Ask The Experts

QUESTION: *Individuals with high-level (C1-C3) spinal cord injuries need to use ventilators full time to assist their breathing. However, I know several people with a spinal cord injury at a lower level who were weaned from the ventilator but now, decades later, seem to be having more trouble breathing. What kinds of tests should be conducted to evaluate their breathing? Would a bilevel device with a nasal or face mask be prescribed to use at night?*

ANSWER: *Franz Michel, MD, FCCP, Swiss Paraplegic Centre, Outpatient Care Unit, Nottwil, Switzerland, www.paranet.ch*

Decades after incurring a spinal cord injury, you will lose the ability to breathe adequately due to several reasons. Depending on your lesion level, your inspiratory muscles weaken. Your thoracic (rib) cage stiffens and becomes narrower, trapping your initially normal lung so that it cannot expand fully. Due to the autonomic dysfunction of your intestinal contents, you become more obstipated (severely constipated), and the intra-abdominal pressure rises, causing the intestinal contents to press against the diaphragm, further diminishing your ability to breathe in. With aging, there is often a rise in the use of anti-spastic and pain medications, which will weaken the inspiratory muscles and the central control of breathing, especially during the night. Breathing patterns become irregular and insufficient to the needs of your body. Obesity is also a concern, because most patients gain weight while aging.

What you can do: obtain your maximal inspiratory capacity (MIC), which should be measured at the end of your first rehabilitation. This is done by inspiring as deeply as possible, and then trying, with the aid of the air stacking technique or an Ambu® resuscitation bag, to expand your thoracic cage and lungs as much as possible. The amount of air you are able to exhale is measured and becomes your personal MIC. Once you know this value, try to stabilize or even expand it during the following decades with the aid of a specially designed inspiratory muscle training device and daily efforts to expand your lungs.

Keep your lungs healthy, don't smoke and keep your airways clear with an efficient cough (either through special cough training or manually-assisted cough techniques or mechanically-assisted techniques, such as the CoughAssist®). Your lung function should be tested at regular visits (once a year or every two years), particularly if you are tetraplegic. These tests include body plethysmography to measure the volume of gas in the lungs, maximum inspiratory and expiratory pressure (MIP and MEP), maximum inspiratory capacity and peak cough flow. If you are very sleepy during the day, first obtain an overnight screening with oximetry, and if in doubt, a sleep study.

For those with insufficient breathing and symptoms (initially most often during the night), I prescribe noninvasive ventilation with a nasal or nasal-oral mask and initiate this therapy during a short hospital stay or in an outpatient setting if appropriate.

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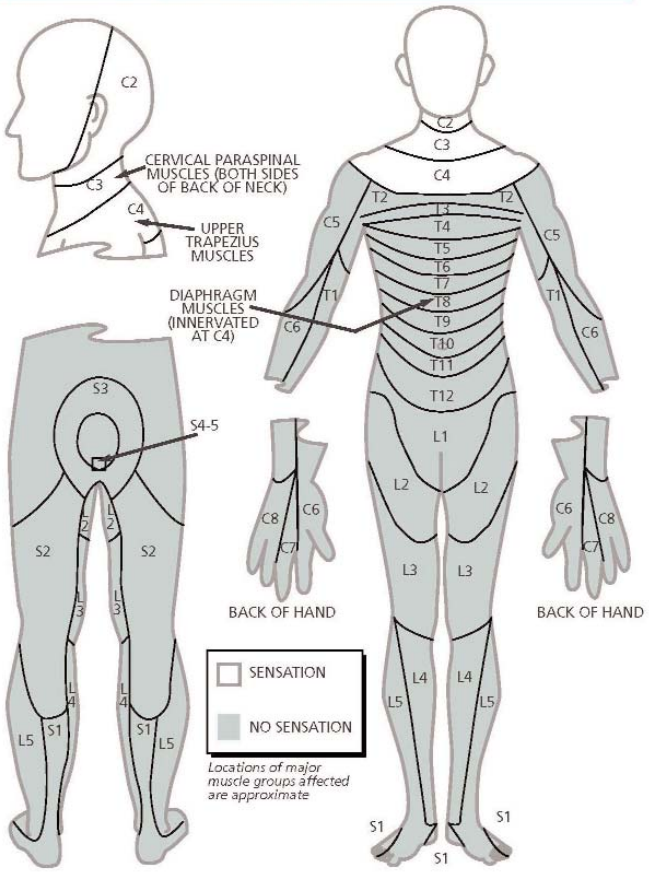
ANSWER: ***Steven Kirshblum, MD, Medical Director, Director of Spinal Cord Injury Services, Kessler Institute for Rehabilitation, and Professor, UMDNJ-New Jersey Medical School, www.kessler-rehab.com; http://kesslerfoundation.org/researchcenter/sci***

Most people who initially require a ventilator after their spinal cord injury (SCI) are able to be weaned from the ventilator, unless it is a high level SCI (C1-3). However, as persons with a spinal cord injury age, their ability to remain off the ventilator full time may be affected. (In fact, respiratory issues are the leading cause of death in all persons with SCI, especially patients with high level injuries.)

The need for some assisted ventilation may arise from the development of sleep apnea and/or underventilation or from other changes associated with aging. People with tetraplegia are at higher risk for sleep apnea and underventilation, and those with injuries C4 and above are at highest risk. This is an extremely important issue and should be part of the routine follow up for all patients with chronic injuries. This includes evaluation for symptoms of sleep apnea (i.e. snoring, daytime sleepiness and morning headaches) and testing for the ability to cough and take deep breaths (i.e. peak cough flow, forced vital capacity). Formal sleep testing may be required.

Treatment of sleep apnea and/or underventilation includes traditional measures such as nasal continuous positive airway pressure (CPAP), nasal bi-level positive airway pressure (BiPAP) and supplemental oxygen if needed. Weight reduction is also helpful if this is a problem. ▲

FIGURE 1—LEVEL C4 SENSATION DIAGRAM



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Copies of the PVA's Guidelines are available at www.pva.org or through the PVA Distribution Center (toll-free 888-860-7244).

Are you a ventilator user or health professional with a question about home mechanical ventilation?

Send it to info@ventusers.org, and IVUN will find experts to answer it.

"Postrehabilitative Health Care for Individuals with SCI: Extending Health Care into the Community" and other articles about health and health care disparity in people with SCI appeared in *Topics in Spinal Cord Injury Rehabilitation*, 17(2), Fall 2011,1-58. http://thomasland.metapress.com/content/x59825564807/?p=0fe7d9085fde46df8eef8ca57fc84ddc&pi=0