

# The Respiratory Intensive Care Unit\*

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Each hospital which accepts the responsibility of providing total patient care must establish an area capable of providing care for patients with acute respiratory failure. This does not necessarily have to be a respiratory intensive care unit but may well be an area within a general intensive care unit. The reasons for a designated area are that nursing service personnel, who are a most important portion of the intensive care team, must be adequately trained and experienced with the equipment which is becoming more sophisticated and complicated. The nursing care techniques are those techniques of good nursing care and should be learned by any intensive care unit nurse. Additionally, paramedical personnel need to be trained to provide the type of care that is of great importance in the delivery of acute intensive care to this very ill group of patients. A respiratory intensive care unit was established at the Medical College of Virginia in 1967. This was initially done at the request and with the support of the Federal Public Health system and has been continued by the hospital following the discontinuation of grant support. The unit functions as a patient care area; a teaching laboratory for house staff, nurses, and medical students; and a clinical research laboratory to study the techniques of respiratory care and the pathophysiologic processes which occur in patients with respiratory failure. The unit has lent itself well to these areas while performing its primary purpose, that is, providing superior patient care for patients with acute respiratory failure.

This unit functions within the Department of Medicine and as a regular rotation for the second year medical residents and for the straight medical

interns. Each of these groups of house officers spends one month in rotation on this service. In addition there are medical students and house officers who elect to spend time on this service available most of the time. The nursing service has been trained by the attending physicians in addition to the senior nurses, and it has a continuing program of review and training of respiratory care skills. With this approach, in addition to having a physical facility designed for respiratory intensive care, the following patient care statistics have been generated.

There have been a total of 629 admissions of 503 patients to the respiratory intensive care unit from October, 1967 through October, 1971. Table 1 shows the multiple types of illnesses treated which resulted in respiratory failure. Approximately one-third of these patients have chronic obstructive pulmonary disease and the others a myriad of problems which have resulted in respiratory failure.

Table 2 demonstrates the average bed occupancy bed-day stay and the source of these admissions. Table 3 demonstrates the same information for the group of patients with chronic obstructive pulmonary disease. There was a slightly longer stay for a patient who had chronic pulmonary disease, but other than this, there is no major difference in these two patient populations.

The definition of respiratory failure varies with investigators, however based upon a certain level of arterial oxygen and carbon dioxide. Table 4 contains the values seen in our patients. There were only four patients who had a  $P_{CO_2}$  of less than 60 in this group of patients with chronic obstructive pulmonary disease; thus we are effectively dealing with a group of people who meet the criteria for respiratory failure in most series. It can also be seen that there was considerable improvement in the blood gases at the time of discharge from the hospital.

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\* Presented by Dr. Baker at the Symposium on Respiratory Failure, May 25, 1972, at Richmond, Virginia.

TABLE 1.  
RESPIRATORY INTENSIVE CARE UNIT MCV  
1967-1971

Total Admissions	629	
Total Patients	503	
Diagnosis	No. Adms.	Percent
COPD	203	32.3
Pneumonia (complicated)	78	12.4
Drug Overdose	46	7.4
Postoperative Complication	40	6.4
Asthma	33	5.2
Muscular Dystrophy	24	3.8
Kyphoscoliosis	22	3.5
Chest Trauma	21	3.3
Guillain-Barré	21	3.3
Pulmonary Fibrosis	13	2.1
TOTAL:		80%
Others (2% or less)		
Pulmonary Emboli	Cystic Fibrosis	
Multiple Trauma	Polymyositis	
Respiratory Arrest	Drug Reaction	
Myasthenia Gravis	Bronchiolitis	
Laryngotracheal Obstruction	Myxedema	
Tetanus	Mediastinal Abscess	
Burns & Smoke Inhalation	Reyes Disease	
Pulmonary Malignancy	Massive Hemoptysis	
Meningitis & Encephalitis	Gunshot Wounds	
C.V.A.	Fat Emboli	
Obesity Hypoventilation	Pulmonary Hemosiderosis	
Post Partum Respiratory Failure	Cardiac Disease with Ventilatory Failure	
TOTAL:		20%

The approach to the management of respiratory failure is properly divided into two phases, conservative and complicated. Approximately 80% of patients who have acute respiratory failure with chronic obstructive lung disease should be able to be

TABLE 2.  
RESPIRATORY INTENSIVE CARE UNIT MCV  
Acute Respiratory Failure from All Causes  
(1967-1971)

Total admissions	629
Number of patients	503
Average bed occupancy	72%
Average bed stay	10 days
Direct admissions	55%
Transfer admissions	45%
126 readmissions of 43 patients	

TABLE 3.  
RESPIRATORY INTENSIVE CARE UNIT MCV  
Acute Respiratory Failure with COPD  
(1967-1971)

Total admissions	203
Number of patients	131
Average bed stay	12.3 days
Average hospital stay after transfer from RICU (1967-1970)	7.8 days
Direct admissions	60%
Transfer admissions	40%
72 readmissions of 28 patients	

managed with conservative or low-flow oxygen type therapy as has been described elsewhere in the symposium. Our respiratory unit sees a skewed population of patients, that is, those patients who are refractory to or who have failed with conservative management elsewhere in the hospital; thus, our patient population demonstrates an unusually large percentage of patients who require assisted ventilation. Table 5 demonstrates this fact as well as our results of low-flow oxygen therapy in the respiratory unit. The errors in oxygen therapy occurred early in our experience and consisted basically of giving patients more oxygen than necessary for management of their problem. Approximately one-third of the patients had a tracheostomy at the time of admission. Some of these are patients with chronic tracheostomies and are readmissions to the respiratory unit. Others had required tracheostomy for management prior to transfer to the respiratory intensive care unit.

It has been interesting to us to evaluate the results of our statistics from the mortality of patients within the respiratory unit (Table 6). A year prior

TABLE 4.  
ACUTE RESPIRATORY FAILURE  
CHRONIC OBSTRUCTIVE PULMONARY DISEASE  
(1967-1970)

Arterial Pa <sub>CO<sub>2</sub></sub>	
Before Definitive Therapy	Discharge
73 ± 16 mm Hg	47 ± 8 mm Hg
Arterial Pa <sub>O<sub>2</sub></sub>	
Admission	Discharge
36 ± 9 mm Hg	59 ± 11 mm Hg

TABLE 5.  
OXYGEN THERAPY IN PATIENTS WITH COPD  
(1967-1970)  
152 Admissions

Controlled oxygen therapy		
Attempts	Success	Failure
83	19 (23%)	64 (77%)
A. Reason for failure of low-flow O <sub>2</sub>		
Clinical worsening with conservative management		47
Intubation to facilitate management		12
Errors in O <sub>2</sub> therapy		5
B. Management after failure of low-flow O <sub>2</sub>		
Intubation (subsequent tracheostomy in 24)		36
Tracheostomy		28

to the development of the respiratory intensive care unit, approximately 62 patients were seen in consultation by the attending staff, who subsequently have run the respiratory intensive care unit. Of these there were 27 in-hospital deaths or a mortality of 43.5%. During the four years of operation of the respiratory intensive care unit, there has been a mortality of less than 10%. In the patients with chronic obstructive pulmonary disease, there was a mortality of less than 90% over the four years. This is compared in Table 7 to the mortality of patients admitted to the Medical College of Virginia hospitals with chronic obstructive pulmonary disease and a P<sub>CO<sub>2</sub></sub> above 59 mm of mercury during the year prior to opening of the respiratory intensive care unit. As can be seen, there was reduction in mortality in this group of patients, which is a roughly comparable group to the people managed within the respiratory unit of from 47 to 8.9%.

The cause of death of patients within the respiratory unit is listed in Table 8. Of major importance here, one must note that sepsis was responsible for 18 of the 60 deaths. This is generally complicated

TABLE 6.  
MORTALITY IN PATIENTS WITH ACUTE  
RESPIRATORY FAILURE

	Admissions	Deaths	Mortality
One year prior to RICU	62	27	43.5%
4 years RICU (1967-1971)	611*	60	9.8%

\* 18 patients excluded because of brain death on admission

TABLE 7.  
MORTALITY IN PATIENTS WITH ACUTE RESPIRATORY  
FAILURE AND COPD

	Admissions	Deaths	Mortality
1. One year prior to RICU Patients with COPD and Pa <sub>CO<sub>2</sub></sub> 60 mm Hg or greater	45	21	47%
2. Four years RICU (1967-1971)	203	18	8.9%

sepsis of gram negative etiology and indicates that pulmonary infection is a major cause of death in patients with respiratory failure. The cardiovascular failure is a complex of etiologies involving acute cardiac standstill or ventricular tachycardia as well as central and peripheral cardiovascular failure with unresponsive hypotension.

As is indicated in the foregoing paragraphs and tables, the respiratory intensive care unit at the Medical College of Virginia provides, in addition to an outstanding patient care service, the opportunity for a large number of our house officers, medical students, graduate nurses, and nursing students to become familiar with the techniques and equipment available for the management of acute respiratory failure. The application of these techniques has led to a remarkable reduction in the mortality in this group of very ill patients. These techniques are explained by others and are included in this symposium and may be applied to any hospital.

TABLE 8.  
RICU DEATHS  
(1967-1971)

Cause	Number
Cardiovascular failure	25
Sepsis	18
Ventilatory failure	5
Technical problems with artificial airways	3
Bleeding abnormalities	3
Myocardial infarction	2
Renal failure	2
Hepatic failure	1
Pulmonary emboli	1
TOTAL:	60