

Managing breathlessness in coronavirus

Breathlessness

Breathlessness is one of the main presenting symptoms of coronavirus (COVID-19). Breathlessness can be a very frightening symptom, even in milder cases. It involves multiple axes of the body (box 1).

Treatment of underlying causes of breathlessness should be considered and optimised where possible. COVID-19 and pre-existing conditions such as severe heart or lung diseases, lung cancer, etc. may cause severe breathlessness / distress, especially toward end of life.

In COVID-19 when breathlessness becomes severe it can indicate pneumonia or acute respiratory distress syndrome (ARDS) which needs urgent investigation and treatment. This should be prioritised as an emergency if indicated.

Breathlessness management it involves multiple axes in particular: *lung-brain, behavioural-functional, psycho-social* (see box 1). Targeting these can also help to manage breathlessness.

Step by step: managing breathlessness

1. Optimize treatment of underlying causes of breathlessness, especially if present, chest infection or pneumonia, as above. Check for underlying bronchoconstriction, e.g. from chronic obstructive pulmonary disease. If blood oxygen concentrations are low the person may need oxygen (see box 2).
2. Consider non-pharmacological treatments, in particular breathing techniques and positioning during breathlessness episodes to target the lung-brain axis, at the same time as 1. These are often suitable in less severe cases, and only some can be used when people are severely affected.
 - Breathing techniques include – trying to relax the shoulders and neck during breathing, (tensing the muscles makes the breaths smaller), focussing on breathing out, rather than in, and breathing slowly, which is more efficient (see box 3).
 - The Mantra – or Poem as some people call it, can be used and memorised to help people remember how to breathe more efficiently and can often be used even in severe breathlessness (see box 4)
 - Positions to help breathing while breathlessness, such as leaning forward over the knees, can help recovery while someone is breathlessness (see box 5)
3. More non-pharmacological treatments when people are less severely affected include: encourage pacing, planning, having what is needed frequently close to hand and mobility aids. These can all help with breathlessness management as they target the behavioural-functional axis (see box 6)
4. Relaxation techniques or a relaxation DVD can also help breathlessness via the psycho-social axis.
5. Cooling the face, especially around the nose, is also believed to help reduce the sensation of breathlessness via the lung-brain axis. This can be done by mopping a cool flannel on the nose and

upper cheeks of the face. Often in chronic lung diseases patients find a fan helpful, but in COVID-19 this is **not** recommended because of the potential risk of the fan spreading the droplets further.

6. When the person is deteriorating or at the end of life with severe breathlessness, oral or subcutaneous opioids has an evidence base to reduce the symptoms of breathlessness. The best evidence is for slow release or subcutaneous low dose opioids. (see box 7)

Evidence and information boxes

Box 1. How is breathlessness generated – involvement of multiple axes of the body

Breathlessness, also called dyspnoea or dyspnea, is widely accepted **as a subjective experience of breathing discomfort that consists of qualitatively distinct sensations that vary in intensity.**(1) The experience of breathlessness derives from interactions among multiple physiological, psychological, social, and environmental factors, and may induce secondary physiological and behavioural responses. Importantly, as this definition makes it clear, breathlessness can only be perceived by the person experiencing it.(1)

Breathlessness requires mechanisms for arousal, detection, and triggering of appropriate motor responses to correct actual or threatened disturbances to homeostasis, likely involving common corticolimbic pathways.(2)(3) There are no sensory afferents solely responsible for the sensation of breathlessness.(4-6) Instead, at least three inter-related axes are involved, and in treatment these can be targeted: Lung-brain, behavioural-functional, psycho-social (see appendix 1).

Box 2. Evidence about oxygen

Oxygen has a clear and accepted role in hypoxic patients. However, in mildly or non-hypoxaemic breathless patients, in most studies to date on those with chronic lung diseases, the benefit derived from oxygen is similar to medical air and there are limitations to its use (e.g. safety, cost).(7, 8)

Box 3. Breathing and positioning techniques

Evidence from randomised trials and systematic literature reviews, and direct patient studies.(9-13)

Be aware of breathing,

- When a person breathes in, do they tensing your shoulders to lift the chest up?
- To exhale, do you force the air out?
- When they need to move, do they hold their breath?

Try to get them to Relax the shoulder and chest muscles, and relax the jaw.

Slow down the breathing (slow breaths are more efficient) and try to get them to breathe

using the diaphragm (which means the tummy will be pushed out).

See: <https://www.kcl.ac.uk/cicelysaunders/attachments/breathlessness-final/managing-breathlessness.pdf>

Other techniques include: *blow as you go* (where you breathe out while you make the effort to do something, and *paced breathing* (where you pace your breaths and your steps) see

<https://www.blf.org.uk/support-for-you/breathlessness/how-to-manage-breathlessness>.

These techniques are adapted from the breathlessness support toolkit at the Cicely Saunders Institute

(<https://www.kcl.ac.uk/cicelysaunders/research/symptom/breathlessness>) and the Cambridge Breathlessness Intervention Service:

<https://www.cuh.nhs.uk/breathlessness-intervention-service-bis/resources/patient-information-leaflets>

Box 4. A Mantra or Poem for the management of breathlessness

Source: <https://www.kcl.ac.uk/cicelysaunders/attachments/breathlessness-final/breathlessness-poem.pdf>

with thanks to Jenny Taylor, St Christopher's hospice. Evidence of effects:(9, 11, 12, 14, 15)

Be Still... Be calm...

Drop the shoulders

Slowly sigh Out...and...Out

Hear the sigh Haaah.... ...soft and quiet

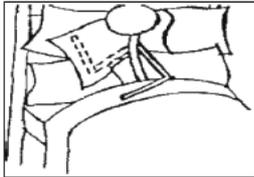
Feel control returning

Peaceful and safe

Box 5. Positions to ease breathlessness

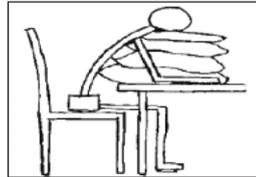
(from <https://www.kcl.ac.uk/cicelysaunders/attachments/breathlessness-final/positions-to-ease-breathlessness.pdf>)

1. High side lying



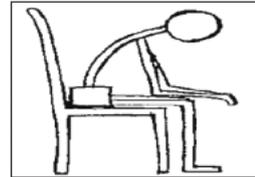
- Make sure your head and chest are supported
- Bend your top leg over
- Put your lower arm under the pillows.

2. Forward lean sitting



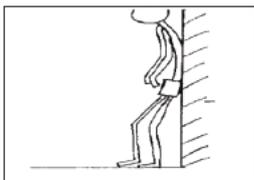
- Pile several pillows on a table
 - Relax your head on them
 - Relax your arms on the table
- Do not try this position if you have neck problems or are uncomfortable with things near your face.**

3. Relaxed sitting position



- Sit on a chair
- Rest your elbows on your thighs
- Relax your hands and wrists.

4. Relaxed standing



- Lean against a wall
- Relax your shoulders, arms and neck.

5. Forward lean standing



- Lean against a banister, fence or wall but keep a comfortable distance.
- Relax your hands, wrists and neck.

These techniques are adapted from the breathlessness support toolkit at the Cicely Saunders Institute

(<https://www.kcl.ac.uk/cicelysaunders/research/symptom/breathlessness>) and the

Cambridge Breathlessness Intervention Service:

<https://www.cuh.nhs.uk/breathlessness-intervention-service-bis/resources/patient-information-leaflets>

Box 6. Non-pharmacological strategies to address the behavioural functional axis

- Plan - a very important part of controlling breathlessness is to plan activities, decide priorities and try not to do too much at once or in any one day.
- Pace - allow plenty of time and take breaks. Activity will increase the feeling of breathlessness but this is normal. Arrange furniture in convenient places to rest, such as an extra chair in the bathroom or hallway.
- Walking and mobility aids have an excellent evidence base for the management of breathlessness and are often overlooked.(13) A walking stick or holding onto a rail or worktop in the house are often helpful, and if there are available encourage their appropriate use.

- Manage energy levels

These techniques are adapted from the breathlessness support toolkit at the Cicely Saunders Institute

(<https://www.kcl.ac.uk/cicelysaunders/research/symptom/breathlessness>) and the Cambridge Breathlessness Intervention Service:

<https://www.cuh.nhs.uk/breathlessness-intervention-service-bis/resources/patient-information-leaflets>

Box 7. Pharmacological evidence in the management of breathlessness

The European Respiratory Society (ERS) and the American Thoracic Society (ATS) have both concluded that beyond oxygen and opioids there is not a robust evidence base for other pharmacological agents.(1, 16)

Relevant systematic reviews of effectiveness and clinical trials are available for opioids, oxygen and benzodiazepines.(7, 17-22)

Opioids by mouth and injection can reduce breathlessness.(17, 23) How opioids work is not known, in theory they may influence a person's central perception of dyspnoea, affecting the lung-brain and psycho-social axes. Doses usually start low and increase.

For example, at the end of life immediate release morphine (orally 2mg, subcutaneous 1-2mg, repeated 2-4 hourly depending on need – see Scottish Palliative Care guidance <https://www.palliativecareguidelines.scot.nhs.uk/media/71338/20-2019-breathlessness.pdf>). Or if there is a need to keep contact with patients low -morphine modified release 5mg twice daily, as used in chronic breathlessness. Opioids are licenced for the treatment of chronic breathlessness in Australia, but not other countries currently. In Australia they recommend a sustained release morphine capsule, licensed for use in chronic breathlessness due to any cause, starting at 10mg once daily, up to a maximum of 30mg once daily.

Evidence currently does not support the use of nebulized opioids or transmucosal fentanyl.(17)

Oxygen has a clear and accepted role in hypoxic patients. However, in mildly or non-hypoxaemic breathless patients the benefit derived from oxygen is similar to medical air and there are limitations to its use (e.g. safety, cost).(7, 8) There are no randomised trials of oxygen in ILD.

The evidence from Cochrane reviews does not support a role for benzodiazepines, except as second or third line treatment if opioids fail, as there is no overall evidence of benefit and some evidence of possible harms.(21, 24) Benzodiazepines have a role in anxiety management, and possibly for severe anxiety with breathlessness. In this instance lorazepam 0.5mg sublingual prn is often recommended in palliative care guidelines.

In the last days of life, morphine 2.5-5mg SC prn, midazolam 2.5mg SC prn, and consider morphine 10mg and / or midazolam 10mg over 24 hours via syringe driver, increasing to morphine 30mg / midazolam 60mg step-wise as required, as per standard palliative care guidelines.

Appendix 1.

The science of breathlessness

In health, the lungs have a great capacity to deliver oxygen and remove carbon dioxide, and so the breathing can adjust, recovery is rapid, and the breathlessness is not distressing.

In illness, the lung capacity is reduced and breathlessness often persists and becomes distressing. At its most severe breathlessness is interpreted as an immediate threat to life and often results in hospitalisation.(25)

Breathlessness is a distressing, multidimensional sensation resulting from complex interactions between physiological, environmental, cultural and social factors, with a considerable emotional component. This requires mechanisms for arousal, detection, and triggering of appropriate motor responses to correct actual or threatened disturbances to homeostasis, likely involving common corticolimbic pathways.(2)(3) There are no sensory afferents solely responsible for the sensation of breathlessness.(4-6) Instead, at least three inter-related axes are involved.

A. Lung-brain

The sensation of breathlessness is closely related to the sensation of respiratory effort, suggesting common neurophysiological origins.(25) Respiratory effort is increased when the load on the respiratory muscles increases, the capacity of the respiratory muscles decreases, or there is a combination of both factors. When there is load–capacity imbalance, neural drive to the respiratory muscles (neural respiratory drive; NRD) from the medullary respiratory centre increases to maintain gas exchange. The conscious awareness of the level of NRD is important to the perception of breathlessness (see figure).(26-28)

When there is increased work of breathing and lung capacity is reduced, a mismatch can occur between increasing NRD

and the ability of the respiratory muscles to increase the level of ventilation.(26, 29) Increasing requirements for oxygen (because the lungs do not work well, or the muscles need more oxygen)(30) generates the breathlessness and its distinct sensations.(25, 26)

B. Behavioural-functional
Breathlessness produces a “spiral of disability”

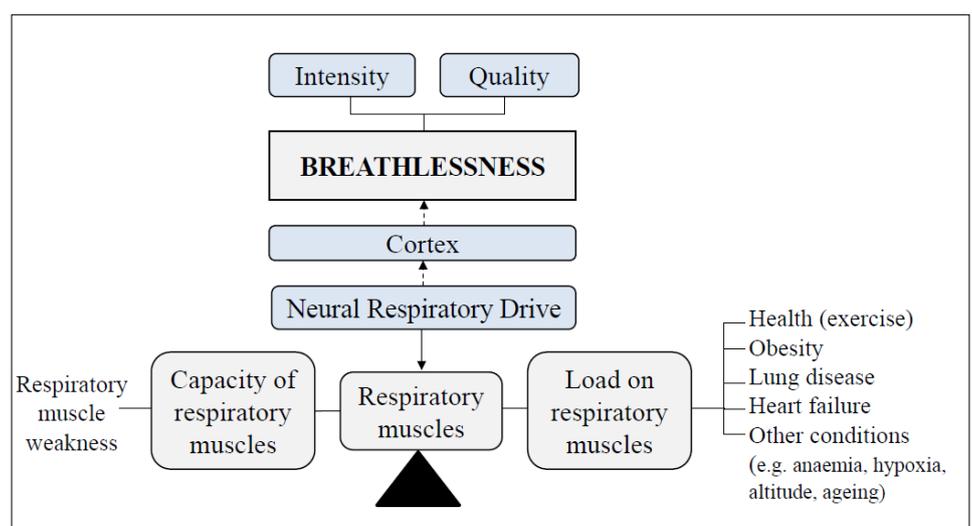


Figure 1. Schematic diagram showing how increased load and/or reduced capacity of the respiratory muscles leads to an increased level of neural respiratory drive (NRD) to the respiratory muscles. Conscious awareness of the level of NRD is related to breathlessness. Source: Jolley CJ & Moxham J AJRCCM 2016 <https://www.atsjournals.org/doi/full/10.1164/rccm.201510-1929ED>

whereby physical inactivity causes deconditioning, reduced functional capacity and increased NRD and breathlessness at progressively lower workloads.(25, 31-35) Deconditioning also leads to muscle wasting weakness, especially of the quadricep muscles (legs).(36) Skeletal muscle aerobic function is reduced, leading to lactic acidosis induced by exercise at relatively low workloads.(37) This increases NRD due to CO₂ generated by bicarbonate buffering and hydrogen ion stimulation thereby increasing breathlessness.

C. Psycho-social

Emotion affects the anticipation, perception of and response to afferent information.(4) Panic and anxiety are common responses to breathlessness, modulated by context, culture and prior experiences.(38) Respiratory afferent information may be translated into neural code and transmitted to a subcortical gating area. This allows sensations to reach consciousness via distinct areas of sensorimotor and affective cortex.(39) Neuroimaging studies suggest plasticity in pathways traditionally associated with the perception of noxious stimuli, including breathlessness.(40-43) This potentially allows treatment of breathlessness-related distress without a reduction in NRD or the associated sensorimotor activation.

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