Cardiovascular Nursing
Prevention, Intervention, and Rehabilitation

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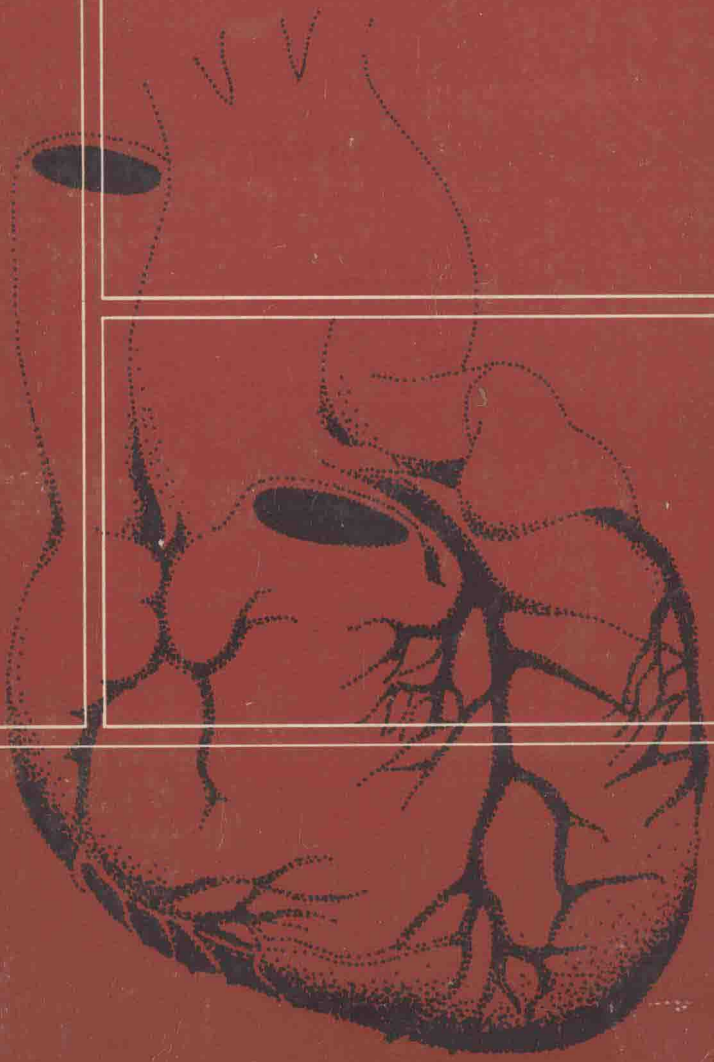

Cardiovascular Nursing: Prevention, Intervention, and Rehabilitation

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Preface

Cardiovascular disease still ranks as the number one killer and crippler in the United States. More and more of the population is becoming potentially at risk for or afflicted by this disease despite current decreases in overall mortality during the acute phase of the illness. These statistics make it imperative that the nurse continuously update her knowledge regarding the prevention, intervention, and rehabilitation of this disease process in order to better meet patient needs.

Many changes have occurred in the area of cardiovascular nursing in the past 10 years. The technological advances, the current trends toward early detection and prevention of risk factors, and the increased focus on rehabilitation of the cardiac patient have greatly enlarged the nurse's role. This role expansion places additional responsibility on the nurse to keep abreast of current trends in treatment and to update her knowledge.

The purpose of this book is to review the skills that are necessary to assess normal and abnormal cardiovascular function and to utilize the current methods of treatment for cardiovascular disease. It is intended to "refresh" and update the knowledge of the nurse who has been absent from participation in the professional activity of nursing as well as to assist in the continuing education of the generalist who wishes to become more skilled in this specialty.

A book of this size cannot hope to encompass all aspects of cardiovascular nursing. Therefore, the scope has been limited to include only particular aspects of physiology and acute care. Throughout the book, current concepts of prevention, patient education, and rehabilitation are emphasized as an important aspect of cardiovascular nursing. It is hoped that this book will serve as a basic resource for the nurse and will assist her in administering knowledgeable and skillful care to the patient with existing or potential cardiac dysfunction.

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Cardiovascular Nursing: Past, Present, and Future

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One cannot speak of the changes that have occurred in the field of coronary care unit nursing without looking at the evolution of nursing as a vocation and profession in the last century. Much change has occurred both within and outside the profession, and this change has brought about reorganization, redefinition, and collaborative effort between nursing and other professions in the health care field. Nursing is fashioning a new role for itself to meet consumer needs better by increasing professional competence.

HISTORICAL PERSPECTIVE ON NURSING

As far back as the first century A.D., nursing existed as a vocation directed at helping the sick. It was practiced by neighbors and friends of the ill and was based on Christian tenets of unselfishness and love of neighbor.

However, it was not until the era of Florence Nightingale (1820–1910) that nursing began to have structure and foundations. Although it was not considered a profession at that time, it was a respected vocation for a woman. Emphasis was placed on the physical aspects of nursing, but the supportive and comforting role of the nurse was also encouraged.

From the time of Nightingale to World War II there was little change within the nursing profession. The lag in progress can probably best be attributed to World War I and the economic depression, since other professions also experienced a lack of change [1, 17].

With World War II came many technological innovations and advances. This period was the beginning of the scientific era, and nursing, as well as other professions, underwent tremendous change and reorganization. The size of the health care team grew by leaps and bounds as many auxiliary people entered the health field; and the rapid accumulation of new knowledge indicated that change had to occur for the needs of the ill to be met.

The years following World War II produced more change within the nursing profession than did any other period. Knowledge was exploding, and scientific discoveries were being made daily. More personnel were being introduced into the health care system, and nursing and medicine struggled to define roles clearly so that duplication of services might be prevented and some facets of autonomy and professionalism retained. Nursing was attempting to define itself as a profession and to delineate the functions that were uniquely its own. It was a time of turmoil and change, and the focus of nursing began to shift from the

physical aspects of care to total patient care, or treating the person as a whole [1, 17].

During this era many recommendations were made for changes in nursing education that would enable nursing to establish itself as an autonomous profession. The *Goldmark Report* of 1923 [12] and Esther Lucille Brown's *Nursing for the Future* of 1948 [6] were landmarks that indicated a need for the upgrading of educational standards to conform to those of other professions. In 1966 the American Nurses' Association published its position paper on nursing education [2]. The association felt that, because of the explosion of scientific knowledge and changing technology, the changes in the health problems of man, and the growing complexity of society, education for those in nursing should take place within the general system of education. It further recommended that in the future there be two types of nurse – the technical nurse and the professional nurse and that minimum educational preparation for the beginning technical nurse be an associate degree education and for the beginning professional nurse a baccalaureate degree education in nursing.

The flurry created by this paper resulted in major changes in all three educational programs for nurses – baccalaureate, associate degree, and hospital-based (3 year) diploma degrees. Educational standards were upgraded, students were moved from the bedside to the classroom, and scientific knowledge and sociocultural trends played significant roles in curriculum development.

The last decade or so has brought about much needed organization and focus to the profession of nursing. The nursing process – the scientific method of ensuring competent care to patients – is employed by most members of the profession. Activity has begun to focus on the patient as a consumer rather than on the nurse as an agent. Nurses have begun to analyze problems, seek solutions, and project plans for nursing. Nursing activity is no longer intuitive but rather has a scientific basis [8].

The change in role and the other dynamic alterations the profession has undergone to increase professional competence and to coordinate efforts to provide better care for the sick and the well are the results of the interaction of hard work, insight, socioeconomic, psychological, and educational factors and the willingness to change.

Trends such as an increase in population, especially in the below-20 and above-65 groups, as well as an increase in immigration and migration patterns, have forced changes in the health care system and within the medical and nursing professions. Enlargement of the scope and definition of nursing and an expansion of role have been unavoidable results [7, 13].

The affluence of U. S. society, as well as recognition of existent poverty, has brought about increased consumer knowledge, social revolution, and demands for adequate health care as a right. Federal legislation is attempting to recognize that right, and it has necessitated much change in the health care delivery system.

The research that has been ongoing as a result of increased knowledge and the incorporation of the social sciences into health care studies have indicated that change must take place and that new roles and functions must be established. The profession of nursing opened itself to scrutiny from outside professional groups in order to produce the change that was necessary for its professional survival. Esther Lucille Brown's *Nursing Reconsidered: A Study of Change* [7] and *The National Commission for the Study of Nursing and Nursing Education* (the Lysaught Report) [15] examined the profession, its past and present, and made specific recommendations for change that must occur for nursing to survive and to meet the needs of the consumer.

The Lysaught Report found that to improve the actual treatment given to the patient, to improve the economics connected with the delivery of health care, and to deepen nursing commitment to the field, several changes were needed. The report recommended that the scope of nursing practice be enlarged to include keen sensitivity to patient needs, a comprehensive knowledge of procedures and technology, and a clear grasp of the behavioral and physical sciences that provide a basis for judgment [15].

This report developed a three-dimensional conceptual model for nursing practice, listing the primary tasks of nursing as assessment, intervention, and instruction. These tasks were to be expanded and their magnitude varied, with changes in the environment and in the patient's condition. Intervention and instruction would differ from the traditional activities, since they would include the channeling of health care delivery to both the well and the sick in a context that was both distributive and episodic.* This readjustment would begin to deliver comprehensive care to entire segments of our population that were not receiving it.

The specific changes recommended that would help nursing to develop this model were (1) greater clinical specialization, (2) more education in and greater focus on health maintenance, and (3) reciprocal changes in the roles of nurse and physician that would extend nursing activities to meet society's needs.

Other findings of the report were that the health needs of society

*Distributive health care is that which meets the needs of the family and community in the prevention as well as the treatment of disease. Episodic health care deals only with acute illness.

were not being met and that to meet them, changes had to occur in all aspects of health care delivery, education, and research. The central problem was seen to be how to control and implement change, i.e., how to incorporate today's advances into the still useful practices of yesterday. The key to maintenance of humane, individualized concern for people was seen possibly to be held by nursing, and nursing in the future was seen to play a major role in meeting health needs.

These recommendations have placed on the profession a major responsibility for improving the quality and amount of health care delivered to consumers. Nursing has taken up the challenge. Education on a baccalaureate level seems to be geared toward a distributive level within the community and to be aimed at health maintenance while providing the opportunity for students to practice episodic care in the acute care setting if they so elect. Graduate and practitioner programs are seeking to deepen the knowledge and enhance the skills of the nurse in a particular clinical specialty. And to increase the quality of care, professional organizations have developed standards of practice for nurses in the various specialties. The standards provide a basic model by which the quality of nursing care may be measured. (The standards of practice for cardiovascular nursing [3] are listed in the Appendix.)

Change that is effective usually comes slowly; change has occurred and is still occurring throughout the profession. Nursing is recognizing its reason for existence and is defining its functions in terms of patient needs rather than merely the sphere of traditional nursing activity.

EVOLUTION OF CARDIOVASCULAR NURSING

The coronary care concept has been in existence for over a decade. It began to be actualized as the explosion in technological knowledge and changes within the nursing profession took place. The concept grew and was formulated as the statistics related to death following myocardial infarction became overwhelming. In 1966, 30 percent of all patients hospitalized with myocardial infarction died during hospitalization. This figure is even more overwhelming when coupled with the statistic that 40 percent of all deaths in the United States in 1966 were the result of myocardial infarction [16].

Despite considerable advances in knowledge about heart disease, in the mid-1960s there seemed to be no way to prevent its occurrence. The solution to reducing mortality seemed to be to improve the methods of treating cardiac catastrophes after their occurrence. Thus, the first coronary care units were created; they were aimed at treating potentially fatal arrhythmias and initiating resuscitative measures when necessary. The use of cardiac monitors and the constant surveillance

of patients in these specialized units seer ed to be helpful in reducing overall mortality due to heart disease.

This specialization of treatment brought about many changes in the role of the nurse and also many problems that have taken almost a decade to approach resolution. Initially nursing in the coronary care unit was seen to be a status symbol, and jobs there were offered to nurses whom physicians considered competent to handle them. The lures of increased salary, prestige, and a colleague relationship with physicians brought many young nurses into the new field. Unfortunately, training programs were nonexistent, and knowledge and skill were acquired on the job. Each nurse determined what her learning needs were and sought ways to meet them.

After a few years it became evident that it was possible to intervene before the patient became fatally ill. However, intervention required nurses to take on additional responsibilities, such as interpretation of electrocardiographic disturbances and the initiation of appropriate treatment. These responsibilities required a great deal of knowledge and skill, and most nurses were not adequately prepared to assume new responsibility.

To meet the educational needs of nurses and ensure knowledgeable care to patients, the Department of Health, Education and Welfare set up guidelines and criteria, and federally funded coronary care training programs of 6–8 weeks' duration were established. The programs dealt with technological developments, interpretation of findings, and appropriate therapies. Unfortunately, because of lack of time and the large amount of material to be covered in the courses, the psychological aspects of care were inadequately taught. This lack and the fact that technological developments had in some areas outpaced biological knowledge led to some problems in coronary care unit nursing.

The courses emphasized the utilization of equipment and the detection of arrhythmias. However, methods of signaling trouble do not mean definitive therapy. Standing orders were instituted in these units, sometimes with disastrous effects because the nurses did not have sufficient knowledge to make appropriate judgments. One may well question the use of a standing order for a patient whose condition was so critical and so changeable that he needed to be placed in a special care unit.

Doctors were delegating medical responsibilities to nurses, who, impressed by this respect, were assuming them. In some instances the delegating was justifiable, but in many situations it decreased the quality of nursing care. Because certain activities are carried out by the nurse does not necessarily mean that those activities are nursing ones.

Nursing care became synonymous with medical care, and autonomy in determining the nursing care of the patients was lost [14].

The environment in the coronary care unit affected patients and nurses. In the early days, few nurses were consulted about the construction of the units. The atmosphere was generally close; the units were artificially lighted, and they consisted of numerous cubicles that afforded patients little privacy and rest and made them feel imprisoned and violated. The patients were "tied down" by machines and felt like mere extensions of them. There were constant noise and crises in the units, and patients often saw attempts at resuscitation that made them anxious. In general, the units were impersonal and dehumanizing. It is incongruous that these units were constructed to deal with the stress of a patient having undergone an acute myocardial infarction.

The environment also adversely affected the staff. There was a constant state of crisis and competitiveness among personnel in the unit, where the pace was hectic and tense and the work involved both pain and death. Demands on the staff were high, and the source of greatest satisfaction was also the source of greatest difficulty – caring for patients who were desperately ill and in need of much support. A danger in such an environment is that personnel may seek out the work for the intensity alone. The pace, not the people, may be the stimulus, and supportive nurse-patient relationships may not be formed [9].

As a result of these factors, some units began to develop into highly technical, impersonal ones in which the nurse was taking on the physician's function and discarding her autonomy as a nurse. The concept of a specialty as a mastery and deep understanding of knowledge and skills seemed to have been lost. Nurses were referring to themselves as specialists simply because they were performing specialized skills.

However, as was happening in other areas of the profession, the coronary care group began to reexamine itself and orient itself to a role that would meet present and future patient needs. Research was done on the effect of psychological stress on physiological functioning, on preventive measures in heart disease, and on the need to rehabilitate the cardiac patient. The concept of coronary care enlarged to that of cardiac care and expanded to include preventive aspects, precoronary care, the acute incident, and rehabilitation and follow-through [4].

Graduate education began to prepare specialists in cardiac care with an in-depth knowledge and understanding of their specialty. The need for increased knowledge was recognized, and basic and advanced programs in cardiovascular nursing were developed for continuing education [5].

As the scope of practice extended and nurses became more aware

of patients' needs, it was necessary to incorporate other health team members into the specialty. As her staff became more competent and knowledgeable, the clinical specialist was able to move out to other areas and assist staff nurses, social workers, and public health nurses to become involved in varying aspects of the specialty. The treatment of myocardial infarction and the reduction of mortality was no longer the responsibility solely of the nurse in the coronary care unit. Nurses in the community were encouraged to promote health and prevent cardiovascular disease through counseling about risk factors and screening for familial lipid problems. The general staff nurse was given the role of preparing the cardiac patient for discharge through inclusive teaching care plans; and other health team workers were involved from admission through discharge of the patient. Many new roles were established in the hospital and in the community. Nurse-run clinics were implemented to help people receiving therapy for chronic conditions to adapt to their condition and to maintain an optimum level of health. These clinics are involved with long-term management of hypertension and congestive heart failure, with pacemakers, and with anticoagulant therapy. The nurse in such a clinic must have knowledge and skill in case-finding, physical assessment, history-taking, diagnostic-test interpretation, health-teaching, and management [10, 11].

Cardiovascular nursing at the present time seems to have accepted the mandate issued to the profession in general. It has moved from being solely episodic to being distributive as well. The scope and function of cardiovascular nursing practice have been more clearly defined, and the quality and scope of health care offered to the consumer ensure more effective health care delivery. It is hoped that through this activity, larger segments of the population will be reached and the overall mortality from cardiac disease will decrease.

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The Process of Oxygenation: Respiratory and Cardiovascular Physiology

2

One of the major functions of the cardiovascular system is the delivery of a sufficient amount of oxygen to the body cells to meet the metabolic needs of tissues. The concept of oxygenation is an important one, since man is in constant interaction with his environment and needs a constant supply of energy to perform and maintain his level of activity. Energy is stored in the food taken in, but it cannot be properly utilized unless oxygen is continuously delivered to the cells.

Oxygen is obtained from the atmosphere and is transported by the lungs to the heart and then delivered by the arterial system via the medium of blood to the tissues. All parts of the cardiovascular and respiratory systems must be functional for adequate oxygenation at a cellular level. Therefore, the anatomy and physiology of the pulmonary, cardiac, vascular, and hematological systems will be considered in this chapter. For clarity, respiration (oxygenation) will be divided into two sections: (1) external respiration (that segment involving the movement of oxygen through the lungs) and (2) internal respiration (the segment involving the transport of oxygen to tissues by the cardiovascular system) [5].

Because oxygen is a gas and its movement, or entry into the body, is controlled by its form and structure, there are several basic gas laws that must be mentioned before discussing respiration.

GAS LAWS

1. Gases always move from an area of higher concentration to an area of lower concentration and pressure in order to equalize the proportions within mixtures.
2. In a mixture each gas assumes a partial pressure or a percentage of the total pressure of the mixture. This partial pressure is independent of the pressures of other gases within the mixture.
3. All gases do not move through a mixture at the same speed. Their rate of movement depends on their solubility and their pressure.
4. As the volume of an area within which a gas is present increases, the pressure or activity of the gas will decrease. Conversely, when the volume of an area decreases, the pressure or activity of a gas within this area will increase [7].

EXTERNAL RESPIRATION

Air passes from the atmosphere to the respiratory tract and is cleaned, warmed, and moistened as it moves through the tract. The upper por-

tion of the respiratory tract (nose, pharynx, larynx, and trachea) plays a major role in filtration and protection of the lower respiratory tract from foreign organisms. The cilia and mucus trap and suspend particles, allowing them to be removed by sneezing or coughing [7].

The trachea divides into the right and the left bronchi, which further subdivide, finally terminating in anatomic air spaces, the alveoli.

It is at the alveolar level that oxygen is exchanged, or diffused, into the pulmonary arterial capillaries and that carbon dioxide (the end product of metabolism) is removed from the capillaries.

The alveoli have a very high surface tension that causes a strong tendency toward collapse. If they collapsed, the alveoli would be unable to deliver oxygen to the pulmonary capillaries and the process of oxygenation would be interfered with. To prevent this from occurring, an enzyme called surfactant is released from the alveolar lining. Surfactant is detergentlike in its activity, and, by surrounding each molecule in the alveoli, it keeps the molecules from coalescing, thereby preventing collapse of the alveoli. Release of this enzyme is triggered each time one breathes in deeply or sighs [7]. Anything that interferes with deep inspiration or sighing, such as prolonged bed rest, infection, or paralysis, also interferes with release of this enzyme and causes atalectasis (alveolar collapse).

The lungs are cone-shaped organs that house the alveoli and the bronchi. The left lung is partially divided into two lobes and the right lung into three lobes. The lungs are surrounded by a potential space called the pleura. The pleura has an inner (visceral) and outer (parietal) lining, and the space between these linings maintains a constant pressure that is more negative than the pressure in the lungs [3]. This constant negative pressure keeps the lungs expanded, since the lungs are elastic and have a tendency to recoil and collapse. The presence of an infection or fluid in the pleural space causes the pleural pressure to become more positive than that in the lungs and may cause a portion of the lung to collapse (pneumothorax).

All these anatomical structures must be intact for oxygen to be transported from the atmosphere through the lungs to the alveoli and for diffusion of oxygen into blood to occur (Figure 1).

Movement of Oxygen from the Atmosphere to the Alveoli

For appropriate oxygenation to occur, oxygen must move from the atmosphere into the lungs and carbon dioxide must be moved from the lungs to the atmosphere. For gases to be exchanged between the lungs and the atmosphere, there must be a pressure difference (gas law 1). The pressure in the atmosphere is normally 760 mm Hg (oxygen is 21 percent of that, or 159 mm Hg). At rest the pressure in the lungs is