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Case Report

Multidisciplinary management of chronic obstructive pulmonary disease exacerbation in a veteran with chronic kidney disease Stage 5, coronary artery disease, and agent orange exposure

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ABSTRACT

Chronic obstructive pulmonary disease (COPD) exacerbations are a leading cause of morbidity and mortality, particularly in patients with systemic comorbidities such as chronic kidney disease (CKD) and coronary artery disease (CAD). A 68-year-old male presented with acute dyspnea, peripheral edema, and hyperkalemia. Imaging revealed pulmonary congestion, and lab findings confirmed CKD Stage 5 and troponin elevation. This case highlights the complexity of managing a severe COPD exacerbation in a veteran with CKD Stage 5 and CAD, compounded by a history of Agent Orange exposure.

Keywords: Agent orange, chronic kidney disease stage 5, chronic obstructive pulmonary disease exacerbation, coronary artery disease, multidisciplinary management.

Chronic obstructive pulmonary disease (COPD) is a chronic and progressive disease characterized by airflow limitation, commonly associated with acute exacerbations that significantly impact patients' quality of life and healthcare utilization. When compounded by systemic comorbidities such as chronic kidney disease (CKD) and coronary artery disease (CAD), the management of COPD becomes exceedingly complex. The interplay between these conditions creates a cascade of systemic inflammation, metabolic disturbances, and cardiovascular strain, significantly worsening prognosis.[1] In addition to the direct impact of these comorbidities, the presence of Agent Orange exposure in this case raises the question of long-term environmental and occupational risk factors that predispose individuals to chronic diseases.[2,3]

Effective management of COPD exacerbations in such patients requires a nuanced understanding of the underlying disease mechanisms and a multidisciplinary approach to care. Guidelines for COPD management emphasize the importance of addressing comorbidities alongside respiratory symptoms, as untreated systemic conditions can exacerbate the frequency and severity of COPD exacerbations.[4] Chronic kidney disease is particularly problematic in these patients, as it limits the choice and dosing of pharmacological agents due to altered drug metabolism and excretion.[5] Similarly, CAD complicates the management of COPD by increasing the risk of adverse cardiovascular events associated with common therapies like bronchodilators and corticosteroids.[6,7]

This case report explores the case of a veteran with severe COPD exacerbation, CKD Stage 5, and CAD. By applying current evidence-based practices, the care team was able to navigate the challenges of multimorbidity and optimize patient outcomes. The case serves as a model

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for integrating specialty care to address complex medical scenarios.

CASE REPORT

A 68-year-old male veteran with a history of severe COPD, CKD Stage 5, and CAD presented to the emergency department with acute dyspnea, wheezing, and peripheral edema. The patient reported a history of Agent Orange exposure during military service, which has been linked to long-term adverse health effects, including increased risks for respiratory, renal, and cardiovascular diseases.[3,8] He had a prior history of frequent hospitalizations for COPD exacerbations and was receiving home oxygen therapy. His medications included a long-acting bronchodilator, a beta-blocker, and a diuretic, but adherence was suboptimal due to depressive symptoms and complex care needs. Written informed consents were obtained from the patients.

On examination, the patient was in acute respiratory distress, with an oxygen saturation of 85% on room air and bilateral wheezing on auscultation. Laboratory tests revealed a significantly elevated creatinine level (6.8 mg/dL) and hyperkalemia (5.8 mmol/L), consistent with CKD Stage 5. Troponin levels were elevated, raising concern for concurrent cardiac ischemia. Imaging showed hyperinflated lungs, cardiomegaly, and evidence of pulmonary congestion. The clinical picture suggested a COPD exacerbation complicated by cardiorenal syndrome.

Initial management focused on stabilizing respiratory function with nebulized bronchodilators, systemic corticosteroids, and supplemental oxygen. Intravenous diuretics were administered cautiously to manage fluid overload without exacerbating renal dysfunction. Cardiology was consulted to address the troponin elevation and optimize cardiovascular management. The multidisciplinary approach facilitated timely interventions and mitigated potential complications.[9,10]

Management

The management of this patient's COPD exacerbation required careful coordination among multiple specialties to balance the risks and benefits of treatment. Inhaled bronchodilators were administered to relieve airway obstruction, but the selection of agents was influenced by the patient's CAD and CKD. Long-acting beta-agonists and anticholinergics were used judiciously, as these therapies carry a risk of cardiovascular adverse events, particularly in patients with significant cardiac history.[8] Corticosteroids were initiated to reduce airway inflammation, following evidence that supports their efficacy in reducing the duration and severity of exacerbations.[11] However, the dosing was carefully adjusted to minimize hyperglycemia and fluid retention, which could exacerbate CAD and CKD.

Diuretic therapy was a cornerstone of management for this patient's fluid overload, but its use required close monitoring of renal function and electrolytes to avoid further deterioration of kidney function.[9] This aligns with recent guidelines that emphasize the importance of personalized diuretic regimens in managing cardiorenal syndrome.[10] The patient was transitioned to oral diuretics as his condition stabilized, with nephrology closely monitoring his renal parameters.

Anticoagulation was withheld due to the heightened risk of gastrointestinal hemorrhage, a common complication in patients with combined COPD and CKD.[12] Instead, efforts were made to optimize other cardiovascular risk factors, including blood pressure and lipid control. Depression was also addressed with the initiation of a selective serotonin reuptake inhibitor and coordination with mental health services. Studies indicate that treating comorbid depression can significantly improve adherence to medical therapy and the overall quality of life in COPD patients.[8,11]

DISCUSSION

This case underscores the intricate challenges of managing COPD exacerbations in patients with advanced CKD and CAD, particularly when compounded by a history of environmental exposures such as Agent Orange. The interplay between these conditions creates a cascade of systemic effects that complicate pharmacological management and increase the risk of adverse outcomes.

Chronic kidney disease exacerbates the inflammatory burden associated with COPD

by contributing to systemic inflammation and oxidative stress, which are already heightened in COPD due to airway damage and recurrent exacerbations.[5] Chronic kidney disease further complicates management through its impact on drug metabolism and excretion. For example, renally excreted medications, such as certain beta-agonists and corticosteroids, require careful dose adjustment to avoid toxicity. The accumulation of inflammatory cytokines in CKD patients amplifies respiratory inflammation, thereby worsening COPD outcomes. Evidence shows that CKD patients with COPD have a higher frequency of hospitalizations and poorer survival rates compared to those without CKD, underscoring the importance of individualized therapy in these populations.[5,6]

Coronary artery disease introduces an additional layer of complexity. Many pharmacological treatments for COPD, including long-acting beta-agonists and systemic corticosteroids, are associated with cardiovascular risks, such as tachyarrhythmias and ischemic events.[6,8] Patients with CAD are more susceptible to these adverse events, requiring a cautious approach to therapy. The literature highlights the importance of using cardioselective beta-blockers and titrating inhaled bronchodilators to balance the need for symptom relief with the risk of exacerbating cardiac complications.[8] Recent studies suggest that combining therapies such as inhaled corticosteroids with bronchodilators can reduce COPD exacerbation frequency without significantly increasing cardiovascular risks, but this requires careful selection of agents and close monitoring.[8,9]

The role of multidisciplinary care is critical in addressing these complexities. A coordinated team approach involving pulmonologists, nephrologists, and cardiologists ensures that treatments are tailored to the patient's unique pathophysiology. For instance, nephrologists play a pivotal role in managing fluid balance through diuretics, which must be adjusted to prevent worsening renal function while alleviating fluid overload from pulmonary edema.[10] Cardiologists contribute by optimizing cardiovascular medications to support cardiac function while minimizing interactions with COPD therapies. Pulmonologists oversee the adjustment of bronchodilator regimens to maximize respiratory benefits without aggravating cardiovascular risks. This collaborative model is supported by evidence showing that multidisciplinary care reduces hospitalizations and improves overall survival in patients with multimorbidity.[11]

Agent Orange exposure adds another layer of complexity to this patient's systemic disease burden. Studies link exposure to dioxins, a key component of Agent Orange, with increased risks of developing chronic diseases, including respiratory, renal, and cardiovascular conditions.[3,4] Dioxins act as endocrine disruptors and are thought to promote systemic inflammation and oxidative stress, contributing to the development and progression of COPD and CKD. Veterans exposed to Agent Orange are at greater risk for multimorbidity, making targeted screening and early interventions essential.[3] Comprehensive assessment of environmental exposures should be part of routine care for veterans and similar high-risk populations, as this can guide tailored interventions to mitigate the long-term effects of toxic exposures.

The long-term management of multimorbidity in such cases requires innovative strategies. Current evidence highlights the importance of integrating chronic disease management programs, which focus on patient-centered care and proactive monitoring to prevent exacerbations.[9,11] For instance, telemedicine initiatives and structured follow-up plans have been shown to improve adherence to treatment and reduce the frequency of hospitalizations in patients with COPD and CKD.[11] Incorporating mental health services is also essential, as untreated depression and anxiety can lead to poor adherence and worse outcomes. Evidence suggests that addressing mental health needs can improve the overall quality of life and treatment engagement in patients with multimorbidity.[8,11]

Future research should focus on refining these strategies to better address the needs of high-risk populations. For example, precision medicine approaches that tailor treatments to individual genetic and environmental factors could optimize outcomes in patients with

overlapping conditions like COPD, CKD, and CAD.[3] Additionally, studies exploring the long-term effects of environmental exposures on disease progression could inform targeted prevention efforts. In the context of veterans, enhanced surveillance and comprehensive care programs could address the unique challenges posed by multimorbidity and environmental risk factors, improving long-term outcomes and quality of life.

This case exemplifies the challenges and opportunities in managing complex medical scenarios involving COPD exacerbations, CKD, and CAD. By integrating evidence-based guidelines with personalized care plans, multidisciplinary teams can navigate these complexities and optimize patient outcomes. The role of environmental exposures like Agent Orange highlights the importance of addressing broader social and occupational factors in chronic disease management. As healthcare systems continue to evolve, the integration of multidisciplinary and precision approaches will be pivotal in advancing care for patients with multimorbidity.

In conclusion, managing COPD exacerbations in patients with advanced CKD and CAD requires a nuanced approach that integrates evidence-based guidelines with individualized care. This case highlights the importance of a multidisciplinary team in addressing the interconnected pathologies of respiratory, renal, and cardiovascular systems. The application of personalized treatment plans, informed by the latest research, underscores the potential to improve outcomes in complex medical scenarios. Continued efforts to integrate specialty care and address environmental exposures are essential for advancing the management of multimorbidity.

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