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Interstitial lung disease; a need for oxygen concentrator rental business in Nigeria?

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Abstract

Background: Patients with chronic obstructive airway diseases often need domiciliary oxygen supply.
Case report: We report an elderly woman with interstitial lung disease that was dependent on intranasal oxygen. We discuss the need for rental oxygen concentrator business in Nigeria.

Key words: Interstitial lung disease, Oxygen concentrator rental, respiratory distress

Key Message: Rental oxygen concentrator business will make oxygen concentrators affordable in Nigeria.

Case report

An elderly female presented to the accident and emergency with cough and recurrent breathlessness for three months and swelling of the legs for three weeks. The cough was insidious in onset, productive of copious milk-coloured sputum, not associated with hemoptysis while breathlessness was initially on exertion but worsened to occur at rest, with orthopnea and easy fatigability. Three weeks to presentation she developed leg swelling. She had a similar episode of breathlessness and cough three years ago. There was no fever, weight loss or night sweats. She had no previous history of heart disease, smoking or tuberculosis and no family history of asthma or chronic obstructive airway disease. She looked acutely ill, dyspneic, had bilateral pitting leg edema up to the upper third. Her blood pressure was 120/80mmHg. Pulse was 110/minute, temperature 36.7°C, respiration 40/minute, elevated jugular venous pulsation, crepitations scattered over the middle and bibasal lung zones and mild epigastric tenderness.
Her oxygen saturation before commencement of oxygen was 74% and oxygen saturation was 84% on intranasal oxygen at 5L/minute. Investigations results were as follows: Serum electrolyte urea and creatinine showed serum creatinine 0.9mg/dl (0.5-1.5), urea 39mg/dl (13-43), sodium 134.9mmol/L (135-145), potassium 4.6mmol/L (3.5-5.5) chloride 108.0mmol/L (98-115), Fastng Lipid Profile showed HDL-Cholesterol was 77mg/dl, LDL-Cholesterol 100mg/dl, total cholesterol 198mg/dl, triglyceride 113mg/dl. Fasting blood sugar was 74mg/dl. Electrocardiogram showed sinus tachycardia. Chest radiograph showed cardiomegaly, unfolded aorta, upper lobe diversion, and mixed alveolar and interstitial shadowing (Figure 1). Two-dimensional echocardiogram showed dilated right chambers, moderate tricuspid regurgitation and pulmonary hypertension (pulmonary artery systolic pressure 51mmHg). Ejection fraction was 66.9% and fractional shortening 46.9%.
An impression of chronic obstructive airway disease with cor pulmonale and respiratory failure type 1 was made. The following treatments were administered: intravenous frusemide 40mg twice daily, tablet spironolactone 25mg daily, nebulised

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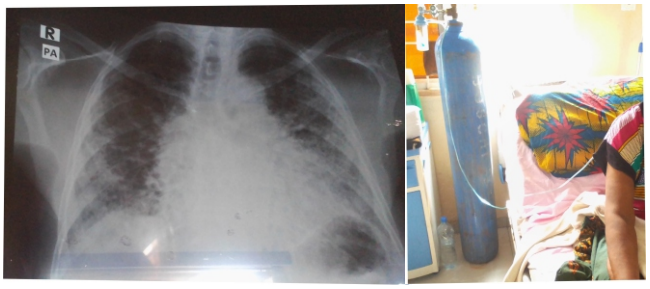

Figure 1: Evidence of interstitial lung disease and oxygen supply via cylinder

salbutamol 5mg with ipratropium 2.5mg, intravenous dexamethasone 4mg eight-hourly for forty-eight hours, intranasal oxygen at 5L/minute (Figure 1), and subcutaneous enoxaparin 80mg twice daily.

After seventeen days on admission, she was still desaturating with oxygen saturation of 87% on intranasal oxygen. Widespread bronchial breath sounds were present with scanty crepitations. Intravenous Frusemide was stopped, oral frusemide at 80mg daily, Sildenafil 50mg twice daily was added, with steroid and long-term bronchodilator inhaler twice daily. The relatives were advised to arrange for an oxygen concentrator for use at home, as patient was dependent on oxygen, which was likely to continue long-term.

Discussion

Oxygen availability and affordability is a problem in sub-Saharan Africa. This portends a mortality concern for patients with respiratory failure. A study of twenty-two countries in the region showed that availability of oxygen delivery systems ranged from 42%-94% between facilities, with wide variability in the consistency of availability. Oxygen concentrators however have been recognized as the most cost-effective delivery system where power is readily available.[1]

A recent study in Nigeria[2] found that estimated 5-year cost-effectiveness of concentrators was US$86 per patient treated, $2694-4382 per life saved and $82-125 per disability-adjusted life year-averted for a median of 10 797 hours. This demonstrates the affordability issue faced by patients needing domiciliary oxygen supply. In a study of oxygen provision for neonates with respiratory distress, oxygen supply were delivered by oxygen pipeline in 70%, cylinders 10.9%, concentrators in 12.3% and mixed sources in 6.7%.[3] For a mean duration of 5.4 days, mean cost was ₦37,645 ($25) or ₦6,971 ($4.65)/day. This further highlights the high cost of oxygen delivery in low resource settings. Medical oxygen delivery in Sub-Saharan Africa is further impeded by distance from production centers, under-maintained infrastructure, and a fragmented supply chain.[4]

Rich families procure oxygen concentrators for relatives with domiciliary oxygen need. These expensive machines are abandoned in most homes in sub-Saharan Africa, and maintenance and turn-over services are often not available. Renting will spare patients the need of purchasing entire machines, spreading out the cost over the larger pool of elderly patients that will need domiciliary oxygen support. Oxygen renting has been reported to reduce cost to about half that of the traditional oxygen tanks or liquid-oxygen systems.[5,6] It is therefore encouraged as a new business opportunity meeting a patient need.

Oxygen rental business, however, does not come without challenges. Vendors are expected to take operational (including user training) and safety responsibilities for concentrators.[7] Biomedical engineering departments of large hospitals can assure performance standards, and use qualified rental vendors as their preferred suppliers.[8]

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