine whether aggressively treating comorbid risk factors may improve outcomes in sarcoidosis patients.

Screening for Extrapulmonary Sarcoidosis

Ophthalmologic screening to preserve vision

Sarcoidosis clinics can encourage and provide regular screening for ocular sarcoidosis. Estimates suggest 30-60% of patients with sarcoidosis develop ocular involvement.[8] Goals of ophthalmologic screening and monitoring should include identifying and treating ocular sarcoidosis as well as identifying and treating other ocular conditions which may be related to sarcoidosis therapies, with the ultimate objective of preserving vision. There are no specific published guidelines recommending when and how often to screen. Most commonly, patients with ocular sarcoidosis present with uveitis; symptoms include light sensitivity, pain, and acute onset blurry vision. They can also present with lacrimal gland enlargement and optic neuritis. Black patients present with sarcoidosis at a younger age and are more likely to have uveitis and other ocular findings.[8] The sarcoid ophthalmologist can also monitor for medication side effects, including development of glaucoma or posterior subcapsular cataract formation related to prednisone use, hydroxychloroquine retinopathy ("bull's-eye maculopathy"), and amiodarone eye effects which may include optic neuropathy. Some patients with evidence of active or prior ocular inflammation may have mild or no symptoms. In our clinic, we recommend baseline ophthalmologic screening at the time of sarcoidosis diagnosis and yearly follow-up exams.

Screening for cardiac sarcoidosis to prevent sudden death

Cardiac involvement occurs in up to 25% of patients with sarcoidosis and can lead to life-threatening bradyarrhythmias, tachyarrhythmias and heart failure.[9] In a nationwide study from Finland, nearly two-thirds of all fatalities from CS were caused by undiagnosed granulomas in the heart.[10] Sudden cardiac death can be the presenting manifestation of CS in 14% of patients.[10] The 2014 Heart Rhythm Expert Consensus Statement supports screening all patients with biopsy-proven sarcoidosis in any organ system with a simple algorithm evaluating for symptoms (including significant palpitations, presyncope, or syncope), electrocardiogram (ECG) abnormalities and echocardiogram abnormalities.[9] If any of the three is abnormal, then advanced imaging with either cardiac magnetic resonance imaging or ^{18}F-fluorodeoxyglucose-positron emission tomography (FDG-PET) scan is recommended. If all three are normal, the patient has a low probability of cardiac sarcoidosis. It is not known when and how often to repeat screening in patients who are deemed "low risk" by this algorithm. Patients who have cardiac sarcoidosis can then be assessed for risk of life-threatening arrhythmias and the risks and benefits of defibrillator implantation considered. In practice, there are multiple approaches to assessing risk, including invasive electrophysiology studies, cardiac magnetic resonance evaluation of scar burden, and prolonged ECG monitoring.

Promoting compliance with vaccination recommendations/guidelines

Typically, guidance on vaccination is provided to patients by their primary care physicians. However, immunocompromised patients have special considerations as they are at higher risk for infections as well as higher risk for poor outcomes from such infections. They should thus be advised on infection prevention by their sarcoidosis specialists based on the recommendations by the Centers for Disease Control. Vaccination guidelines for influenza, pneumococcal, zoster, and tetanus are well documented.[11] Though recommendations for the coronavirus disease 2019 (COVID-19) vaccine are evolving as we learn more about the virus and the body's immune response to the vaccines, sarcoidosis clinics should continue to stay abreast of current recommendations to properly counsel their patients.

Research

Based on the heterogeneity of clinical presentations and outcomes, sarcoidosis is a challenging disease entity to study. There remain critical knowledge gaps in the understanding of the etiology, genetic basis, immunologic mechanisms, optimal care strategies, imaging approaches and optimizing outcomes and quality of life in sarcoidosis. By serving as a referral center and providing coordinated care across multiple disciplines, sarcoidosis centers are well situated to participate in clinical and translational research. Development and participating in research is critical to improve the understanding and treatment of sarcoidosis. Sarcoidosis centers should aim to partner with patients to give opportunities to participate in studies and clinical trials. While the individual risks and benefits must be considered by the potential participant and the research team, there are multiple psychosocial facilitators that influence participation, including personal benefits (including therapeutic benefits, closer monitoring, access to new treatments, and gaining knowledge of their own health), altruism (including benefits to science, helping others, and financial benefit or incentives).[12]

Recruiting Diverse Patients

Recruiting and retaining diverse research participants in sarcoidosis trials is critically important to understand the disease process in the patients who are most adversely affected. Despite suffering a higher disease burden and worse outcomes, black patients are often underrepresented in sarcoidosis clinical research.[13] Research teams should seek to enroll patients who are representative of the demographics of sarcoidosis patients in their geographic area. VCU serves an inner-city population with a large percentage of black patients. We have demonstrated the feasibility of successfully enrolling diverse cardiac sarcoidosis patients in prospective research and clinical trials (Table 1).[14] Of 121 patients enrolled in prospective CS research at VCU, more than half were female (n=62, 51%) and 69 (57%) were black/African-American. Additionally, research should focus on identifying barriers that lead to underrepresentation of women and minorities in sarcoidosis research and determine specific approaches to overcome these challenges.

Teaching

Engaging learners at multiple levels is critical to train future health care providers on current best practices and ensure an ongoing availability of specialty-trained providers. In the clinic and hospital, bedside teaching by sarcoid specialists can help highlight state-of-the art practices, the importance of communication with the patient, family members and other health care providers, and awareness of health care disparities that lead to worse outcomes for women and minorities. Participation in didactics at a local, regional and national level can help increase awareness of sarcoidosis diagnostic strategies and management of complex patients. Medical students, residents, subspecialty fellows, practicing physicians, and advanced-practice providers should receive education on sarcoidosis management. Screening practices can be improved through participation in multidisciplinary education sessions, including grand rounds in other departments such as dermatology and neurology, complex case presentations and discussion, and didactic and research presentations at regional and national

Table 1. Enrollment of cardiac sarcoidosis patients in prospective research at Virginia Commonwealth University is shown by sex and race. More than half of study patients were female and 57% were black/African-American. *The MAGiC ART study is a multicenter study with enrollment at Virginia Commonwealth University and University of Michigan.

Study	Study Design	Patients enrolled	Female	Male	Black/African American	White
Cardiac Sarcoidosis Consortium	International Multicenter Prospective Registry	80	38 (48%)	42 (52%)	48 (60%)	29 (36%)
Circulating Levels of Fibrocytes in Cardiac Sarcoidosis	Prospective evaluation of peripheral blood fibrocyte and activated phenotype levels	25	14 (56%)	11 (44%)	13 (52%)	11 (44%)
Cardiac Sarcoidosis Randomized Trial (CHASM-CS-RCT) NCT03593759	Randomized controlled trial of prednisone vs. methotrexate/ prednisone	3	1 (33%)	2 (66%)	0 (0%)	3 (100%)
Multimodality Assessment of Granulomas in Cardiac Sarcoidosis - Anakinra Randomized Trial (MAGiC-ART) NCT04017936	Randomized controlled trial of Interleukin-1 blockade vs. standard of care	13*	9 (69%)	4 (31%)	8 (62%)	5 (38%)
Total		**121**	**62 (51%)**	**59 (49%)**	**69 (57%)**	**48 (40%)**

meetings. Sarcoidosis specialists may also participate in patient-facing education, which can help provide patients and caretakers with high-quality, audience-appropriate information and disseminate resources for patients to understand their disease.

Community Engagement

In addition to healthcare provider education, community awareness of sarcoidosis can also be very impactful. Sarcoidosis patient focus groups reported the following barriers to care: perceived inadequate knowledge about sarcoidosis among providers, communication barriers with providers, and the high cost of treatment. Patient efforts to overcome these barriers included independent learning, self-advocacy, medication non-adherence and use of alternative treatments.[15] Interventions targeted at patients that may improve socioeconomic disparities include promoting self-management and education focused on symptom recognition, treatment options, and side-effect management, with educational programs that are available to patients regardless of socioeconomic status.[13]

Sarcoidosis specialists can help patients, family members, and others learn about the impact of sarcoidosis through venues that help raise awareness of this chronic illness, such as public health forums, health fairs, or support groups. Patient support groups, though not specifically studied in sarcoidosis and other rare diseases, have been shown to have some perceived benefits in chronic illnesses. Support groups provide a forum for patients to interact with others who have the same disease, and allows them to give and receive emotional support for their experiences. These groups can provide an alternative source of information about their disease and therapy, and can also pave a road to healthcare advocacy. Patients who participated in support groups felt better informed about their disease, had an enhanced sense of well-being and self-esteem, and had improved confidence in their treatment plan and in their relationship with their physician. A small number of patients also reported an improved acceptance of their illness. Overall, patients reported an enhanced social well-being, improved confidence in their treatment and in their relationship with their physician, and an increased feeling of control over their future after participating in support groups.[16] In patients with rheumatic diseases who were taught coping mechanisms versus those in a control group, there was noted to be less loneliness and some increase in life satisfaction.[17] Online support groups, an alternative to face-to-face meetings, can have other benefits such as increased access, anonymity, and diversity. However, it can be difficult to control the accuracy of the information that patients access. Patients may also experience nonverbal miscommunication or inflammatory comments from other members.[18] With the ongoing COVID-19 pandemic, having virtual support options for patients may be advantageous.

SUMMARY

In the process of building a sarcoidosis clinic, we identified four pillars of patient-centered sarcoidosis clinic: clinical care, research, teaching, and community outreach. Each of these facets plays a critical role in improving the health of individual sarcoidosis patients, creating strong infrastructure to improve the future of sarcoidosis treatment, and developing community-based resources that can empower patients and diminish feelings of isolation. Access to multidisciplinary sarcoidosis centers of excellence may be not only helpful but necessary for those patients with difficult diagnoses and challenging treatment decisions. Beyond this, patients cared for in such an environment stand to benefit from increased efficiency of care delivery, improved clinical outcomes, improved quality of life, and access to cutting-edge research. Perhaps most importantly, such expert care likely reduces mortality and healthcare disparities, which is of paramount importance in the current era of sarcoidosis treatment.

LIST OF ABBREVIATIONS: CHASM-CS-RCT: Cardiac Sarcoidosis Randomized Trial; CS: Cardiac sarcoidosis; COVID-19: coronavirus disease 19; ECG:electrocardiogram; HRQoL: health-related quality of life; MAGiC-ART: Multimodality Assessment of Granulomas in Cardiac Sarcoidosis - Anakinra Randomized Trial; MDC: multidisciplinary clinic; SES: socioeconomic status; VCU: Virginia Commonwealth University; WASOG World Association of Sarcoidosis and Other Granulomatous Disorders

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