SICKLE CELL DISCOVERY HANDBOOK

Crisis Prevention, Reversal and Management

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For Physicians, Healthcare workers, Patients, Caregivers and Families

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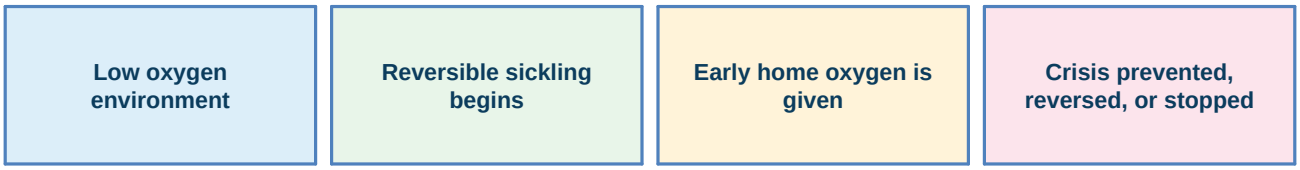
The right treatment Inhalation oxygen	**The right place** At home	**The right time** The golden half hour

Website: sicklecelldiscovery.com

Golden Half Hour Mechanism



Core Treatment Model

Reactive paradigm	Preventive paradigm
Hospital treatment starts late	Patient and family respond early
Irreversible vaso-occlusion has already occurred	Home oxygen is started in the golden half hour
Pain, anemia, and organ injury are already underway	Reversible cells are restored before severe crisis develops

Foundation of Dr Sota Omoigui's Discovery (www.sicklecelldiscovery.com):

The right treatment – inhalation oxygen, in the right place – at home, at the right time – the golden half hour

Sickling

Under conditions of low oxygen - hypoxic stress (HgbS containing sickle cells) undergo shape transformation to the characteristic sickle form, progress from reversible to irreversible cells, become inflexible, obstruct the blood flow and then have to be destroyed to restore blood flow, resulting in a drop in hemoglobin.

Hgb S polymerization (sickling) under hypoxia (low oxygen) induced stress is not a single phenomenon but a two stage process, with an initial phase that is reversible by reoxygenation. See Scriver and Waugh in 1930, Franck and Chiu in 1983, Robert Hebbel in 1991, Zipursky et al in 1992, Melanie Gonick in 2015, Sota Omoigui in 2024 and 2025.

Time critical reoxygenation with home oxygen, administered in the golden half hour (30 minutes) can prevent, reverse and stop a sickle cell crisis. The consistent and rapid responses across age, geography, and severity validate the Omoigui time-sensitive model of oxygen therapy. Inhalational oxygen provided in the right place - at home, and at the right time- the golden half hour

Reactive Paradigm: By the time patients are in the hospital, they are already in an irreversible crisis and what is being implemented is the same reactive paradigm of the last 100 years after the vaso-occlusion from irreversible sickle cells had occurred and damage to all the organs was already occurring.

Pain is predictable. The greatest occurrence of a low oxygen environment occurs during sleep. Hargrove et al in 2003 concluded that low nocturnal oxygen saturation was highly significantly associated with a higher rate of painful crisis in childhood ($P < .0001$). In a study by Chang et al in 2024, of 21 screened participants, nine (43%) had sufficient nocturnal hypoxaemia to warrant oxygen therapy.

A Century of Failure

Lanzkron et all (2013) used the National Center for Health Statistics multiple-cause-of-death files to examine age at death and calculate mortality rates from 1979 to 2005, in patients with sickle cell disease. The median age at death in 2005 was 42 years for females and 38 years for males. The overall mortality rate increased 0.7% ($p<0.001$) each year during the time period studied. The adult (>19 years of age) mortality rate increased by 1% ($p<0.001$) each year during the time period studied. The pediatric mortality rate decreased by 3% ($p<0.001$) each year during the time period studied. Increasing hospitalizations and readmissions, are most often due to vaso-occlusive crisis, and explain the increase in mortality rates for adults observed in this study.

Vaso-occlusive crisis are the gateway to the complications of sickle cell disease, including severe pain, anemia, acute chest syndrome, avascular necrosis, kidney damage and death. Over hydration with intravenous fluids results in fluid overload with pulmonary edema, which has a mortality rate similar to that of acute chest syndrome.

Preventing, reversing and stopping a vaso-occlusive crisis is the key to reducing hospitalizations, blood transfusions and all the other complications of sickle cell disease. No medication administered orally can prevent, stop or reverse a sickle cell crisis. Not even Hydroxyurea. Only home oxygen in the golden half hour can do so.

Therefore the present reactive paradigm of the medical establishment waiting to treat an irreversible sickle cell crisis, in the hospital has failed this population.

Inhalation Oxygen Specifications

Oxygen Equipment Summary

Oxygen cylinder	Oxygen concentrator
Minimum size: 680 liters E tank	Continuous flow only
Preferably larger M tank where feasible	Flow rate at least 1-2 liters/min
	Purity at least 90% +/- 3% across all flow rates
	Rechargeable battery recommended where power supply is erratic

Oxygen Cylinder

Minimum size 680 liters Etank, preferably bigger M tank

Oxygen Concentrator

• 1. Continuous flow only. Pulse dose not acceptable.

• 2. Flow Rate - At least 1-2 liters per min

• 3. At least 90% +- 3% purity across ALL flow rates. Concentrators with low quality sieve beds will have oxygen purity drop when flow rate increases.

• 4. Rechargeable battery - For those in Nigeria and due to erratic power supply.

Oxygen Safety

The safe use of oxygen therapy at home requires careful preparation and adherence to best practices. Below are key safety guidelines based on the provided materials:

1. Setup and Equipment

• Location: Keep oxygen equipment at least 6-10 feet away from open flames, heat sources, or electrical appliances to avoid fire hazards

• Ventilation: Place equipment in a well-ventilated area to prevent oxygen buildup, which increases fire risk

• Storage: Store oxygen cylinders upright and secure them to prevent tipping

2. Operational Safety

• Flow Rate Settings: Ensure the oxygen flow rate is set as prescribed by your healthcare provider. Improper settings can lead to insufficient oxygen or overexposure

• Monitoring Devices: Use a pulse oximeter to monitor blood oxygen levels regularly, ensuring the therapy is effective

3. Fire Safety Precautions

• No Smoking: Strictly prohibit smoking near oxygen equipment

• Fireproof Environment: Avoid using flammable products like petroleum-based ointments or alcohol near oxygen

4. Maintenance

• Regular Checks: Inspect oxygen equipment for leaks or malfunctions. Replace or repair faulty components promptly

• Battery Management: If using portable oxygen concentrators, ensure batteries are charged and maintain a backup

5. Emergency Preparedness

• Backup Plan: Have an alternative oxygen supply (e.g., cylinders) in case of equipment failure

• Contact Information: Keep emergency numbers, including oxygen suppliers and healthcare providers, readily available

6. Education and Training

• Train caregivers and family members on the proper use and handling of oxygen equipment to ensure safe and effective therapy

By following these guidelines, you can ensure the safe and effective use of home oxygen therapy for managing sickle cell disease or other conditions

Hydroxyurea

Akingbola et al found out in their 2018 study that a "fixed low-dose" regimen of 500 mg daily (10 mg/kg) of Hydroxyurea in adults to be just as effective as higher doses, with increases in hemoglobin F, reduction of pain crises, acute chest syndrome and blood transfusions, but with a lower chance of toxic side effects such as decrease in hemoglobin, decrease in white blood cells with increased risk of infection and decrease in platelets with increased risk of bleeding. (https://doi.org/10.1182/blood-2018-99-114990)

With home oxygen, the fixed low dose of 500 mg /day in adults, should work well with home oxygen and yet avoid the toxic side effects of Hydroxyurea.

Air Travel

The initial causation of hemoglobin polymerization (sickling) as due to hypoxia (low oxygen), was described by Hahn and Gillespie in 1927. Sea Level Baseline: The partial pressure of oxygen at sea level is roughly 159–160 mmHg (21% of (760 mmHg) total pressure). Aircraft cabins are pressurized to an "altitude" of 5,000–8,000 feet, which corresponds to a PO2 of approximately 118- 125 mmHg. Thus at 8,000 feet, the PO2 is about 74% of sea-level pressure. Starting after 10 mins of ascent in an aircraft, with an altitude greater than 10,000 feet, oxygen saturation in people with sickle cell disease drop from an average of 93 to 95% at sea level to 77% to 83%. Complications that have resulted in people flying without supplemental oxygen have included, pain crisis, avascular necrosis of the bones, splenic infarction and death even while still in the aircraft. The simplest solution, - Dr Sota Omoigui’s discovery of providing inhalational oxygen in the right place - in the aircraft, and at the right time- the golden half hour at take-off. And for the entire duration of the flight.

> Note: Use only continuous flow oxygen concentrators or compressed medical oxygen cylinders provided by the airlines. Do NOT use pulse dose oxygen concentrators as they have to be triggered by breath and do not provide sufficient oxygenation to prevent a crisis.

InFlight Flow rate: Children 0.5-1.5 lpm Adults - 1-2 lpm

Exercise

Exercise including soccer, basketball, cricket, gym, swimming etc may be done with the following caveats:

No sauna – excess heat can precipitate a crisis

Heated pools for swimming – cold water can precipitate a crisis

After exercise, use oxygen for at least one hour before sleep – whether in the daytime or night time.

Prevention of Crisis

• A/ Vaccination against pneumococcal infection- prevena vaccine (adult and children)

• B/ Vaccination against salmonella/Typhoid infection - Typhrix vaccine (both adult and children)

• C/ vaccination against meningococcal infections (especially the warriors who live in Savannah and Sahel regions of Africa eg northern Nigeria)

• D/ Effective Antimalarial prophylaxis - (use of Paludrin) in combination with effective malaria infection control measures - regular use of insecticide treated bed nets, netting of all the doors and windows in the house, regular use of mosquito insecticides, good environmental sanitation - regular refuse disposal and prevention of water logs around the house etc in order to prevent mosquito bites which are the vectors of malaria parasites.

• D/ Hydroxyurea at low fixed dose of 500 mg daily with frequent monitoring for side effects together with the other routine medicines

• E/ Home oxygen therapy in the golden half hour at the earliest signs of crisis or after exposure to any of the triggers of the crisis.

• F/ Healthy lifestyle Behaviour -

1/ Avoidance of toxic substances and behaviour - Alcohol consumption, cigarette smoking, street drugs use, reckless sexual activity, coffee and caffeinated drinks

2/ Healthy dietary Protocol - consumption of all the vegetables and fruits in season generously without exemption. Minimise the consumption of processed and ultra processed foods etc

3/ Effective mental healthy management - avoiding negative emotions - anger, bitterness, anxiety, fear, depression etc and ensure positive emotions at all times - joy, peace, happiness, satisfaction, self confidence, etc

Use of Home Oxygen

When there is any stressor during the day, as listed below, the person should use oxygen as described:

Inhale oxygen for 10 minutes to 2 hours before sleep or use the oxygen for as long as needed for part or the entire duration of sleep.

Flow rate:

Children 0.5-1.5 lpm

Adults - 1-2 lpm

> Note: Sleep is the most dangerous time as the low oxygen environment will tip the person into a crisis:

Physical stress: eg from physical activity

Intellectual stress eg preparing for exams, writing papers

Environmental stress eg cold environment, high altitude, air travel

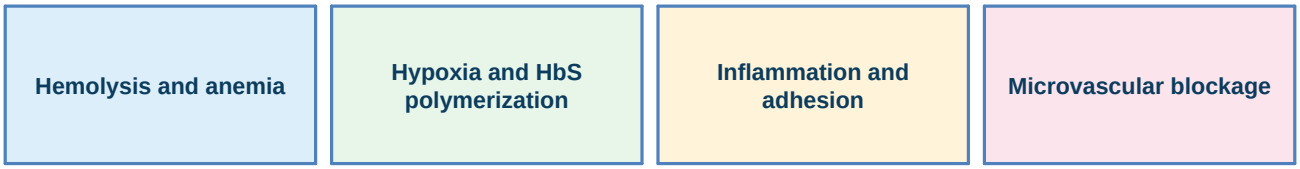
Physiological stress eg during sleep, excess heat, dehydration, pain, emotional stress, infection, malaria.

> Note: Infection and malaria, bone marrow suppression from toxic doses of Hydroxyurea or hemolytic crisis from antibodies in improperly cross matched blood transfusions, also need to be prevented and timely treated. Otherwise there will be more reversible sickle cells than oxygen can restore.

Treatment: use oxygen within the golden half hour to stop a crisis.

Mechanisms: How Malaria Triggers Sickle Cell Crisis

Malaria to Crisis Cascade



A. Increased Hemolysis → Severe Anemia

Sickle cell patients already have fragile RBCs. Malaria: Destroys infected RBCs. Also causes immune destruction of uninfected RBCs, Suppresses bone marrow temporarily

Result:

Rapid drop in hemoglobin → tissue hypoxia → sickling worsens.

This alone can trigger: Pain crisis, Acute splenic sequestration, Heart strain

B. Hypoxia Worsens Sickling

Malaria causes: Fever, Poor oxygen delivery, Metabolic acidosis

Low oxygen levels cause HbS to polymerize → RBCs sickle more.

This leads to: Vaso-occlusion, Severe bone pain, Organ ischemia

> Note: Home oxygen in the golden half hour could blunt hypoxia-driven sickling.

C. Inflammation Increases Vascular Adhesion

Malaria triggers massive inflammatory cytokines: TNF-alpha, IL-1, IL-6

Inflammation causes: Endothelial activation, Increased adhesion of sickled RBCs

Microvascular blockage. This significantly increases risk of: VOC, Acute chest syndrome, Stroke

D. Splenic Stress

Malaria heavily affects the spleen. In sickle cell: the spleen may already be enlarged (children) or fibrosed (adults). Malaria can cause: Splenomegaly, Acute splenic sequestration, Splenic rupture (rare but possible)

This may explain recurrent sequestration episodes in endemic regions.

E. Increased Blood Viscosity

Malaria causes: RBC rigidity, Clumping (rosetting). Sickle cell causes:

Deformed RBCs, Sluggish blood flow.

Combined effect: Microvascular blockage risk multiplies.

Clinical Consequences in SCD Patients

Complication	Why It Happens
Severe anemia	Massive hemolysis
Pain crisis	Hypoxia + inflammation
Acute chest syndrome	Lung inflammation + sickling
Stroke	Cerebral vessel occlusion
Acute kidney injury	Hemolysis + ischemia
Death	Rapid Hb drop + organ failure

Children under 5 are especially vulnerable.

Symptoms of Sickle Cell Disease in a 6 Months-2 years old Child

Infant Warning Signs

Urgent symptoms	Emergency red flags
Excessive crying or irritability	Enlarged spleen or abdomen
Swelling of hands and feet	Fast heartbeat or weakness
Fever above 38 C	Sleepiness or reduced responsiveness
Pallor, jaundice, poor feeding	Fast breathing or chest retractions

At this age, symptoms are often different from older children, because fetal hemoglobin (HbF) is still present but starting to decline.

1. Pain Crisis (Often the First Sign)

In infants, pain may not look obvious. Instead, you may see:

Excessive crying, Irritability, Refusal to move a limb, Fussiness when touched or carried.

Swelling of hands and feet

This is called dactylitis (hand-foot syndrome) and is often the first presentation.

2. Swelling of Hands and Feet

Usually occurs between 6 months and 2 years

Due to blockage of blood vessels in small bones

3. Fever

Fever is very dangerous in infants with sickle cell because:

They are at high risk of infection (especially pneumococcus)

The spleen may not work properly

Any fever > 38°C (100.4°F) should be treated as an emergency.

4. Pallor (Anemia)

You may notice:

Pale lips, Pale palms, Fatigue, Weak feeding

5. Jaundice

Yellowing of: Eyes, Skin

This happens because of rapid red blood cell breakdown.

6. Enlarged Spleen (Splenic Sequestration)

This is an emergency and requires proceeding immediately to the hospital.

Signs include:

Sudden weakness

Fast heartbeat

Enlarged abdomen

Child becoming sleepy or unresponsive

Rapid drop in hemoglobin

Parents should be trained to check spleen size daily, especially in infancy.

7. Poor Growth or Feeding

Refusal to breastfeed

Poor weight gain

Frequent illness

8. Breathing Symptoms

These may include: Fast breathing, Chest retractions, Grunting

Reduced oxygen saturation.

This can indicate:Acute chest syndrome, Severe anemia, Infection

Oxygen Flow Rate in a 6 Months-2 years old child with Sickle Cell

For infants, oxygen must be used carefully but early.

Recommended Initial Flow Rate

For home or emergency use:

• 0.5 to 1.5 L/min via nasal cannula

Most commonly:

Start at 0.5L/min to 1 L/min

Adjust based on symptoms

When to Use Oxygen in Infants

Use oxygen early if there is:

• Pain or irritability

• Fever

• Weakness

• Fast breathing

• Pale appearance

• Reduced feeding

• Signs of infection

• Before or during transport to hospital

Early use is especially important in resource-limited settings, such as in Nigeria

Duration

Use until symptoms improve

Continue during transport or medical evaluation

Can be used intermittently at home during early crisis

Safety Notes

Use humidified oxygen if possible

Monitor for nasal dryness

Avoid excessive high flow unless medically supervised

When Home Oxygen Does not Work

Please go to the hospital if your pain persists. It means something else is going on and there are more reversible sickle cells than oxygen can restore and these reversible cells will progress to irreversible cells and an intractable crisis.

You need to be worked up for the following:

Blood for Full Blood Count to check for PCV, wbc, platelets, reticulocytes to evaluate anemia from destruction of irreversible sickle cells, and any toxic effects of hydroxyurea

Blood for bacteria, viral or fungal culture, and TB test

Blood smear for malaria parasites

Coombs Test – Direct and Indirect to evaluate for hemolytic crisis (red blood cell destruction) due to antibodies in improperly cross matched blood transfusions

Urine for urine analysis, culture and sensitivity

Chest X-ray – to rule out pneumonia, TB

X-rays / CT-Scans of Hips and extremities to rule out avascular necrosis

Management of Crisis in the Hospital – Physicians Take Note

Hospital Management Priorities

Control pain immediately	Continuous oxygen by nasal cannula	Treat infection, malaria, and anemia	Use cautious hydration and targeted transfusion

Quick Haematological work up - CBC, LDH, indirect bilirubin, rectic count,

Microbiology - Rapid malaria test, widal reaction , urine m/c/so etc

• A/ Control Pain, Control Pain and Control Pain immediately. Failure to control pain results in increased mortality. Implement strong analgesia with pure opioids such as Morphine, Hydromorphone or Pethidine combined with anti-inflammatory such as Diclofenac. Ketamine should be used if pure opioids are not available. Obtain from your surgical Theater or Emergency Department. If your hospital does not have pure opioids, you can request from NAFDAC. Do NOT use Pentazocine or Tramadol as these drugs are ineffective, fail to provide pain relief, and will result in chest splinting, increased hypoxia, increased sickling and acute chest syndrome. Pentazocine is banned in the United States due to its psychiatric side effects.

In adults and children with SCD and a VOC being treated with opioids, monitor for excessive sedation by measuring sedation and oxygenation levels with pulse oximetry and an objective sedation scale.

Gradually titrate down parenteral opioids as VOC resolves.

DOSES – For weight based dosing, Use Max Weight of 50kg

> Note: Patient must be on Oxygen by Nasal Cannula: Continuous Flow at 0.5 -2 liters per minute. This is to prevent further progression of reversible sickle cells to irreversible sickle cells as well as prevent hypoxia from opioid induced sedation.

Monitor patients carefully for respiratory depression and other adverse effects of opioid therapy.

Hydromorphone (Dilaudid):

Slow IV: 0.5–2.0mg (0.01–0.04mg/kg) every 30 mins as needed

IM/SC: 2–4mg (0.04–0.08mg/kg) every 4–6 hours.

Rectal: 3mg every 6–8 hours.

Morphine:

IV: 2.5–10.0-mg. every 15–30 minutes as needed (Children, 0.05–0.2-mg/kg. Maximum10 mg.)

Infusion: 0.5–10.0-mg/hr. (Children, 10– 100-mcg/kg/hr.)

IM/SC: 2.5–15 mg. (Children, 0.05– 0.2-mg/kg. Maximum15 mg.)

PO: 10–30-mg every 4 hours as needed for pain.

Rectal: 10–20-mg every 4 hours.

Pethidine (Meperidine):

PO/IM/SC: 50–150mg (1–3mg/kg) every 3–4 hours.

Slow IV: 25–100mg (0.5–2.0mg/kg) every 3–4 hours.

Ketamine:

SQ/IM/IV 5 mg to 7.5 mg (0.1-0.15 mls) (children 0.1 mg/kg) administered every 30 mins as needed and as tolerated.

> Note: Ketamine may be utilized alone or to decrease the amount of opioids required as well as decrease their side effects, while providing effective pain control. Utilize Hydralazine (IV 5-20 mg) titrated as needed for elevated blood pressure.

Combine above opioids or Ketamine with an anti-inflammatory eg Diclofenac or Ketorolac

Diclofenac:

Adult: Deep IM: 75 mg, to be repeated after 6 hours if necessary

IV infusion: 75 mg over 30 to 120 minutes, to be repeated after 4 to 6 hours if necessary. Use a solution of 5% glucose or 0.9% sodium chloride and add 0.5 ml of 8.4% sodium bicarbonate per 500 ml.

Rectal Suppositories: 12.5 – 100 mg. Do not exceed 150 mg in 24 hours.

Max Dose 150 mg in 24 hours

Children (1-14 yrs)

Rectal Suppositories 0.5 to 2 mg/kg body weight daily in 2 to 3 divided doses.

Use only 12.5 mg or 25 mg suppositories

Do not exceed 150 mg in 24 hours.

Ketorolac:

IV/IM: 30mg (0.5mg/kg) every 6 hours as needed.

PO: 10–20mg stat then 10mg every 4–6 hours.

Maximum total parenteral dose (IV/IM): 120mg daily. Maximum PO dose: 40mg daily. IV doses should be infused slowly (>15 seconds) to reduce risk of phlebitis. Combined duration of use for parenteral and oral Ketorolac in all patients should not exceed 5 days.

• B/ Home oxygen in the golden half hour and continuous oxygen therapy until patient recovers

• C/ Oral hydration. Control pain and the patient can hydrate orally. Except where there is clinically significant dehydration, IV fluids should be administered cautiously as there is risk of harm in patients with cardiopulmonary compromise. Do not over hydrate with IV fluids as it can result in fluid overload and pulmonary edema which has a mortality rate almost equivalent to acute chest syndrome. Include blood transfusions in your fluid input calculations.

D/ Acute Chest Syndrome (ACS)

Pain-associated shallow breathing and maldistribution of ventilation may contribute to the pathogenesis of acute chest syndrome, and these results support the need for adequate pain relief and monitoring of ventilatory patterns during the treatment of VOC. Hypoventilation and hypoxemia, result in increased sickling of the red blood cells. The major acute pulmonary complication of SCD is ACS, and it is a major cause of morbidity and mortality. ACS has been defined as the presence of a new pulmonary infiltrate (involving at least one complete lung segment, not atelectasis) with chest pain, a temperature of > 38.5°C, tachypnea, wheezing, or cough in a patient with SCD.[3]■ Mechanisms that lead to this syndrome include lung infarction, fat emboli from infarcted bone, pulmonary infection, atelectasis from splinting due to thoracic pain during VOC, in situ thrombosis, vascular injury due to cell-cell interactions and inflammatory mediators, and thromboemboli.

Antibiotic treatment for Acute Chest Syndrome (ACS) in sickle cell disease, often triggered by community-acquired pneumonia, requires broad-spectrum coverage for both typical and atypical bacteria.

Recommended therapy typically combines a third-generation cephalosporin (e.g., ceftriaxone) with a macrolide (e.g., azithromycin) to cover S. pneumoniae, M. pneumoniae, and C. pneumoniae.

Recommended Antibiotic Regimens

Preferred Initial Coverage: Ceftriaxone (75 mg/kg IV/IM daily, max 2g) + Azithromycin (10 mg/kg on day 1, then 5 mg/kg for 4 days).

Alternative/Atypical Coverage: Respiratory fluoroquinolones (e.g., Levofloxacin) are recommended if there is a cephalosporin allergy.

Severe Cases: Consider adding vancomycin if there is severe illness or suspicion of S. aureus.

Key Considerations

Duration: Typically, a 5- to 10-day total course of antibiotics is recommended, with a shift to oral medication (e.g., amoxicillin) upon discharge.

Effectiveness: Using both a macrolide and a cephalosporin significantly reduces the risk of 30-day readmission.

Management: In addition to antibiotics, management includes oxygen supplementation, pain control, and blood transfusion if necessary.

E/ Severe Anemia

Assess patients whose hemoglobin concentration is 2 g/dL or more below their baseline (or less than 6 g/dL when the baseline is unknown) for acute splenic sequestration, anaplastic episode, a delayed hemolytic transfusion reaction, ACS, and infection.

F/ Blood Transfusions

In adults and children with SCD and a VOC, do not administer a blood transfusion unless there are other indications for transfusion, such as: simple transfusion for symptomatic ACS combined with a decreased Hb of 1g/dl below the baseline; exchange transfusion for symptomatic severe ACS (as defined by an oxygen saturation less than 90%); despite supplemental oxygen; simple transfusion for acute splenic sequestration plus severe anemia; and simple or exchange blood transfusion for stroke.

Chronic Transfusion Therapy

Chronic transfusion therapy is used primarily to reduce the risk of stroke in high-risk individuals with SCD 31, 32. However, it can also be used to reduce the levels of circulating sickled RBCs, and thereby decrease the number of vaso-occlusive crisis (VOCs) when used as prophylactic therapy 33. Complications of chronic transfusion therapy include the risk of allo-immunization, iron overload, and its related complications. The utility of chronic transfusion therapy in SCD is limited by the availability of a compatible blood donor population. Individuals undergoing transfusion for SCD may also generate antibodies against the transfused RBCs, resulting in unpredictable, delayed hemolytic transfusion reactions and thus require phenotypically matched blood.34

Despite improved implementation of Hydroxyurea (HU) and chronic transfusion therapy for disease management in SCD, recurrent VOCs continue to be associated with disease severity and mortality. Of greater concern is the increased risk of early mortality in individuals with more frequent VOCs. In a study of 264 subjects with SCD, there was a significantly younger age of death (55.8 years versus 66.2 years; $p = 0.04$) and a higher risk ratio (RR) of death (RR = 2.68; $p = 0.03$) among individuals with high rates of VOCs (defined as ■1 ED/hospitalization

for pain in the prior 12 months) compared with those with low rates of VOCs (defined as 0 ED visits/hospitalizations in the prior 12 months).35 In this study, 41% of participants reported HU use, and 39% reported >10 RBC transfusions during their lifetime. Major trials investigating transfusion therapy, including SIT, SWITCH, and TWITCH, showed a lower incidence of VOCs with transfusion therapy, although VOCs continued to occur despite chronic transfusion therapy.36,37. Conclusion - Preventing, reversing and stopping crisis is the key to stopping pain, suffering, reducing hospitalizations and blood transfusions as well as preventing premature death in sickle cell disease. Nothing in the past 100 years is as effective as Dr Sota Omoigui's discovery of home oxygen in the right place - at home and at the right time - the golden half hour.

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G/ Fever:

Treatment in patients with fever should include potent antimalarial as indicated (to achieve early total parasitaemia clearance), intravenous antibiotics that provide coverage against community-acquired pneumonia and gram-negative enteric organisms, as well as simple or exchange blood transfusion where indicated.

H/ Aplastic Crisis

Manage aplastic events with immediate red blood cell transfusion aimed at restoring the hemoglobin to a safe (not necessarily baseline) value. Isolation of hospitalized patients (droplet precautions) is required to prevent the spread of the parvovirus B19 to pregnant women and others with SCD or compromised immunity. In people with hypovolemia due to severe acute splenic sequestration, immediately provide IV fluid resuscitation.

Strict compliance of this management protocol will ensure a good response to the home oxygen therapy, prevent hospitalization or reduce significantly long hospitalization. While on hospital admission, the attending physician must maintain continuous oxygen administration. This will prevent further sickling of the red blood cells while the body tries to mop up the already irreversibly sickled red blood cells (by phagocytosis and sequestration etc) which are responsible for the ongoing crisis. Also note that as long as malaria and infections are not successfully treated and anaemia is not corrected, the vaso occlusive crisis will persist even with the continuous oxygen therapy. Please note, all the patients must endeavour to own a home oxygen therapy appliance - either an

oxygen concentrator or an oxygen cylinder.

Note: Pulse Oximetry and Oxygen Saturation

In sickle cell disease, there is a poor correlation between oxygen saturation measured by pulse oximetry (which primarily reflects arterial oxygen saturation) and venous oximetry, meaning that a seemingly normal pulse oximetry reading may not accurately represent the actual oxygen saturation in the venous system due to the abnormal blood flow dynamics caused by sickling red blood cells; therefore, careful interpretation is crucial when monitoring oxygenation in sickle cell patients, often requiring further evaluation with blood gas analysis. [1, 2, 3]

> DISCOVERY NOTE: A normal oxygen saturation > 90% can occur in the presence of sickling and provides no reassurance or guarantee against a crisis. What is more significant is a sudden change in the baseline oxygen saturation.

A low oxygen saturation < 90% however and especially if lower than the baseline and at bedtime increases the likelihood of nocturnal hypoxemia and sickling during sleep. This can be prevented by using oxygen at bedtime for 1 hour or more including throughout sleep as needed.

Key points about this correlation: [3, 4, 5]

Sickle cell pathology: Sickle hemoglobin (HbS) polymerizes under low oxygen conditions, causing red blood cells to become rigid and sickle-shaped, which can obstruct blood flow in small vessels, leading to tissue hypoxia even with seemingly normal arterial oxygen saturation. [3, 4, 5]

Venous oxygen extraction: Due to impaired blood flow in sickle cell patients, tissues may extract a higher percentage of oxygen from the blood, resulting in a lower venous oxygen saturation even if the arterial oxygen saturation is normal. [3, 4, 6]

Pulse oximetry limitations: Pulse oximetry can underestimate oxygen saturation in sickle cell patients because it relies on the difference in light absorption between oxygenated and deoxygenated hemoglobin, which can be affected by the altered blood flow dynamics and the presence of abnormal hemoglobin variants like HbS. [1, 7, 8]

Clinical implications: [1, 3, 6]

Monitoring oxygenation: When managing sickle cell patients, relying solely on pulse oximetry may not be sufficient, and more invasive monitoring like central venous oxygen saturation (ScvO2) may be necessary to assess tissue oxygenation. [1, 3, 6]

Treatment decisions: Low venous oxygen saturation, even with seemingly normal pulse oximetry readings, could indicate the need for interventions to improve blood flow and oxygen delivery. [1, 4, 6]

References

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Oxygen Toxicity or Side Effects

Oxygen Safety Clarification

Key message	Supporting point
Low-flow oxygen corrects a low-oxygen environment	Hospital oxygen is used for much longer in severe crisis
2 liters/min by nasal cannula is about 28% oxygen	Reported pediatric LTOT experience was safe and feasible
The aim is normalization, not toxic exposure	No major adverse events were reported in the cited summary

Oxygen toxicity from low flow oxygen in a hypoxia induced crisis is a non possibility. In sickle cell disease, the problem is a low oxygen environment that induces a crisis. Supplemental oxygen normalizes the low oxygen environment. There are no side effects. As you are reading this, you are inhaling air which is 21 % oxygen, several times a minute. Oxygen 2 liters per minute by nasal cannula is 28% oxygen. Liguoro I, et al. in 2021, concluded that long-term oxygen therapy (LTOT) administered from 2014 to 2019, was a safe and feasible treatment option for children (age range 6-15) with SCD and chronic hypoxaemia. No child discontinued LTOT because of intolerance or poor adherence. No major adverse events were reported. Laboratory data did not show significant changes in haemoglobin and reticulocyte count after 1 year of follow-up. Furthermore, it is the same oxygen that is administered in the hospital, and for a much longer duration of time, when the person is in an irreversible crisis, and when the oxygen cannot restore irreversible cells but only prevent more reversible cells from progressing to irreversible cells.

Case Series - 2025

Home Oxygen Therapy in the Golden Half Hour for Sickle Cell Disease: A Prospective Real-World Cohort Demonstrating Reduced Pain, Hospitalizations, and Transfusions in Nigeria - 2025

Authors: Omoigui S, Fakunle B, Onugu E., Grange A.

Abstract

Background: Hospital-based oxygen is standard to treat irreversible sickle cell crisis, but there has been no previous use of home oxygen to restore reversible sickle cells back to their normal discoid shape in the golden half hour, thereby prevent, reverse and stop a sickle cell crisis. Methods: We conducted a prospective observational cohort (N = 98) of sickle cell patients in Nigeria using a structured digital questionnaire and daily symptom logs. Patients with home oxygen served as their own controls, comparing 6-month pre-oxygen and post-oxygen periods. Patients without oxygen served as a natural comparison group. Results: Pain crisis were prevented or aborted in 80-90% of early oxygen users with a drop from 7–10 → 0–2 within 20-60 minutes. Home oxygen reduced hospitalizations by 79% with most users going months without needing emergency care. Blood transfusions drop 80%. Quality-of-life (qoL) items revealed substantial baseline functional impairment, with patient reports of improved sleep, emotional outlook, and social participation and reduced fear of hospitalization, after obtaining home oxygen. Non–oxygen patients continue to suffer high crisis burden reporting persistently high crisis frequencies (most with ≥3 crises/year). This confirms the treatment effect is real, not due to regression or bias. Conclusions: Home oxygen therapy dramatically reduces pain, transfusions, and hospitalizations and improves the qoL for sickle cell patients. This the first use of a medical gas in the history of medicine to reverse the pathologic basis of a disease by restoring reversible sickle cells back to their normal discoid shape - instead

of just treating the symptom of a disease such as using oxygen for an asthmatic attack.

About the Discoverer

“I tackle problems that have not been solved for thousands of years - not because they are difficult but because they are impossible”

Sota Omoigui MD - July 4th, 2024

Sota Omoigui M.D. is CEO of State-of-the-Art Technologies Inc and Medical Director of the L.A. Pain Clinic in Hawthorne, California. He is board certified in Anesthesia with subspecialty certification in Pain Medicine. He has served as an adviser to the United States, FDA Advisory Committee on Anesthetics and Life Support Devices. He is author of several drug handbooks published in six languages.

He has 1050 plus Google Scholar citations for his scientific research work.

He is a Recipient of the US FDA Advisory Committee Service Award, in recognition of his distinguished service to the people of the United States of America.

Since the dawn of time, 300,000 years ago, Mankind has tried to understand the origins of pain. From Athenian philosopher Plato (c. 428 to 347 B.C.) to the 1644 pain theory, by the French philosopher Renee Descartes to the 1965 gate control theory by Melzack and Wall. None of these theories have withstood the test of time.

In his seminal book titled: The Biochemical Origin of Pain and published in 2002, Dr Sota Omoigui proposed his theoretical law that the origin of pain is due to inflammation and the inflammatory response. His subsequent publication of his theory as a journal article in 2007 has been cited as of this date by 504 medical publications. In his 2002 theory, he demonstrated a clear association between migraine and the release of inflammatory mediator calcitonin gene-related peptide (CGRP) and substance P (SP). In 2019, seventeen years later, the US FDA approved members of a new class of drugs specifically designed to treat migraine by targeting calcitonin gene-related peptide (CGRP). Those drugs have been the greatest advance in the treatment of migraine.

Finally

He is also a co-author of the All Nigerian 1978 national anthem - Arise O’Compatriots

On July 4th, 2024, he described the

The First Solution in 7300 years to prevent, reverse and stop a sickle cell crisis in the golden half hour

Let Oxygen be your medicine

Dr Sota Omoigui’s discovery heralds the beginning of a new century of transformation for patients, their families, their communities and the world.

He is an independent translational researcher, analyzing and applying patterns in basic science research to discover novel clinical applications. Dr Sota Omoigui’s discovery has come to offer a solution to a problem 7300 years old. It is bringing a Paradigm Shift

From

A reactive treatment approach of the last 100 years of modern medicine, wherein patients are treated in a hospital after going into an irreversible sickle cell crisis, experiencing severe pain, suffering and multi organ damage and death

To

A preventive proactive symptomatic approach where patients and family, empowered by knowledge, are transformed from hopeless and helpless bystanders, to first responders utilizing home oxygen therapy in the

golden half hour, to restore reversible sickle cells to their normal discoid shape, prevent, reverse and stop a crisis making hospitalizations, and blood transfusions few and far between, saving and changing lives all over the world.

More than 200 patients in different continents, in collaboration with their physicians, are currently implementing his discovery using inhalational oxygen in the right place - at home and at the right time- the golden half hour, and experiencing a dramatic change in their lives and a significant reduction in hospitalizations, blood transfusions and all the complications of a sickle cell crisis. Testimonies and the scientific foundation of his discovery may be seen on his website at sicklecelldiscovery.com

About the Discovery

Dr Sota Omoigui's Discovery - Announced on July 4th, 2024.

• 1. The first solution in 7300 years to prevent, reverse and stop a sickle cell crisis in the golden half hour

• 2. A solution that has confounded the biggest and most resourced pharmaceutical companies and researchers that have spent billions of dollars looking for a solution to stop a vaso-occlusive sickle cell crisis but that has eluded them

• 3. A discovery that has changed the entire paradigm of treatment for a chronic disease since Banting and Best isolated insulin in 1921 and changed the entire paradigm for treatment of diabetes that had hitherto been a uniformly fatal disease killing diabetics in their 20's and 30's.

• 4. The first use of a medical gas in the history of medicine to reverse the pathologic basis of a disease by restoring reversible sickle cells back to their normal discoid shape - instead of just treating the symptom of a disease such as using oxygen for an asthmatic attack.

• 5. A discovery now preventing hundreds of hospitalizations, hundreds of blood transfusions, hundreds of organ damage and death in Nigeria, the United States and all over the world.