Exhaler Class:
A Multidisciplinary Program for
High Quadriplegic Patients

Pamela A. DiPasquale

Key Words: handicapped, physically • program development • services, occupational therapy

The Exhaler Class at Craig Hospital was developed to meet the physical, psychosocial, and educational needs of high quadriplegic patients. The class uses a multidisciplinary approach and includes exercise and educational sessions. To date, a total of 56 patients have participated in the 6-week program, and those surveyed rated the sessions as good both in content and presentation. An average increase in vital capacity of 0.5 L was observed in 20 patients surveyed.

This article describes the Exhaler Class, a multidisciplinary program at Craig Hospital designed for high quadriplegic patients, some of whom are ventilator dependent.

A report by the National Spinal Injury Data Bank indicates that the number of survivors of high cervical injuries is increasing. Of 3,950 spinal cord injury cases compiled from 14 regional spinal cord injury centers during a 4-year period, an average of 16.4% of the total spinal injuries were above the fifth cervical level (1). During 1973, 13% were high cervical injuries, and by 1979 these had increased to 22%. Most high cervical injuries of the Frankel A Classification (2) (complete motor and sensory loss below last preserved level) remain complete injuries. Of the cases reported during the years 1975 to 1979, 95% remain complete injuries, while 2 to 4% had a recovery of sensation or motor-useless function (3).

As a regional spinal cord injury center, Craig Hospital regularly admits many high spinal cord injury patients as part of a specialized hospital network. Since these admissions have increased in the last few years, the need for a specialized program was recognized. The traditional treatment of these patients at Craig was to mainstream them into other existing patient groups, such as classes designed for patients with more functional lower cervical injuries. However, the high quadriplegic patients were unable to engage in many of the exercises and activities in these classes because they did not have enough remaining musculature to do mat exercises or upper extremity strengthening exercises. In addition, the equipment introduced in these classes was not appropriate for their functional level. The staff observed that these patients appeared frustrated about not being able to participate fully in the existing program or use the information given. Furthermore, these patients, especially the ventilator-dependent individuals, were socially isolated from the rest of the patient group. They had difficulty interacting because their tracheotomy tubes slowed their ability to speak, and the required respiratory equipment made it difficult to get close to them physically. These patients often expressed the feeling that their injuries were more severe than the injuries of the other patients, and that this tended to isolate them from the other patients. Although a class for high quadriplegic patients was held to deal with issues such as specialized equipment, attendant care, public reaction to their disability, community resources, and psychological adjustment, a more comprehensive approach was needed to attend to all aspects of the group's rehabilitation.

A hospital committee supported the occupational and physical departments' proposal to develop a special program, the Exhaler Class.
The overall goal of the Exhaler Class, which uses a multidisciplinary approach, is to better meet the physical, psychosocial, and educational needs specific to high quadriplegic patients through a group format. Program goals specific to each discipline/department are listed in Table 1.

Patient Selection and Staff Training

Patients are selected for the Exhaler Class according to their neurological level of injury (Cervical Level 1–4) and their psychological adjustment. Initial levels of functioning are determined by the patient's individual occupational and physical therapists at the time of admission to Craig, and referral to the program is based on the patient's sensory motor findings. Injury at these levels typically involves complete paralysis of the trunk, partial or complete paralysis of all four extremities, and lack of proprioceptive sensation throughout the body. Generally, the remaining musculature includes the neck and scapula muscles. In some cases, the shoulder muscles are innervated to a limited extent. Sensory preservation is often restricted to the face, neck, and top of the shoulders. There is impairment of respiration, which is due to the lack of intercostal muscles, and, in some cases, denervation of the phrenic nerve to the diaphragm. Most patients in the Exhaler Class have neurologically complete high cervical injuries: not all are ventilator dependent, however. Some of the patients are able to end or at least reduce their dependence on the ventilator.

A candidate's psychological readiness is determined through a team evaluation. Specifically, the candidate's current level of psychosocial adaptation (coping mechanisms, behavioral history, and stage of recovery) (4) is evaluated through clinical observation. A referral is made in the form of a physician's written order during team rounds.

Potential candidates for the program must participate in an initial conference, a meeting in which all disciplines involved in treating the patient present their evaluation to the physician and the patient. This occurs within the first weeks after admission. During that time the patient's medical status and neurological level, functional assessment results and long- and short-term goals, and frequently also the patient's prognosis are discussed. This conference can be an intense and even devastating experience for the patient because the information shared (X rays of the injury site, goals based on the level of cervical injury, and expected functional outcomes) may force him or her to confront the severe nature of the disability. The conference also serves as a mechanism for the educational process that prepares these patients for the Exhaler Class.

Table 1
The Goals and Topics for Each Department Involved in the Exhaler Class

<table>
<thead>
<tr>
<th>Department</th>
<th>1. Occupational Therapy</th>
<th>2. Physical Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals</td>
<td>Improve neck strength, neck endurance, upper extremity range of motion, trunk rotation, and sitting tolerance. Educate about maintenance of electric wheelchairs, work center equipment, environmental control systems, alarm and phone systems, mouth stick, and transportation needs.</td>
<td>Improve strength, range of motion, endurance, and posture. Educate about wheelchair handling, transfer techniques, weight shifts, equipment options, manual recliner wheelchair, cushions, and airline travel procedures.</td>
</tr>
<tr>
<td>Goals</td>
<td>Improve effectiveness of leisure time, self-expression, and recreational experiences. Educate about quality of leisure life-style and specific social skills. Have patients explore or discover what makes a meaningful recreational experience.</td>
<td>Improve basic understanding of the human body. Educate about changes that occur after spinal cord injury, how to maintain health.</td>
</tr>
<tr>
<td>5. Speech Pathology/Respiratory Care</td>
<td>Improve the independent production of an effective cough or instruct another person to do a quad cough; vital capacity to at least 40% of predicted; voice volume and speech skills. Educate about respiratory education and hygiene; methods of relaxation for maximum respiratory function and speech production.</td>
<td>1. Quad coughing. Postural Drainage. Chest PT. 2. Suctioning/Tracheostomy Care. Breathing Exercises. Incentive Spirometry. 3. Voice Production/Glossopharyngeal Breathing. 4. Respiratory Hygiene and Complications. 5. Anatomy and Physiology of Respiratory System. 6. Care and Cleaning of Ventilators and Equipment.</td>
</tr>
</tbody>
</table>
To accommodate the ventilator-dependent participants, the Exhaler Class staff is trained in respiratory care and must pass a special “checkout.” The checkout evaluates the staff member’s suctioning skills; knowledge of the use of the ventilator, airway maintenance, and appropriate responses to alarms; and ability to transport the ventilator-dependent patient while he or she is off the ventilator. Basic knowledge of anatomy and physiology of the respiratory system is also reviewed.

General Format of Program

The Exhaler Class is a comprehensive 6-week course. The general format offers 15 minutes of daily warm-up exercises followed by 30 minutes of educational sessions 5 days a week.

The daily warm-up exercises include manual resistance to head and neck motions, passive range of motion to the upper extremities, glossoaryngeal and deep breathing exercises, relaxation techniques, and instruction in the use of head and neck for postural adjustment.

The educational sessions are conducted by representatives from the various disciplines on a rotating basis. Each representative presents a lecture on a specific topic, using a variety of media, including handouts, slides, slide-sound instructional packages, equipment demonstration, and videotapes. The representatives are registered occupational therapists (OTRs), registered physical therapists (RPTs), nurses (RNs or LPNs), speech therapists, respiratory therapists, and recreational therapists. Table 1 lists the topics presented by each discipline.

In addition to the daily classes, an outing is organized by the therapeutic recreation department once a month. Outings include such activities as visits to the zoo, museums, cinemas, and shopping malls. The class participants decide on the nature of the outing.

Program Modification

Our experience with the Exhaler Class suggested modifications in the areas of patient transportation, referral procedure, and staffing. We found it essential to assign a staff person to each patient who is responsible for transporting the patient to the class on time. This one-to-one ratio is possible by using “spotters,” representatives from each discipline attending the sessions. A spotter is responsible for the care of a patient in the department he or she represents. Since some patients become accustomed to a particular spotter and are disturbed if the assignment is changed, the spotter is assigned to the same patient for a minimum of 3 weeks. The spotter receives a brief orientation on his or her responsibilities and the exercise techniques.

The timing of referrals to the class was also modified. Patients can join the class at any point during the 6-week series. Additionally, patients may repeat all or part of the sessions, depending on funding, motivation, and their learning capabilities.

Changes in staffing made a difference in class organization. We found that when the leader of the exercise period (representatives from speech therapy, occupational therapy, or physical therapy) rotated weekly instead of daily, better coordination resulted. The weekly leader is responsible for determining which department will charge the patient, documenting daily attendance and weekly vital capacity measurements, and turning in this documentation to a designated secretary for record keeping.

Further organization was achieved by designating a staff member participating in the class as the Exhaler Class coordinator. Coordinators follow up on new referrals to the class and gather the names of patients and spotters for staffing assignments. They then give this information to the secretary who includes it in a memo, which is circulated to all departments. The memo describes the patient and spotter assignments, class topics, and the discipline leading the warm-up exercises for the week. The patients’ attendance is documented for the medical chart and Exhaler Class records. This documentation has helped in keeping down costs. If funding is difficult to obtain for a patient, the patient can be followed more closely to avoid having him or her repeat classes.

Results

A total of 56 patients have participated in the Exhaler Class since its beginning in 1983. Upon completion of the 6-week class, participants can rate the content and the speaker for each session on a 3-point scale. Although only 10% of the participants completed the evaluation, their comments revealed that they considered the sessions on transfers, skin care, and bowel care as most beneficial because these sessions provided practical advice and were “important to my health.” The outings were seen as useful because they helped the patients realize their capabilities in the community.

Several of the program goals have been accomplished, especially in the area of psychosocial adjustment. After participating in the class the patients began to feel part of the group, as observed by the feeling of camaraderie that was established within the class and the increase in communication among group members. Interaction between the patients and the staff not directly involved with their individual program also increased. Patients described themselves as more “outgoing” as a result of the class.

Participants also became more involved in their therapy program, partly because of the increased time they spent out of bed. The Exhaler Class afforded a structured class, which required patients to leave their rooms and go into the general therapy area. Patients’ participation in their individual programs increased...
because the less intimidating group approach helped them accept the special equipment. The warm-up exercises played an important role in helping patients reach their goal of maintaining or improving strength in the remaining musculature or range of motion.

The goals to provide specific patient education in self-care and available resources were also reached. The patients were more receptive to nursing aspects of bowel care, bladder management, and skin care in a group setting than during individual instruction. The staff noted that participants felt freer to ask questions during class.

In particular, the respiratory/speech therapy goals were achieved. Patients acquired a knowledge of the care and use of the ventilator, of respiratory techniques, glossopharyngeal breathing and quad coughing, and basic anatomy of the respiratory system. This knowledge is central to the rehabilitation of the ventilator-dependent quadriplegic person. In the past, most of this patient education occurred on a one-to-one basis in individual sessions. After the Exhaler Class was introduced to Craig, these topics and skills were taught in the group setting. In the group setting, the information is given repeatedly and in small amounts. This method appears to result in a greater retention of information. Vital capacity was improved in all 53 cases by an average of 0.5 L.

Other, less predictable results were achieved. With a better understanding of anatomy and physiology of the respiratory system, patients were less resistant to respiratory treatment. The Exhaler Class also proved to be cost-effective because the patient is charged for group treatment instead of individual treatment. Cost containment was especially significant for respiratory therapy training. In addition, unnecessary charges were avoided because the participant was told not to attend a session if a topic was to be repeated.

Summary
In summary, ventilator-dependent quadriplegics who attended the Exhaler Class gained in the psychosocial process of adapting to their disability as observed by the staff, improved their vital capacity, received neck muscle strengthening and range of motion benefits, and profited from information provided for their special needs.

Acknowledgments
The author thanks the Education Department at Craig Hospital for assistance in the preparation of this manuscript, and the Occupational Therapy Department at Craig Hospital for continuing support.

References

Related Reading