FOURTH EDITION

# COMMONSENSE APPROACH TO CORONARY CARE *A PROGRAM*

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The C. V. Mosby Company

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## A PROGRAM

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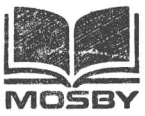


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# Foreword

This book is a good example of a premise that arose twenty-two centuries ago, namely, that teaching is an art rather than a science. Unfortunately, this principle is often neglected in our technified age. To achieve their purpose the authors of this book have addressed human beings as individuals, not anonymous persons. Readers must be well aware of these aims if they are to obtain full benefit from the material presented. They must also recognize that it is dangerous and antididactic to apply the goals and methods of science to all aspects of learning. Gilbert Highet has repeatedly emphasized that a strictly scientific relationship (either verbal or written) between teacher and pupil is inadequate and undesirable. Naturally, some coherence is required in all presentations, but this requisite does not remove the emotional ingredient.

The "system" used in this book arose after hundreds of live encounters in the form of spontaneous (or conventional) lectures, dialogues, and discussions. Hence it was based on a person-to-person relation in which readers must act as inquisitive pupils, true interlocutors who can find themselves—whether believing or doubting—persistently *thinking* about the various approaches to coronary care, which they would not have looked at in exactly the same fashion. Unless readers work themselves into the proper mental framework, it is possible that this approach might appear too comlex, highly dogmatic, or, for some, extraordinarily simple. But in any case, the stimulation created in the minds of readers is even more important than the factual information. Whereas not every scientific statement can be proven, the desire to learn can be experienced by all.

**Agustin Castellanos, Jr., M.D.**

# Preface

We first became aware of the need for a new approach to coronary care training while teaching nurses in a course sponsored by the Florida Regional Medical Program and the Florida Heart Association. Initially we used a traditional, fragmented approach, but this method met with only moderate success. It did not provide the nurse with a basis for realistically and systematically solving patient problems. Subsequently, we developed our own methods for simplification, organization, and practical presentation of the subject matter. When this approach met with success, we wondered if others might also find it meaningful. It has been gratifying to find, through comments made on previous editions, that this approach has been found valid by many of our readers.

Our approach is based on a thorough knowledge of normal anatomy and physiology. Utilizing knowledge of anatomy and physiology, the student is able to deduce the clinical consequences of pathological changes. For example, knowledge of the anatomy of the coronary artery system enables the practitioner to anticipate the type of complications that will be associated with coronary artery occlusion. Knowledge of the role of electrolytes in cardiovascular tissue enables the practitioner to better understand newer diagnostic tests as well as the effects and side effects of recent advancements in drug therapy. Information in this area has been expanded in this edition to reflect current knowledge and modes of therapy.

It is our aim to simulate as closely as possible our classroom situation. We believe that students' interest increases as they are encouraged to participate. By participating, students are also given a means of evaluating their understanding of the topics discussed. We chose the programmed format for this book because we felt that is would be the best to fulfill these aims. Information is presented in a comprehensive, correlated form. We believe that memorization is a crutch, not an effective learning tool. Therefore readers are encouraged to use their reasoning powers to a maximum and keep memorization to a minimum.

This text is constructed so that each unit is built on the preceding one, and the student is cautioned not to read isolated segments of the book. Cross references, reviews, and repetition are provided to maintain the continuity of the units. Readers who do not understand the answer given should refer to the previous unit discussing that topic. Also, an index has been provided with this edition.

This book is directed to both beginner and advanced practitioner. No previous knowledge of cardiology is necessary, although we believe that those who have some experience will also find this book useful. Because recent advances in coronary care have expanded the scope and comprehensiveness of this field of nursing, a more in-depth knowledge of physiology is required. New material is included in this revision to solidify the current physiological bases of nursing care in this field. If beginners find some of this material complex, we strongly

urge that they pace themselves to facilitate comprehension of basic concepts. The text remains structured so that the more complex areas may be omitted without loss of continuity.

Our primary focus, as with previous editions, is still the patient with acute myocardial infarction in the coronary care unit. However, in this edition we have expanded the scope to include more patient teaching and rehabilitative aspects, especially in the area of diagnostic testing, risk factor control, and stress testing. Information provided on related coronary artery syndromes and functional disorders, such as angina, arrhythmias, and congestive heart failure, will be valuable in any setting dealing with the patient with heart disease.

This fourth edition contains several major revisions. Unit 10, pharmacological intervention, has been almost completely rewritten, reflecting the many recently introduced cardiovascular drugs. These agents include new antiarrhythmic, beta-blocking, calcium-blocking, and thrombolytic drugs. Application of even the traditional therapeutic agents has expanded to include consideration of pathological and metabolic changes. Unit 10 was reorganized and expanded to reflect the broadening of therapeutic dimension. The common structural and metabolic alterations linking angina and acute myocardial infarction are stressed in accordance with recent trends. New information on the role of calcium in cardiovascular cells and effects of calcium channel blockade has been incorporated into the discussion of electrolytes (Unit 4), pathophysiology of arrhythmias (Unit 7), and pharmacological intervention (Unit 10). Unit 6 has been extensively revised, as previously mentioned, with emphasis on expanding nursing roles in assessment and evaluation of the patient with coronary artery disease (angina or myocardial infarction). The discussion of pacemakers in Unit 11 has also been rewritten to include multiple new advancements in pacing modalities. Evolving sophistication in the electronic circuitry of pulse generators has shifted the emphasis toward dual-chambered pacing. The content of Unit 11 has been reorganized and expanded and is now balanced between single and dual-chambered pacing. The former systematic approach to the ECG assessment of single-chamber patterns remains intact and provides the basis for assessment of the more complex, dual-chambered patterns. New illustrations and tables are provided to facilitate the understanding of these new systems. Bibliographies have been updated in all of the units. New illustrations have been added to Units 6, 7, 10, and 11.

We strongly recommend that readers of this text supplement their knowledge with a basic life support course provided by the American Heart Association. The topic of cardiopulmonary resuscitation is critically important in coronary care and is omitted from this text only because of the excellent training programs already established by the American Heart Association. Certain areas of this text may be useful for those interested in pursuing advanced life support training. With this purpose in mind, the units on drugs and arrhythmias have been correlated to the cardiac arrest setting.

We would like to acknowledge and thank Dr. Agustin "Tino" Castellanos, our teacher, philosopher, and friend, for his patience and encouragement, for always being available when we needed him, and for never complaining while proofing this text; Dr. Louis Lemberg, for his willingness to sponsor us in all our endeavors, for his dedication and commitment to coronary care nurse training, and for keeping us clinically oriented; Dr. Azucena Arcebal, for her unique ability to present complex material simply but accurately, for her willingness always to share her knowledge with us, and for treating us as peers; and The Florida Regional Medical Program and the Florida Heart Association, for giving us the opportunity to become involved in coronary care nurse training.

We would also like to acknowledge others who have taught and encouraged us during the past 10 years: Gloria Steffens, R.N., Dr. Joan Mayer, Dr. Robert Boucek, Dr. Ramanuja Iyengar, Dr. Ronald Fox, Dr. Charles Roeth,

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# Contents

# Priority critical care assessment: implications for coronary care

Critical care nursing is based on a dual challenge: (1) assessment of life maintenance priorities, and (2) implementation of a comprehensive, yet patient-centered approach to the care of the critically ill. This challenge can best be met by utilizing a systematic, scientifically based assessment process.

Patient responses to critical illness may be grouped into two categories: (1) patterned responses—both physiological and psychological—that are similar to those of other patients and (2) individual responses unique to each patient. Maslow's conceptual framework of basic needs provides a meaningful initial reference point for the assessment of the patterned responses. Selye's stress framework can also provide a reference point for less specific patterned responses (see Unit 6).

Maslow's framework is based on three principles highly applicable to critical care:

1. Both physiological and psychological needs may be patterned to some extent.
2. Physiological needs take first priority.
3. Complete satisfaction of physiological needs is not necessary for psychological needs to emerge as well.

Meeting physiological needs assumes first priority for both patient and nurse in life-threatening or crisis situations. This focus does not negate the existence or importance of psychological needs. Unmet needs generate the patient problems and responses that form the focal point of nursing care.

Although Maslow's original heading of *physiological needs* was divided into more specific subcategories, priorities were not designated. Certain physiological needs assume priority over others in the critically ill patient. Comparison of these needs with Maslow's original list allows for modification of the original list with assignments of priorities. In this way a realistic system can be developed for the assessment of the physiological needs of the critically ill patient. A similar approach was recently suggested for use in general nursing practice in Campbell's textbook *Nursing Diagnosis and Intervention in Nursing Practice* (see Suggested Readings, p. 4).

It is our premise that *lack of oxygenation* is the most immediately life-threatening physiological problem. The two major systems providing for tissue oxygenation are the cardiovascular and pulmonary systems (see Unit 3). Thus assessment of these two major body systems must take priority in the management of the critically ill patient. The patient with coronary artery disease experiences a direct insult to the cardiovascular system. Assessment of this system therefore assumes the highest priority and is discussed in this text in great detail. *Fluid and chemical imbalances* also have life-threatening potential and exert a major influence on the cardiovascular and respiratory systems. Assessment of chemical imbalances thus assumes second priority. Subsequent physiological assessment, in decreasing priority, can include *metabolic* (nutritional) *imbalances;* alterations in body *defense mechanisms;* limitation of *structure, activity,* or *rest;* and alterations in *sexual activity* (Fig. 1). The neuroendocrine system integrates all these functions. Therefore assessment of *neuroendocrine function* is inte-

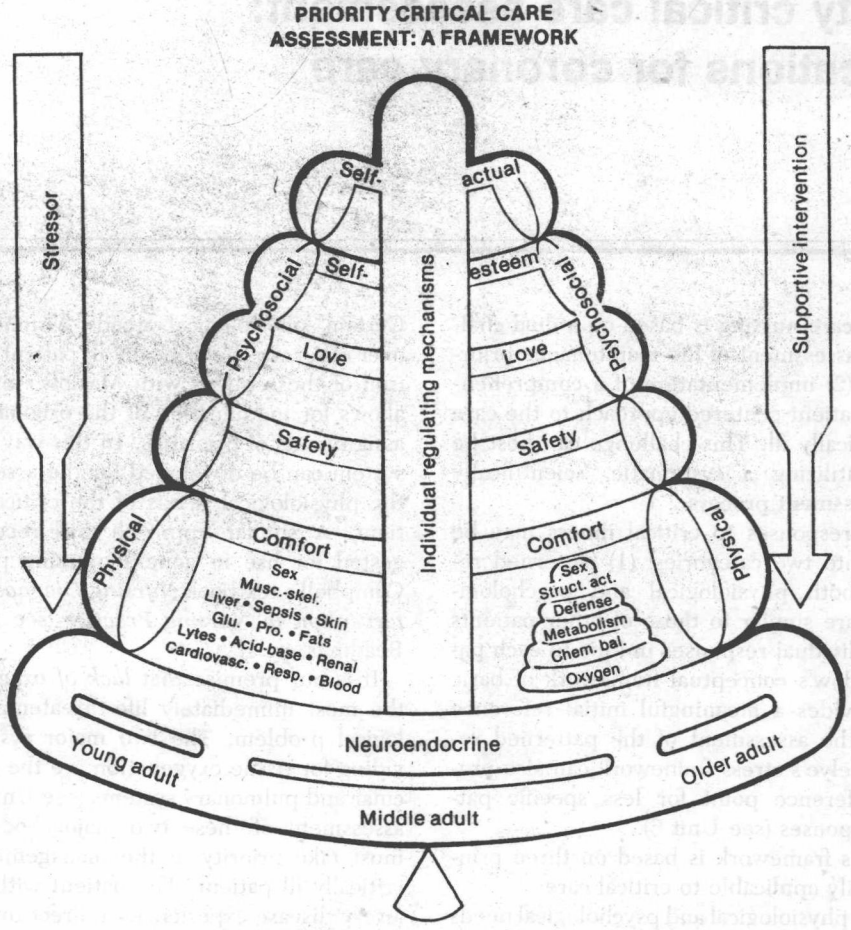


**Fig. 1**

grated within assessment of the cardiovascular and respiratory systems and fluid and chemical balances. It may be considered separately, as well, in the patient with a primary or secondary neurological disorder. Its exact priority level may be adjusted according to the specific clinical setting.

Maslow's *psychosocial* categories provide a framework for the assessment of the psychological needs and responses of the critically ill. *Safety* is regarded as the need for psychological order, consistency, and stability as well as protection from physical harm. The sense of safety may be disrupted by threats to either physical or psychological integrity, including pain, impending death, discomfort, and unfamiliar environments or routines.

*Love* or affiliation needs are regarded as needs for affection and attention from others as well as for interaction with others. Potential threats to meeting love needs include separation from family or significant persons and lack

of attention from others, such as the nursing staff.

*Self-esteem* is Maslow's third psychosocial assessment level. Self-esteem may be regarded as the need for a sense of self-respect and personal worth. This sense of personal worth is derived from recognition by others, status, reputation, power, physical strength, mastery of skills or competence in selected performance areas, independence, and a sense of control over one's physical and personal self. Potential threats to self-esteem include loss of physical strength, dependence on others for physical care or decision making, loss of control over one's behavior, repeated failure at performing tasks or overcoming obstacles, and verbal or nonverbal indications of lack of respect. Repeated criticism and lack of recognition (reinforcement) can further aggravate these threats.

*Self-actualization* is the last level in Maslow's assessment framework. Self-actualization includes the need to know and understand, to appreciate beauty and harmony, express creativity, and act spontaneously, and thus develop one's full potential as a human being. Most people probably exhibit certain aspects of these needs for at least short periods of time. (Examples are love of music and art, creative expression in hobbies, and enjoyment of favorite pastimes.) Emergence of self-actualization needs is particularly difficult for the patient with an acute myocardial infarction (MI) while he or she is in a coronary care unit, since so many basic needs are initially threatened. However, in the progressive care setting these needs may begin to emerge and may be utilized to release stress, promote relaxation, minimize boredom, and reduce the focus on the sick role.

Threats to psychological needs may be manifested by diffuse behavior patterns. In the patient with acute MI, the behavior patterns most commonly observed are overt anxiety, depression, and defense mechanisms. Temporary use of defense mechanisms can be a protective and often effective way to cope with the impact of multiple physiological and psychological threats. Denial is a commonly recognized defense mechanism used by the patient with an acute MI. This defense mechanism is crucial to the patient's well-being and should not be abruptly destroyed until the patient spontaneously expresses readiness or until the number of stressors have been reduced (as in a progressive care area). Although the specific cause of the behavior may be difficult to pinpoint, assessment of potential mechanisms (single or multiple) can remain systematic utilizing a framework such as Maslow's (see Unit 6, Table 7).

In addition to the patterned responses discussed so far, the critically ill patient will also exhibit unique responses based on individual background of resources, interactions, and experiences. This background can include such items as the patient's home, family, friends, occupation, past illnesses or experiences with hospitalization, stress patterns, diet, and elimination patterns. Specific tools can be developed to elicit this information. This core of individual resources and experiences influences the ability of the individual to deal with threats to his or her physiological and psychological needs. Threats or stressors may temporarily disturb the patient's inner balance. It is the nurse's role to investigate the patient's own resources as well as his or her potential needs so that the individual may be assisted in returning to a steady state of both physiological and psychological balance.

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UNIT 1

# Anatomy and physiology

1 The primary function of the heart is mechanical. It serves as a pump to deliver oxygenated blood to the body tissues in an attempt to meet their metabolic demands. The amount of blood put out by the heart *per minute* is known as the *cardiac output*.

2 Cardiac output is a product of *ventricular rate* × *stroke volume* (CO = VR × SV).

Variations in cardiac output can thus be produced by altering the _____ _____ or the _____ _____.

ventricular rate; stroke volume

3 The *heart rate* is primarily determined by the integrity of the heart's electrical system and the influence of the autonomic nervous system.

The *stroke volume* is the amount of blood put out by the heart with *each beat*. It is primarily determined by the pumping efficiency of the cardiac muscle and the blood volume returning to the heart.

4 LET US REVIEW: In an attempt to meet the demands of the tissues the heart pumps out a certain amount of oxygenated blood per minute. This amount of blood is known as the _____ _____.

cardiac output

Cardiac output is a product of _____ _____ and _____ _____.

ventricular rate
stroke volume

5 Normally the body compensates for rises and falls in stroke volume and heart rate so that as one increases the other decreases. Therefore when the trained athlete increases his cardiac muscle mass and thus his stroke volume, the heart rate *(increases/decreases)*.

decreases

6 If the body cannot compensate for a fall in heart rate by increasing the stroke volume or, conversely, for a fall in stroke volume by increasing the ventricular rate, the cardiac output then *(rises/falls)*.

falls

7 If the demands of the tissues for oxygen are not met because of this fall in cardiac output, the patient may begin to exhibit symptoms such as the following:

1. Dizziness, fainting, or mental confusion

2. Cold clammy skin
3. Decreased urinary output

8 When *symptoms* develop because of a fall in heart rate, it is said that the patient is experiencing a _____ fall in cardiac output. The heart rate is too slow for this particular patient regardless of the exact number of beats per minute.

symptomatic

9 When the heart muscle has been damaged or injured, as in acute myocardial infarction resulting in heart failure, the stroke volume *(increases/decreases)*. The body compensates to maintain cardiac output by increasing the _____ _____.

One of the earliest signs of heart failure is *(fast/slow)* rates.

decreases
heart rate
fast

## MECHANICAL STRUCTURES

10 The wall of the heart is composed of three major tissue layers (Fig. 1-1). The middle layer is the thickest layer and is composed of cardiac muscle (see Unit 4 for muscle structure). It is known as the *myocardium*. A thin layer of endothelium lines the *interior* of the heart and is known as the _____.

endocardium

The endocardium is in direct contact with the blood pumped through the heart.

The outer myocardium is surrounded by a membranous sac known as the pericardium. This sac is composed of two layers—a fibrous layer and a smooth layer. The smooth layer has two separate linings. The visceral lining is in close contact with the myocardium. The parietal lining is in close contact with the outer fibrous layer. The visceral pericardium forms the third and outermost layer of the wall of the heart and is also referred to as the *epicardium*.

11 LET US REVIEW: The major portion of the wall of the heart is composed of _____ _____ and is known as the _____. It is lined by an inner layer of endothelium known as the _____ and an outer membranous layer known as the _____.

cardiac muscle
myocardium
endocardium
epicardium

The epicardium forms the innermost part of the two-layer sac surrounding the myocardium known as the _____. Between the epicardium and the parietal pericardium is a potential space. A small amount of fluid is normally contained within this space and provides protection against mechanical friction and excess movement of the heart with posture and thoracic pressure changes.

pericardium

12 The layer of myocardium just below the endocardium is referred to as the *subendocardium*. The layer of myocardium just below the epicardium is referred to as the *subepicardium*. The subendocardial layer of myocardium has a poorer blood supply than the subepicardium.

Myocardial infarction may be limited to only one area of the myocardium, such as the subendocardium or, more commonly, may affect