UNIT NO. 3

RESPIRATORY SUPPORT FOR HOME CARE PATIENTS

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ABSTRACT

Home respiratory support for patients in the home care setting can range from simple oxygen supplementation, non-invasive ventilation, to home ventilation support via a tracheostomy. A home care doctor may not be able to know everything about ventilator support, but he should be familiar with the medical care of patients requiring one, and know who to refer to should patients require ventilator adjustments or troubleshooting. The management of such patients is challenging outside the hospital setting and usually requires a multidisciplinary team effort from the doctors, nurses, medical social worker, respiratory therapists, vendor of the ventilator and, most importantly, dedicated and well-trained caregivers. This article will cover two other important topics that Family Physicians should know when managing patients who require home respiratory support: home oxygen therapy and tracheostomy care.

Keywords:
Home Care, Respiratory Support, Long Term Oxygen Therapy, Tracheostomy

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LONG-TERM OXYGEN THERAPY

INTRODUCTION

Long-term oxygen therapy (LTOT) is the provision of oxygen for continuous use at home. It is needed to maintain tissue oxygenation and allow periods of increased activity in patients with decreased cardiopulmonary reserves. Two landmark multicentre trials, the Nocturnal Oxygen Therapy Trial (NOTT 1980) and the Medical Research Council (MRC 1981) study have already shown that it improved survivals of chronic obstructive pulmonary disease (COPD) and chronic respiratory failure.[1,2] Other benefits include stabilisation of pulmonary arterial hypertension, fewer cardiac arrhythmias and electrocardiographic findings suggestive of myocardial ischaemia, an improvement in neuropsychiatric function and in health-related quality of life,[3] and reduction of hospitalisations.[4]

Indications

Common indications for LTOT therapy are chronic hypoxaemia, nocturnal hypoventilation and palliative care. Medical conditions associated with chronic hypoxaemia include:

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- Chronic obstructive pulmonary disease;
- Severe chronic asthma;
- Interstitial lung disease;
- Cystic fibrosis;
- Bronchiectasis;
- Pulmonary vascular disease;
- Primary pulmonary hypertension; and
- Chronic heart failure.

Decision to start LTOT in patients with chronic hypoxaemia will depend on oxygen saturation (SpO_2) measured using a pulse oximeter, or arterial oxygen tension (PaO_2) from an arterial blood gas measurement at various activity levels. Other considerations include the presence of complications such as cor pulmonale, right heart failure, dyspnoea and other symptoms (Table 1).

LTOT Prescription

Once the patient has been assessed to require LTOT, treatment should be tailored to the specific needs of the patient. The physician will need to go through a checklist (Table 2) when individualising a treatment regimen. The recommendation is to set the oxygen flow to achieve oxygen saturation $SpO_2 \geq 90\text{-}92\ \%$ or the $PaO_2 \geq 60\text{-}65$ mmHg.

Oxygen equipment and delivery system[7]

Home oxygen can be delivered in three ways: oxygen concentrators, liquid oxygen systems and compressed oxygen cylinders.

Oxygen concentrators (Photo 1) concentrate oxygen from atmospheric air by filtering out nitrogen. After passing through the filter system, oxygen is then stored within the device and is available for the patient. The advantages are they are easy to operate, require minimal maintenance and there are many portable designs available. However, they are electrically powered devices and require an uninterrupted source of household electrical current especially for non-portable ones.[8] As for the portable oxygen concentrators, they are battery-powered, which makes them suitable for ambulatory oxygen therapy.[9] Some in fact have been approved in some countries for use in air flight. There are also devices that incorporate a stationary oxygen concentrator with the capability of generating liquid oxygen that can then be used to refill a small portable liquid oxygen unit for ambulatory use.

Liquid oxygen is a form of gaseous oxygen that is stored as liquid in a tank. Approximately 840 litres of gaseous oxygen can be generated from every litre of liquid oxygen. It is often used by people who are more active because larger amounts of oxygen can be stored in smaller, more portable units. There are also refillable portable liquid oxygen units available from a stationary larger tank that can be stored at home. However, it cannot be kept for extended periods because the oxygen will

evaporate.

Oxygen cylinders are the ones which contain compressed gaseous oxygen. Lightweight small oxygen cylinders such as carbon fibre wrapped aluminium cylinders are available and have higher filling pressures.

For those using liquid oxygen or oxygen cylinders, there should always be a backup oxygen cylinder supply.

The main settings instructions given to patients include flow rate and duration. Flow rate in L/min should be stated as continuous or intermittent use and when to use, for example at rest, during exercise or at sleep. The duration is usually

Table 1: Indications for LTOT in patients with chronic hypoxaemia[5,6]

Activity	**At rest**	**At rest**	**During sleep (Nocturnal hypoventilation)#**	**During exercise**
Arterial oxygen tension (PaO_2)	≤ 55mmHg	55-59mmHg	≤ 55mmHg	≤ 55mmHg
OR				
Pulse oxygen saturation (SpO_2)	≤ 88%	≤ 89%	≤ 88%	≤ 88%
Other considerations		If evidence of: -Cor pulmonale -Right heart failure -Erythrocytosis (HCT >55 %)	Decrease in PaO_2 > 10mmHg and/or Decrease in SpO_2 > 5 % during sleep with signs and symptoms of nocturnal hypoxaemia: -Impaired cognitive function -Morning headaches -Restlessness -Insomnia	Dyspnoea and ventilatory abnormalities even though there is no significant desaturation during exercise
If patient meets criteria at rest, oxygen therapy should be prescribed during sleep and exercise. It should be appropriately titrated during both sleep and exercise.				

other conditions like neuromuscular, spinal, chest wall disease and obstructive sleep apnoea (OSA) may have nocturnal hypoventilation. Oxygen therapy can be used as an adjunct with home ventilators.

In palliative care, oxygen therapy is frequently prescribed for the management of dyspnoea in pulmonary malignancy and other causes of disabling dyspnoea due to terminal disease.

Table 2: Checklist Form for prescribing oxygen therapy[5]

- Particulars of patients
- Medical condition and Indications
- Clinical support staffs' contacts/Equipment vendor's contacts for enquires
- Oxygen sources: Oxygen concentrators, Liquid oxygen system, Oxygen cylinders
- Setting: Flow rate (L/min), Duration (Hours/day)
- Oxygen delivery system: Nasal cannula, Face-mask
- Other equipment: Humidifier, Nebuliser, Portable pulse oximeter
- Any oxygen conserving devices
- Any ventilator
- Diary card on oxygen usage and SpO_2 readings

Photo 1: Oxygen concentrator

Photo 2: Humidifier

Photo 3: Portable pulse oximeter

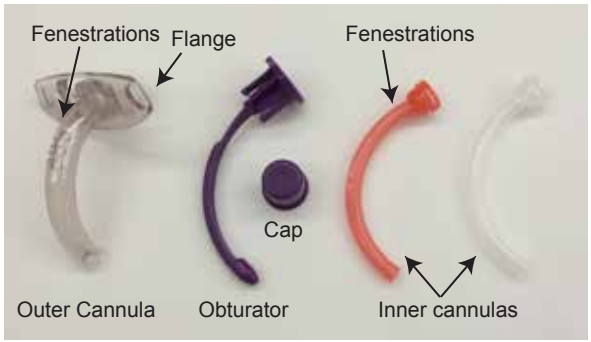

Photo 4: Portex™ tracheostomy tube

Photo 5: Bi-level positive airway pressure machine

Photo 6: Continuous positive airway pressure (CPAP) machine

Table 3: Setting of flow rate (L/min) to achieve approximate FiO_2

Flow rate (L/min)	**FiO_2 (%)**
Nasal cannula	
1	24
2	28
3	32
4	36
5	40
6	44
Simple face mask	
5-6	40
6-7	50
7-8	60
Venturi mask (green cap)	
3	24, 26
6	28, 30
Venturi mask (white cap)	
9	35
12	40
15	50
Non rebreather mask (NRM)	
15	100

Table 4: Examples of oxygen settings to achieve PaO_2 > 60mmHg

PaO_2 (mmHg) at room air	FiO_2 (%)	Nasal cannula (L/min)
50	24	1
45	28	2
40	32	3
35	36	4

stated as number of hours/day and LTOT is usually given for at least 15 hours daily, to include night time, in view of the presence of worsening arterial hypoxaemia during sleep.
Two commonly used oxygen delivery systems include the nasal cannula and face-mask. It is important to know the setting of the flow rate corresponding to FiO_2 (Table 3) and examples of oxygen settings to achieve PaO_2 > 60mmHg (Table 4).

Oxygen conservers are devices that enable the use of less oxygen compared to the normal continuous flow oxygen to maintain desired levels of oxygenation. Oxygen conserving devices have enabled the development of lightweight systems with the provision of longer duration of oxygen delivery. It is especially useful for ambulatory oxygen therapy.[10] There are three main types, namely demand oxygen pulsing device, reservoir cannula and transtracheal oxygen.

Demand oxygen pulsing devices are normally either electronic or mechanical (pneumatic). They may be time-cycled or operate on demand by responding to a pressure drop triggered by the patient's inspiratory effort and then delivering a predetermined bolus of oxygen. Some may deliver a bolus only, while other devices may deliver a bolus followed by a set flow of gas until the demand valve closes. They may be used with oxygen concentrators, liquid oxygen systems and compressed oxygen cylinders.

Reservoir cannulas function by storing oxygen during exhalation, making that oxygen available as a bolus upon the onset of the next inhalation. Reservoir cannulas are particularly useful in patients who require a flow rate of oxygen 4 L/min or higher. Examples of reservoir cannulas would be a moustache configuration (Oxymiser) and a pendant configuration (Oxymiser Pendant). Both devices are partial rebreathing systems which effectively increase the relative humidity of the inhaled oxygen by returning some of the patient's warmed expired air that has elevated moisture.

Transtracheal oxygen delivery improves the efficiency of oxygen delivery by creating an oxygen reservoir in the trachea and larynx at end exhalation and bypassing a portion of the dead space of the upper airways. It reduces inspired minute ventilation, which may lessen the work of breathing, conserve energy expenditure while decreasing dyspnoea.

Other than the oxygen supply and delivery system, some equipment such as humidifier, nebuliser and pulse oximeters are essential to some patients as well.

The humidifier (Photo 2) adds moisture to the air to prevent dryness that can cause irritation. Oxygen supplied by the nasal cannula at a flow rate ≤ 4 L/min need not be humidified.

The nebuliser, in general, should be driven by piped oxygen or a compressed oxygen source (e.g., an oxygen cylinder) fitted with a high-flow regulator capable of delivering a flow rate of 6 L/min for the proper functioning of a nebuliser. If the cylinder does not produce this flow rate, an air-driven nebuliser (with electrical compressor) should be used with supplemental oxygen by nasal cannula at 2–6 L/min to maintain an appropriate oxygen saturation level.

Portable pulse oximeters (Photo 3) are now widely available for the assessment of arterial oxygenation (SpO_2). They are lightweight and convenient handheld devices for ease use by the patients. Some examples of usage: to spot exercise desaturation, to diagnose sleep apnoea and to monitor ambulatory oxygen flow rate (aim to maintain above 90-92% during exercise).

Delivery and setup of oxygen equipment: The delivery and setup with basic instruction on the use and maintenance of the home oxygen equipment should be performed in accordance with applicable regulations. Patients and/or their caregivers may operate and maintain oxygen delivery devices after they have been instructed and have demonstrated the appropriate level of skill.

Patient education

Following a decision to provide oxygen therapy, it is recommended that the patient receives education and written information about the oxygen prescription. The topics for patient education should cover the patient's medical condition requiring LTOT and indications for prescription. There should be explanations on the requirements of taking LTOT for at least 15 hours daily and also on the oxygen source and delivery equipment. Advice on travel with oxygen therapy can also be given.[5]

The patient has to be informed about the danger of burns over the face and upper airway.[11] The main cause of burns is exposure to open flames. Patients should be reminded not to smoke while using supplemental oxygen and also to keep oxygen at least 2m away from any open flame. Hence, smoking cessation is an important component to starting LTOT for patients. Patients should avoid using lotions or creams containing petroleum. The combustion of flammable products containing petroleum can also be supported by the presence of oxygen. Use water-based products instead.

There is a risk of carbon dioxide retention in chronically hypoxaemic patients with hypercapnia and chronic obstructive pulmonary disease as excessive oxygen administration may reduce the hypoxic drive, resulting in an increase in $PaCO_2$. Hence patients should follow the oxygen prescription closely.

Undesirable results or events may result from non-compliance with physicians' orders or inadequate instruction in oxygen therapy. Hence, constant reviews and reminders may be needed.

The domestic situation with respect to installation of oxygen equipment or storage should be enquired about. Explanation of home servicing arrangements can be given. The oxygen equipment company will provide the patient with a contact number for emergency breakdowns and problems.

Equipment care should be part of the education as well. Patients should wash their nasal prongs or face mask with a liquid soap and thoroughly rinse them once or twice a week. Replace them every two to four weeks. If there is a respiratory tract infection, change them when symptoms have passed.

Patient follow up

After starting on oxygen therapy at home, a review should be done to enable a re-assessment of the person's clinical status; to ensure that LTOT has adequately corrected hypoxaemia; to ensure that there has been good compliance to the oxygen therapy regimen and correct usage of the equipment; and to conduct a safety review to reduce risks, including fire and falls. The eventual aim is also to provide further education and support for the patient and caregiver.[12]

TRACHEOSTOMY CARE

Introduction

Tracheostomy is a surgical intervention that artificially creates a tract in the cervical trachea to the anterior neck for breathing. It is usually done for the following reasons.[13,14]

1. In prolonged mechanical ventilation;
2. To bypass the upper airway in an airway obstruction (e.g., foreign body, trauma, infection, laryngeal tumour, vocal cord paralysis, facial fractures);
3. Neuromuscular disease; or
4. During head and neck surgery.

To prevent the premature closure after a tracheostomy, a tracheostomy tube is inserted to keep the stoma open.

Parts of a tracheostomy tube

The commonly used dual cannula tracheostomy tube consists of three parts: the outer cannula, the inner cannula and the obturator. The outer cannula supports the tracheostomy at the anterior neck and keeps the stoma open. The flange is a flat "wing-like" extension of the outer cannula that prevents the tube from slipping further into the trachea and allows for anchoring around the neck using a cotton string or velcro. The inner cannula fits snugly into the outer cannula. It can be removed for washing and reinserted, or disposed and replaced with a new one. Its removal also allows for restoration of the airway in the event of tube occlusion. The obturator is only used during the insertion of the tracheostomy tube when it is due for change. When fitted into the outer cannula, it provides a rounded tip to guide the insertion and reduces trauma to the surrounding tissue.

Single cannula tubes do not have a removable inner cannula and are less favourable options for long-term use compared to dual cannula tubes. These are made of silicon and are relatively resistant to the adherence of respiratory secretions.

Types of tracheostomy tubes

Tracheostomy tubes can be divided into cuffed and uncuffed, or fenestrated and non-fenestrated. Cuffed tracheostomy tubes are commonly used during the acute phase when patients are still dependent on the mechanical ventilator in the intensive care unit to maintain a good seal between the tube and trachea in order to prevent air leakage from around the tracheostomy tube. This is usually changed to an uncuffed tube when the patient is weaned off the ventilator. Uncuffed tracheostomy tubes are also compatible for used with a home ventilator or bi-level positive airway pressure (BiPAP) ventilator as these are usually open systems and allow for a certain degree of air leak.

Fenestrated tracheostomy tubes have holes on the superior aspect of the outer and inner cannula. When the tracheostomy tube is occluded, air can pass through the vocal cords and this allows the patient to phonate.

Tracheostomy tubes also vary in the materials that they are made of. Metal ones have been used in the past when patients required prolonged use of the tracheostomy tube. These can be washed and reinserted. However, they have been superseded by tubes made with newer materials such as silicone, polyvinyl chloride and polyurethane.[15]

Table 5: Dimensions of Shiley™ and Portex™ tracheostomy tubes

Shiley™			
Size (Jackson size)	Inner diameter (mm)	Outer diameter (mm)	Length (mm)
4.0	5.0	9.4	62
6.0	6.4	10.8	74
8.0	7.6	12.2	79
10.0	8.9	13.8	79
Portex™			
Size	Inner diameter (mm)	Outer diameter (mm)	Length (mm)
6.0	6.0	9.2	64.5
7.0	7.0	10.5	70.0
7.5	7.5	11.3	73.0
8.0	8.0	11.9	75.5
8.5	8.5	12.6	78.0
9.0	9.0	13.3	81.0
10.0	10.0	14.0	87.5

Size

An appropriately sized tube should be used to prevent problems of poor fit, such as trauma to the anterior or posterior tracheal wall, obstruction of the distal opening of the tube due to compression against the tracheal wall, and pressure at the stoma opening.[16] Choosing the correct tube size requires the expertise of the specialists and should have been decided in the hospital. A correctly sized tube should extend at least 2 to 3 cm beyond the stoma and at least 2 cm above the carina; the curvature of the tube should allow the shaft to be aligned in the centre of the trachea.[17] Table 5 shows the dimensions of the Shiley™ and Portex™ tubes which are available locally.

Long-term complications of tracheostomy

The incidence of long-term complications post tracheostomy has been estimated to be about 15%.[18,19] These include:[18]

- Granulation tissue;
- Stoma/wound infection;
- Tube displacement/obstruction;
- Intratracheal haemorrhage;
- Tracheoesophageal fistula;
- Mediastinitis;
- Tracheal stenosis; and
- Delayed cutaneous closure.

The first three complications (granulation tissue, infection, tracheostomy tube displacement and obstruction) can be managed in the home care setting. The rest will require further assessment and treatment in the hospital setting.

Granulation tissue around the stoma could potentially result in bleeding and difficulty in replacing the tracheostomy, and could interfere with the function of the tracheostomy.[17] Reducing mechanical irritation, ensuring appropriate sizing, and preventing infection and bacterial contamination are measures to prevent the formation of granulation tissue.[20] Topical treatment strategies for granulation tissue include antibiotic cream, steroid cream, silver nitrate, combination of antibiotics, antifungals and steroid powder, and polyurethane form dressings.[21] If topical treatment fails, surgical strategies such as laser excision and electrocautery may be required.[21]

Infection of the soft tissue around the stoma should be treated early. Patients may present with fever, cellulitis and even a local collection of pus. This should be promptly treated with a trial of oral antibiotics, failing which parenteral antibiotics will be required. If patients are known to be carriers of Methicillin Resistant Staphylococcus Aureus (MRSA), intravenous vancomycin may be needed and it may be beneficial to apply mupirocin ointment to the site of infection.[22]

Management of a displaced or dislodged tube depends on the degree of healing of the tracheostomy and formation of a well-defined tract. For home care patients, the tracheostomy tracts are usually matured and the doctor just needs to follow the steps in a standard tracheostomy change (described below). If the tract is not well visualised, a suction catheter can be placed through the tract and its placement confirmed by the presence of secretions from the airway after suctioning. This suction catheter is left in place and subsequently used as a "guidewire" for the insertion of a new tracheostomy tube. If the tract is not patent and the patient is in respiratory distress, endotracheal intubation may be necessary.[23]

Occlusion of the tracheostomy tube may occur and this is usually because of respiratory secretions accumulating inside the inner tube or even the presence of a foreign body. Immediate removal of the inner cannula should re-establish the patency of the outer cannula unless there is further obstruction lower down the trachea that is not immediately visible. For more information on the algorithm for the management of emergency tube obstruction, please refer to the recent Ministry of Health Nursing Clinical Practice Guidelines of tracheostomy care 2010.[24]

Care of the tracheostomy at home

To ensure that patients and family are able to manage the tracheostomy at home, adequate education on proper tube care should have been taught by the hospital prior to discharge. The caregiver should be re-assessed for the competency of these skills during the home visit. These include:

- General cleaning of the skin around the stoma;
- Changing the dressing around the tracheostomy and the ribbon gauze;
- Cleaning, replacing of the inner tube; and
- Suctioning and secretion management.

If retraining is necessary, caregivers can attend caregivers' training courses organised by many community-based organisations such as NTUC eldercare, Tsao Foundation, White Angels, etc.

Regular inspection and good skin care around the stoma is important. The skin should be dry and free from constant friction and pressure necrosis. The dressing around the tracheostomy and ribbon gauze should be changed if they are soiled.

The inner cannula should be inspected at least six hourly to ensure patency, and cleaned according to the manufacturer's instruction prior to reinsertion.[24] Current practice locally is to clean the inner cannula with cooled boiled water with a soft brush. It can also be soaked with sodium bicarbonate if there is excessive accumulation of dried secretions.

Because there is always a chance of blockage of the tracheostomy tube, good secretion management is vital. Adequate humidification is needed to ensure that secretions are at a manageable consistency. This can be achieved with a humidifier unit (active humidification), or using a heat moisture exchanger (passive humidification). Removal of secretions can be done by ensuring adequate effort when coughing. Breath stacking, modified cough techniques and using a mechanical insufflator-exsufflator "cough assist machine" are some options.

Suctioning can be done if cough is inadequate. It should be done as needed and not at regular intervals as it could potentially cause hypoxaemia, bronchospasm, arrythmias, bleeding, infection or trauma.[17] It should be performed based on the patient's respiratory status, and the amount and consistency of secretions. If necessary, aseptic technique should be applied when performing tracheostomy suctioning to reduce the risk of tracheitis, pneumonia and even fistula formation.[24] Pre-oxygenation may be required in some patients to reduce the risk of hypoxaemia.[24] If the patient is using a fenestrated tube, change the inner cannula to one that is non-fenestrated before doing suctioning. This is to prevent the suction catheter from slipping through the fenestrations and traumatising the tracheal wall.

Steps in changing a tracheostomy

Recommendations for the frequency of changing tracheostomy tubes are unsupported by literature and vary widely. Some studies recommend that the tube be changed only if there is a need to do so.[17] Others recommend a three-monthly change because of material degradation and surface wear of polymetric tubes.[15] Locally, the practice is to change the tracheostomy tubes every two to three months.

The first few tracheostomy tube changes may require help

from the ear, nose and throat (ENT) surgeon as the tract may not be fully epithelialised or well formed. Patients with altered anatomy or with difficult changes in the past will also need to seek help from the ENT surgeons. However, for patients with a mature tract, the change of the tracheostomy tube can be safely done in the home care setting with the appropriate equipment ready. These include:

- Correct-sized tracheostomy tube set (you might want to prepare a tracheostomy tube that is one size smaller, just in case);
- Dressing set;
- Sterile water or 0.9% normal saline for cleaning (another option is cooled, boiled water);
- Water-soluble lubricant;
- Sterile or clean gloves;
- Protective eyewear/goggles/face shield;
- Apron;
- Oxygen (if necessary); and
- Suction (within easy reach).

The following describe the steps taken when changing a tracheostomy tube using the obturator tube.

1. Ensure that the patient has been nil by mouth three to four hours prior to the change and explain the procedure to the competent patient.
2. Hand rub with alcohol and put on your personal protection equipment (apron, goggle, gloves).
3. Prepare your equipment such that they are within reach.
4. Insert the obturator into the outer cannula and check that it can be easily removed. Lubricate the obturator and outer cannula with water soluble lubricant.
5. Get the caregiver to assist in the suctioning if necessary. The patient may cough anytime and secretions can be expectorated.
6. Position the patient in the semi-recumbent position with the neck extended.
7. Pre-oxygenate with oxygen if necessary.
8. Remove the old dressing around the stoma and cut the cotton string or velcro anchoring the tracheostomy tube (but do not remove the tube yet).
9. Clean the skin surrounding the stoma site with sterile water or cooled boiled water. While this is done, the caregiver should help hold the tracheostomy tube in place.
10. If the patient can cooperate, instruct him to take slow deep breaths in and out. Explain that the tube change will occur on exhalation and that there will be discomfort.
11. When ready, remove the old tube using a downwards and outwards motion.
12. While the patient is still exhaling, immediately insert the new tracheostomy tube (with obturator) using a downwards and backwards motion.
13. Remove the obturator immediately.
14. Check that the patient is able to breathe effectively and oxygenate after the procedure if necessary.
15. Anchor the tracheostomy tube in place either with the cotton strings or the Velcro straps.
16. Insert the inner cannula into the outer cannula of the tracheostomy tube.

Decannulation

Decannulation is the process of tracheostomy tube removal when there is no longer a need for the tracheostomy. Advantages of decannulation include improved vocal cord, swallowing function, comfort, and perceived appearance, and reduced carer burden.[25]

Suitable patients are those who no longer need mechanical ventilation, can tolerate tracheostomy tube occlusion, have adequate mental status, have effective cough and whose amount of respiratory secretions are controlled.[25] Because the process of decannulation requires continuous pulse oximetry monitoring, hospital admission is necessary. Once decannulation is successful, the stoma closes within five to seven days in a majority of patients. Some may close in a day and others may take weeks.[17,25]

HOME VENTILATOR SUPPORT

Advances in home-based ventilator support have made the care of ventilator-dependent patients at home possible. Domiciliary-based care improves quality of life and is a more economical option with advantages over hospital-based treatment. In Singapore, Tan Tock Seng Hospital runs a Home Ventilation and Respiratory Support Service (HVRSS) to cater for the needs of such patients; and National University Hospital and KK Women's and Children's Hospital offer such support for paediatric patients. These patients require round-the-clock support from the vendors of the ventilator machine for troubleshooting, phone support to address acute medical problems, and access to respiratory therapists for adjustments to the ventilator settings when required.

Medical conditions requiring home ventilation include high spinal cord injuries, neuromuscular diseases (amyotrophic lateral sclerosis, Duchenne's muscular atrophy, myasthenia gravis, etc.) and chest wall deformities.

The role of the home care doctor is to diagnose and treat acute medical conditions that could potentially affect pulmonary function and oxygen saturation, such as pneumonia, secretion management, asthma and COPD exacerbation. In addition, he should be in the know of who to refer to should the patient require troubleshooting of the equipment or adjustments to ventilator settings, and work closely with the hospital respiratory physician in the medical management of these patients. End-of-life discussions and advance care planning should be discussed with the patient and family.

CONCLUSION

The care rendered by a coordinated multidisciplinary home care team is necessary to successfully manage patients with complex medical needs and respiratory support in the home setting. Knowledge in pathology, physiology, oxygen delivery devices, and tracheostomy care are just some of the skills

needed to do so. In patients who require home ventilation, there may be a need for close collaboration between home care teams in the community and the tertiary hospital that is providing the ventilation support.[26] The skills, expertise and resources of community home care teams must continually be enhanced to increase their capabilities to support the increasingly elderly and medically complex patients in the community.

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LEARNING POINTS

- **Patients with chronic hypoxaemia should be carefully evaluated for suitability for LTOT.**
- **Prescription of LTOT has to be tailored to the individual needs of each patient with clear instructions and advice.**
- **The home care doctor must be able to diagnose and treat reversible medical causes that may compromise a patient's respiratory status, failing which, further assessment and management will be required in the tertiary hospital setting.**
- **Caregivers and sometimes patients themselves must be trained in the care of the tracheostomy tube prior to discharge from the hospital. Their competency should be reassessed and reinforced by the community home care team.**
- **When the tracheostomy tube itself is blocked by secretions or a foreign body, immediate removal of the inner cannula will re-establish patency. If the patient is still in respiratory distress, endotracheal intubation and manual ventilation may be necessary.**