SPECIAL REPORTS

Resources for the Optimal Care of Acute Respiratory Failure

Report of the Pulmonary Heart Disease Study Group*

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INTRODUCTION

Five to ten million Americans are partially or totally disabled by chronic obstructive pulmonary disease (bronchitis and/or emphysema). These diseases cause in excess of 25,000 deaths annually, and this figure is doubling every five years. Chronic obstructive pulmonary disease is the most common cause of cor pulmonale, a condition which is estimated to account for 5 to 10 percent of patients presenting to the physician for treatment of organic heart disease. An ever-increasing number of patients are recognized with cor pulmonale due to multiple pulmonary emboli.

In patients with bronchitis and/or emphysema, right heart failure is commonly associated with an episode of acute respiratory failure superimposed upon chronic hypoxia, hypercapnea, and pulmonary hypertension. A program of definitive treatment requires simultaneous management of both pulmonary and cardiac events, because heart failure exacerbates lung failure, which in turn causes more heart failure in a classic cycle of clinical deterioration. The requirements for care of patients in acute respiratory failure are in many ways similar to those for management of patients with myocardial infarction, whose mortality has been reduced by the specialized facilities of the coronary unit.

There are no precise figures to indicate the mortality rate for an episode of acute respiratory failure previously treated on a general hospital ward. Depending on the severity of the pre-existing pulmonary disease, such an acute episode today is found to have a 6-25 percent mortality rate. Although many elements of patient care were changing simultaneously in the last decade, a clearer understanding of the pathophysiology of pulmonary failure, the widespread use of respirators and ventilators and, above all, an organized approach to managing these patients in intensive care areas within the hospital, have brought us to this point.

There are two principal requirements for optimal care of patients in acute respiratory failure: 1) a professional team trained in the principles of respiratory pathology, physiology and therapy, and skilled in the application of these principles in the care of acutely ill patients; 2) the grouping of patients with respiratory disease, especially those with acute respiratory failure, so that the specialized skills and resources of the team may be applied with effectiveness and efficiency. This grouping also facilitates the development of a continuum of patient care from the acute illness through rehabilitation.

RESPIRATORY CARE

The System

Our objective is to define the resources essential for the optimal care of patients with cardiopulmonary disorders and to suggest an integrated system for the organization of these resources that with appropriate modifications will be applicable to a wide variety of local settings.* The following outline provides for the entrance of patients into the care system at one of three levels:

Level I—Life Support Station. Physician’s office, clinic, hospital emergency room, or any hospital without a definitive pulmonary care capability. The objectives and responsibilities at this level include the early recognition of acute respiratory failure, initial steps towards physiologic stabilization, and rapid and safe transfer to a definitive care hospital (Level II or III). Level I care should be available in all communities, but does not require a respiratory care unit.

Level II—Respiratory Care Unit. Community hospital staffed with a respiratory care team, facilities to group

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*This report is concerned with resources for the management of acute respiratory failure. Long-term care and rehabilitation will be the subject of a future report of the Commission.

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patients, and a rehabilitation program. The responsibility at this level is to provide definitive respiratory care. This can be accomplished in a combined cardiac-pulmonary unit, a medical or surgical intensive care unit, or a specialized respiratory care unit as the needs and resources of the community require.

**Level III—Regional Reference Center.** Community or university hospital providing patient care similar to that in a Level II facility, but with the added capability and responsibility to serve as a multiple resource center.

After initial stabilization, patients entering at Level I will be transferred to a Level II or III facility for definitive hospital care. The Level III facility will additionally serve as a resource center for the training of all types of medical personnel, and as a source for consultation within its community or region. Research should be conducted in these facilities with a focus on the practical application of new information to patient care.

This community program is predicated on the twin concepts of stratification and regionalization of health care for patients with cardiopulmonary disorders. Stratification means that each medical facility within a community should have a predetermined role consistent with the needs of the respiratory care system. Each facility should have capabilities appropriate for its role within the system and, therefore, all will not need identical resources. Regionalization implies systematic community planning so that the combination of medical facilities within a region offers the patient the best respiratory care attainable at present levels of knowledge. Effective stratification and regionalization demand that all levels be bound together with the common goal of quality patient care implemented by close working relationships and constant exchange of ideas.

Criteria for the transfer of the patient from one level to another within the stratified system should remain within the province of his physician’s judgment. However, that physician should have full understanding of the resources available for care of his patient, easy access to all levels of the system, and expert consultation when he requests it. Physicists should recognize that the capabilities for Level II or III cardiopulmonary care may be required for patients presenting with illnesses which are not primarily respiratory. General surgery for patients with chronic obstructive pulmonary disease should be performed in a hospital with Level II or III capabilities, since frequent postoperative cardiopulmonary problems can be anticipated.

**Implementation**

Each community and region should recognize and accept responsibility to provide optimal care for patients with acute cardiopulmonary failure. The major requirement for the development of the care system is the establishment of a multidisciplinary planning group to provide coordinated leadership and supervision of the program. This group should have representation from each level within the system and should include physicians, nurses, and other appropriate professional personnel specializing in respiratory care, hospital administra-

PULMONARY HEART DISEASE STUDY GROUP

The patient and those close to him should be aware of his physical capabilities when he is at his best (the point of maximum clinical improvement) so that any deterioration in this capacity can be identified early. How far can he usually walk without disabling shortness of breath? How much does he cough; how much sputum is produced and what is its character? They should be educated about the role of smoking in the production and progression of the disease. Any infection—"cold"—must be regarded as an event of major potential significance. Sudden diminution in exercise tolerance, increased resting respiratory rate or dyspnea, and alterations in state of mentation (sleepiness or inappropriate

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excitement) may be warning signals of the onset of acute respiratory acidosis.6

2. Professional Education. A minimal national goal is the education of all physicians, nurses, and allied health personnel in the techniques of cardiopulmonary resuscitation without the aid of any mechanical device.6 The program should also include the use of the simple squeeze bag devices for respiratory support and the fundamentals of maintenance of a patent airway. Physicians and nurses should be informed of the potential for respiratory acidosis associated not only with chronic obstructive lung disease, but also with other pulmonary disorders; they must be alert to the clinical signs of early respiratory failure.

Greater emphasis should be given to the early recognition of cor pulmonale and right heart failure, and this diagnosis should not be ignored or lost in the welter of pulmonary diagnoses. Guidelines for the diagnosis of both acute respiratory failure and cor pulmonale are detailed in Appendix I.

THE STRATIFIED SYSTEM FOR ACUTE RESPIRATORY CARE

Level I—Life Support Station

Objective: The objective of Level I care for the patient with combined cardiorespiratory failure is early recognition of his illness and initial steps towards physiologic stabilization (life support) until he can be safely transported to a definitive care center (Level II or III).

Facility and Equipment: This level of care should be available in any physician’s office, clinic, emergency room, or hospital without a definitive respiratory care capability.

Two basic equipment items are required to maintain life support:

1) self-inflating bag and mask;7 2) oropharyngeal or nasal catheter or flow-through diluting mask.

If these are available, effective ventilation can be maintained for a considerable period of time. In addition, emergency rooms and the offices of physicians who see a large number of patients with cardiorespiratory disease should be equipped with suction apparatus and ventilator to provide intermittent positive pressure breathing. Spirometers are desirable but not essential at this level. Oxygen should be available, but medical personnel must be aware of both the indications for and the dangers of its use. The routine use of 100 percent oxygen in a closed mask for patients with chronic obstructive pulmonary disease and respiratory failure is to be avoided. Oxygen should be administered to such patients at low flow rates by means of a flow-through mask which delivers oxygen in a concentration of 24-35 percent. Hospital emergency rooms should be stocked with the appropriate fluids and drugs to maintain blood pressure.

A medical record describing the patient's history, physical findings and treatment received should be initiated at Level I and should be transferred with the patient.

Transportation: In most emergency vehicles currently in service, transportation is unsatisfactory for patients with respiratory failure. Ambulance personnel, although diligent in their service, are rarely trained to recognize or manage respiratory problems. Most emergency vehicles are not equipped with respiratory apparatus other than the closed mask and a limited supply of 100 percent oxygen. The training and education of a large number of skilled emergency technicians to man vehicles for the transportation of the critically ill patient is the basic requirement. Ambulance services can then be improved in three stages:

Stage 1. Ambulances staffed by such trained personnel could be made safer if equipped with a self-inflating bag and mask, oropharyngeal airway, and oxygen delivered by nasal catheter or flow-through diluting mask.

Stage 2. The personnel and equipment for Stage I can be augmented by suction apparatus and an automatic pressure-cycled respirator delivering oxygen at appropriate dilution, which may improve ventilation over longer distances.

Stage 3. Optimal transport facilities are provided by the all-purpose ambulance* which, in addition to the above respiratory resources, has the capacity to treat cardiac emergencies.

It does not appear economically feasible or medically justifiable to plan ambulances solely for use in patients with respiratory problems. However, community emergency planning should recognize the specialized needs for respiratory life support and should equip ambulances to meet these needs. With trained personnel in vehicles equipped as described in Stages 2 and 3, it would seem medically safe to transport patients with respiratory failure over distances involving approximately an hour of travel time. However, in each case where doubt exists, the opinion of a physician knowledgeable in the management of respiratory disease should be requested.

Level II—Respiratory Care Facility

Editor's Note: The detailed description of the establishment of a respiratory care facility (Level II) is presented in the unabridged version of this committee's report published in the current issue of Circulation (June, 1971). The basic recommendations for the Level II facility were published in the American College of Chest Physicians' Committee Recommendations in CHEST, May, 1971 (59:554).

Level III—Regional Reference Center

Objective: The patient care objectives at this level are similar to those of Level II. In addition, this facility should serve as a training center; a referral unit for complicated patients, a source for consultation, an institute for basic and applied research, and as a continuing part of the community planning mechanism.

The Unit: The RCU previously described is appropri-

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ate for Level III, although the number of beds will usually be greater and additional space will be necessary for the educational and applied research programs. While much of the training is at the bedside, there must be additional laboratory and classroom space for didactic courses in the curriculum. The function of the unit as a regional referral center for both Level I and Level II may require a larger unit than that planned for the hospital's primary admissions.

Training: The Level III facility should be the regional manpower training center for all types of RCU personnel. Each program must be large enough to meet its own needs, and to provide enough skilled personnel to assist regional hospitals in the attainment of a high level of care.

Physicians—(a) The Level III unit will often be located in a university hospital or large independent private hospital with organized academic departments sponsoring intern, resident and fellowship programs. Courses including unit experience for medical students, house officers, and fellows in respiratory care should be part of the standard curriculum; b) The Level III facility should organize and conduct postgraduate courses for community physicians and nurses. These might be patterned after the courses in coronary care, in which intensive exposure to both classroom and bedside experiences has been successful. These courses serve to acquaint the medical community with the facility and its staff, and also enhance the process of self-appraisal by unit personnel.

Nurses—Continuous education of nurses and of undergraduate nursing students should occur daily in the unit. Postgraduate courses for outside nursing personnel should be offered on a regular basis. Selected institutions should offer programs leading to qualification as a Cardiopulmonary Clinical Nurse Specialist.

Allied Health Personnel—The Level III facility will often assume responsibility for the training of inhalation therapists, laboratory technologists, physiotherapists, and ambulance personnel.

Consultation: The Level III facility and its personnel should feel an obligation for the quality of patient care in its service region. While the facility must certainly be a center of excellence, it must not be remote and inaccessible. The common pattern which requires local physicians to bring complicated medical problems to the center for "show and tell" solutions should be supplemented by new approaches that will bring the center's expertise in an effective and continuing manner to the Level I and Level II facility. As part of its consultation service, the Level III facility should offer complete pulmonary function testing.

Research: The regional reference center with its large and selected patient population, its staff of specialists, and its professionals in training should accept responsibility not only for pursuit of individual basic research interests, but also for development of multidisciplinary, patient-oriented research. This research might be on the level of pathophysiology, epidemiology, therapeutic trials, patient education techniques, or innovations in health manpower utilization, but should be directed toward improving patient care.

Professional nurses in the regional reference center should be included in multidisciplinary teams conducting patient-oriented research in the acute care setting. They should also begin to conduct their own research in cardiopulmonary care in such areas as the collection of epidemiologic data and the effects of new administrative patterns, nursing care interventions, and patient education on the welfare of these patients.

Community Planning—This report has consistently emphasized the need for organized community planning to develop, over a period of years, resources for a stratified system of respiratory care appropriate for each community. While the momentum and focus for such planning will vary from community to community, all medical facilities within the system—including the regional reference center—should be actively and continuously represented in the planning process.

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