Ventilator Dependency
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Due to improvements in medical and emergency care, an increasing number of patients are surviving accidents or serious illness but are left dependent on a ventilator for respiration. Rehabilitation professionals who become involved in the long-term case management and life care planning of these people set up and lead the treatment team, coordinating information from physicians, nurses, therapists, social worker and other health related professionals. Rehabilitation professionals also provide counseling and education services to the patient's family, as well as information on funding sources.

Individuals at all ages and levels of functioning can be helped to make as great as possible a psychosocial adjustment to disability. With appropriate support, those with a higher level of functioning can gain independence and a feeling of self-worth through decision-making, use of technological aids and development of avocational interests. A patient's quality of life and length of life expectancy depend in large part on the level of care after the injury.

Introduction

Rehabilitation professionals are becoming more involved in the case management and life care planning of ventilator dependent patients. They are often asked by attorneys to develop a life care plan for these patients. In so doing, they must take into account the pathophysiology of each patient and how the individual's needs can best be served.

Improvements in the medical field and in the delivery of emergency care have led to a significant increase in the number of patients who survive accidents or serious illness but are left dependent on a ventilator for respiration. Patients on ventilators require long-term care that is both complex and expensive, and rehabilitation professionals are increasingly becoming involved in their case management and life care planning.

The care of these patients is of interest to the legal community, as more and more cases are being litigated. Rehabilitation professionals are often asked by attorneys to develop a life care plan for patients who are dependent on ventilators, in order to carefully assess the damages associated with such cases. The plan must be thorough and should attempt to cover all the patient's needs being as realistic and cost-effective as possible.

Before developing a life care plan, the basic situation of a patient must be fully evaluated with regard to both the particular circumstances of the
individual and the general requirements all individuals in a condition of ventilator dependency. This reading assignment will acquaint the student with the needs of ventilator dependent clients.

**Defining the Patient Population**
A patient may become dependent on a ventilator for respiration as a result of a number of different types of illnesses or traumatic injuries. High-level quadriplegics, vascular accidents, encephalitis, birth defects, brain stem lesions, neurologic defects such as Guillain-Barre syndrome and a range of pulmonary diseases causing chronic air-flow obstruction may all impair pulmonary functioning. While this is not an inclusive list, traumatic injuries or disease processes that may leave the patient unable to breathe without a respirator, cases involving injuries or illnesses are most likely to come to litigation.

Patients who are ventilator dependent may have a wide range of accompanying complications associated with their und illness or injury and therefore have different requirements. Accordingly, each case must be carefully evaluated. The individual with a severe brain stem injury who is in a persistent vegetative state will have needs quite different from those of the quadriplegic with lesions of the first and second cervical vertebrae who is awake and interactive with family and support staff members. It is essential that the rehabilitation professional do a very detailed independent case analysis before developing the life care plan; an attorney should not accept a generic plan that either fails to meet individual patient needs or seems unrealistic or inappropriate.

It is extremely difficult to estimate the number of ventilator dependent patients in the United States and even more difficult to determine how many are being cared for at home and how many in hospitals or nursing homes. The American Association for Respiratory Therapy completed a twenty state survey in 1984 that pinpointed 2200 patients who fell into the category of ventilator dependent. This indicated a significant cost difference in the maintenance of patients receiving home care and those who are hospitalized. In 1984, estimated hospitalization costs for such patients ran to $270,000 a year, while estimates of home care costs were as low as $21,000 per year. Although the study does not delineate exactly what was covered in the $21,000 figure, it is obvious from the amount that ancillary therapy, such as the services of an occupational therapist or a psychologist, was not included; this would leave the patient dependent upon family resources for these functions.

The data presented here clearly demonstrate that the cost of caring for ventilator dependent patients in the home is much higher than $21,000. However,
home care still represents a savings over long-term care provided within the acute hospital setting. Not all patients, of course, are suitable candidates for home care; the more severely injured may require hospitalization or institutionalization. Dr. Norma Braun (1986) categorizes the patient population that can be considered for home care as those whose disabilities can be classified according to the following pathophysiologic etiologies: central or peripheral nervous system disorders, including neuromuscular diseases, thoracic wall dysfunction, pulmonary disorders, obesity and cardiac disease.

**Anatomy and Pathophysiology of Respiration**

The condition of ventilator dependency can be better understood relative to the workings of the respiratory system. The following brief description of the complex nerve and muscle interaction that controls respiration illustrates how a wide range of traumatic injuries and disease processes can impair normal pulmonary function.

The respiratory muscles are under both autonomic and voluntary nervous system control. The controlling mechanisms include the brain stem, the pons and the medullary reticular formation. (See Figure 1.) The nerve pathways carrying the controlling signals are on the ventral surface of the spinal cord the motor voluntary portion of the cerebral cortex and the associated descending pathways lie in the pyramidal tracts extend to the lateral columns of the spinal cord. Both the pathways ultimately come together with motor neurons in the anterior horn of the spinal cord. The inspiratory muscles control the upper airway are supplied by branches of the tenth cranial nerve as well as the eleventh cranial nerve.

To view Figure 1, “Major Divisions of the Brain” click here (please see attached .pdf file “LCP2- Lesson 5- Reading Assignment Ventilator Dependency- Figure 1- Major Divisions of the Brain.pdf”)

Figure 2 shows the nerves that originate in the brain (cranial nerves) and spinal cord (spinal nerves). The sternocleidomastoid area (the sternum, clavicle and mastoid process) innervated by motor fibers from the cervical portion of the spinal accessory nerve that derives from the upper three segments of the cervical spinal cord. The diaphragm is supplied by the phrenic nerve, which arises from the anterior horn cells at the third, fourth and fifth segments of the cervical spinal cord. The phrenic nerve travels adjacent to the mediastinum and enters the diaphragm on its abdominal surface.

To view Figure 2, “Brain and Spinal Cord within Vertebral Column” click here (please see attached .pdf file “LCP2- Lesson 5- Reading Assignment
Inspiratory and expiratory intercostal muscles are supplied by the intercostal nerves arising from the thoracic portion of the spinal cord. The expiratory abdominal muscles are innervated by nerves arising in the lower thoracic and upper lumbar segments of the spinal cord. Thus, spinal cord injuries above the midthoracic level would almost completely paralyze the expiratory muscles. With lesions below the second cervical vertebra (C-2), the diaphragm is paralyzed but the accessory muscles still support inspiration to some extent. When the injury is at the C-1 spinal cord level, all the inspiratory muscles are paralyzed patients with these conditions may be candidates for phrenic nerve pacemaker implants.

**Role of the Rehabilitation Professional**

The quality of life, psychosocial adaptation to disability and long-term survival of the ventilator dependent patient depend in a large part on coordinated, organized and carefully considered case management. The complex, extensive and varied list of therapies, evaluations, equipment, supplies, medications and other services required by the ventilator dependent patient mandates that a rehabilitation professional must establish a very detailed and carefully organized life care plan to eliminate confusion or mistakes in the proper management of the patient’s needs.

The rehabilitation professional, acting as case manager, must be responsible for assisting in the discharge planning, developing the life care plan, selecting vendors and suppliers, managing equipment maintenance, setting up appropriate long-term replacement schedules for durable equipment as well as short-term replacement schedules for replenishable supplies to prevent shortages, and ensuring education on patient safety. Safety issues include making sure there are appropriate escape routes for the patient in the house in case of fire or other emergencies. The rehabilitation professional as case manager must monitor this plan carefully after implementation and make changes as necessary to meet patient needs.

**Works Cited:**