CARDIAC SURGERY ESSENTIALS FOR CRITICAL CARE NURSING

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Dedication

This book is dedicated to Jack, Eleanor, Susan, Ray, Grace, Princess, Pauline, James, and Bria. We are grateful for your love, support, patience, and encouragement as we worked the production of this book.

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Preface

Postoperative care of the cardiac surgery patient is both challenging and dynamic. Changes in technology, new research findings, the advent of minimally invasive procedures, and the development of off-pump procedures now afford patients of advanced age and with higher levels of acuity the opportunity to undergo procedures for which they were deemed unsuitable candidates not so long ago. Hence, patients with more—and more significant—comorbidities are receiving care in the immediate postoperative period in the intensive care unit.

Patients who undergo cardiac surgery are at risk for several adverse events not only related to their preoperative condition, but also as a result of effects of the surgical procedure and anesthesia. This requires ICU nurses to demonstrate high levels of clinical judgment, clinical inquiry, and caring practices to effectively manage patients and help optimize outcomes. High-level competency as a facilitator of learning is also required as nurses prepare their patients to undergo cardiac surgery. Clearly, ICU nurses, as members of a multidisciplinary team, play a pivotal role in promoting 10-year survival and high quality of life for patients who undergo cardiac surgery.

This book is designed to address the needs of both new and experienced nurses who care for patients in the ICU immediately following cardiac surgery. The purpose of this book is twofold. First, it is designed to prepare the nurse who is first learning to care for patients undergoing cardiac surgery. It addresses significant changes in cardiac surgery and the nursing responsibilities required to meet the needs of these acutely ill patients. Second, the book provides advanced knowledge and a scientific basis for care for nurses who have mastered the essential knowledge and skills necessary to care for this patient population, but who now seek to develop a more in-depth knowledge base about advances in this dynamic field and strategies to optimize patient outcomes. The emphasis throughout the book is providing an evidence-based foundation for care of patients during the vulnerable period immediately following cardiac surgery. A number of chapters in the book will also prove useful to nurses who work in other areas in which there are acute and critically ill patients, as many of the concepts discussed here can be translated into care of patients other than those who have undergone cardiac surgery.

Because this book uses a comprehensive approach to address the needs of patients in the immediate postoperative period following cardiac surgery, it can also be used to help prepare nurses who plan to take the Cardiac Surgery Certification (CSC) subspecialty exam offered by the American Association of Critical-Care Nurses.

Throughout the book, Clinical Inquiry Boxes highlight research findings that have implications for nursing practice. Other features that promote critical thinking and provide application of content are the Case Studies and Critical Thinking Questions that follow the respective chapter content. To further enhance critical thinking and for nurses preparing for the CSC exam, the Self-Assessment Questions found at the end of each chapter can be used as practice questions.

Chapter 1

Clinical Judgment in Critical Care

Susan K. Chase

INTRODUCTION

The critical care unit provides a location for continuous monitoring of unstable patients as well as a context for the use of invasive technology that supports basic life processes for acute and critically ill patients. Learning about technology and mastering its safe use are often the foci of basic critical care education and orientation. Aside from its technology, the more basic value of a critical care unit is the level of clinical judgment that occurs there. The thinking processes of clinicians from a variety of disciplines are essential to safe and effective care. The potential for optimal outcomes is enhanced when clinical judgments occur with the nurse synthesizing and interpreting multiple, often conflicting sources of data (Hardin & Kaplow, 2005).

Working in a critical care area is both exciting and rewarding—but it is also demanding and challenging. Nurses in critical care are central for rapid response to potentially life-threatening conditions and key in humanizing technological care. Since critical care units were first developed, the monitoring of, and early response to changes in, patients' conditions by nurses have revolutionized care. Nurses in critical care areas must make rapid and accurate decisions about diagnostic and treatment approaches in an independent way or based on protocols or standard orders. This chapter describes the processes used by critical care nurses as they make these decisions. It will be useful to new critical care nurses as they learn to provide safe care. At the same time, it will also be useful to experienced critical care nurses who wish to improve their processes of thinking and communicating.

The thinking processes used by critical care nurses (CCNs) differ quite dramatically from the schoolbook description of the "nursing process." The linear process of collecting information, forming a decision, choosing an action, and evaluating that action is rarely used in real-world practice. In critical care, multiple conditions are assessed simultaneously, a variety of actions and interventions are carried out concurrently, and the condition of the patient changes constantly. There is not a single diagnosis or condition that is "resolved." Because the thinking work of CCNs is not a linear process, this chapter is likewise not linear. It deals in general terms with phases of the "thinking work" of nursing, but acknowledges that thinking and acting often overlap in real life.

Clinical judgment is one of the eight nurse competencies of the AACN Synergy Model for Patient Care adopted by the American Association of Critical-Care Nurses (AACN) (Reed, Cline, & Kerfoot, 2007). Clinical judgment is defined as the use of clinical reasoning

including decision making, critical thinking, and achieving a global grasp of a situation, coupled with nursing skills acquired through a process of integrating education, experimental knowledge, and evidence-based guidelines (AACN, 2002).

CLINICAL JUDGMENT PROCESSES

Research has provided a window into how humans think and make decisions. Several models can help clinicians understand their decision-making processes and help them to become more efficient and to reduce errors in judgment. The three models that are useful in critical care are information processing, intuition, and decision analysis (Chase, 2004). Each model contributes a unique perspective to decision making, and clinicians can choose which model to apply based on matters of individual style. The nature of specific problems may also determine which model is useful in a particular situation.

Information Processing

The information processing model uses the analogy of the human brain working like a computer as it processes new information that becomes available. It also relies on the assumption that an "optimal" diagnosis can be made by taking into account the data that are available in the problem situation. The possible diagnoses or problems that might be present for a patient are called "hypotheses" before they are confirmed. There are usually multiple competing hypotheses to explain a particular pattern of data. For example, a nurse may notice that a diabetic patient has a serum glucose level above baseline. This finding might be a result of several causes—a faster than expected glucose infusion, a new infection, or a missed insulin dose, among other possibilities. Each of these possibilities is a hypothesis. Further data collection can help to narrow the options by ruling out certain problems or increasing the likelihood of another explanation. In the example just given, if the nurse notes cloudiness in urine and an elevation of body temperature, then the probability that the hypothesis of infection is correct is increased. This, in turn, directs further action by the nurse. More data can be collected, such as a urinalysis and urine culture, to rule in (confirm) a urinary tract infection.

The information processing model focuses on reevaluating competing hypotheses based on new data (Thompson & Dowding, 2002). In critical care areas, nurses frequently work independently in choosing further data to be collected to support a hypothesis. Units may have protocols that authorize the nurse to proceed with further data collection without obtaining orders from a physician. This relative autonomy increases the necessity for critical care nurses to exercise appropriate judgment. It would not be appropriate judgment for the nurse to run expensive tests if the data do not warrant it. Judgment includes the decision to do things or not to do them. An economy of practice occurs when all appropriate actions—but *only* appropriate actions—are taken. To make the choice of further diagnostic testing, all information present must be considered.

In real life, nurses frequently need to act before all information necessary to confirm a diagnosis is available. If a condition that is suspected is particularly critical, such as impending respiratory failure, actions to support the patient must be taken even before a full understanding of the reason for such failure is obtained. To wait to offer support until the patient is in full respiratory failure is to miss the opportunity to offer timely interventions that support the patient's function. At times, by taking the most appropriate actions for the most likely problem and then noting the patient's response to those measures, the diagnosis is either confirmed or refuted. If the treatment approach does not work, additional reasons for the patient's problems

must be investigated. New data must be considered to help develop a picture that answers the question, "What's going on with this patient?"

In any clinical situation, certain diagnoses or problems are possible, and some are more likely than others. Critical care units are places where monitoring equipment allows for the collection of a wider range of data than in less acute settings. Critical care nurses are the constant collectors and evaluators of clinical data. Early in their careers, nurses new to critical care may focus on the compilation of data through the use of new or unfamiliar equipment such as electrocardiography, monitoring systems that reflect and record hemodynamic parameters through the use of a pulmonary artery catheter or continuous blood pressure through intra-arterial lines. It is appropriate that new nurses focus on perfecting their skills in managing and interpreting data from these systems. The assembly of information is just one small aspect of critical care nursing, however. The data obtained from monitoring systems represent key components to be utilized in understanding the full clinical picture presented by the patient.

Nurses collect and evaluate data to arrive at a diagnosis. Even after an initial medical diagnosis of acute myocardial infarction (AMI) is made, for example, the critical care nurse has many diagnostic options to consider. AMI patients may develop dysrhythmias, cardiogenic shock, pulmonary edema, or anxiety. Early detection of these conditions can lead to early and more effective treatment and better outcomes. As more data are collected, they change the likelihood of each of the possible complications that might occur. A normal respiratory rate and arterial blood gas values within normal limits for the patient's age, for instance, indicate that respiratory failure is not imminent. Even simple data, such as vital signs, offer a view of the wholeness of the patient and change the diagnostic possibilities. A normal respiratory rate might indicate that the patient is not in impending respiratory failure or experiencing anxiety. Standard support and monitoring will likely be sufficient to detect any changes in patient status. A rapid respiratory rate or restlessness in the patient should cause the nurse to set up different levels of support and to collect additional data.

Managing Data

In real life, multiple conditions may occur concurrently, and one finding (e.g., vital sign, hemodynamic parameter, lab value, assessment finding) may provide evidence for a variety of conditions. Because so much information is collected and used to form judgments in acute and critical care settings, flowsheets—either written on paper or assembled electronically—are used to organize and present the many pieces of information. Recognition of any condition depends on seeing patterns in the wide range of data available. Additionally, flowsheets enable healthcare providers to see how data points change over time. Individual values in isolation are not reflective of the whole person, nor are they reflective of the direction that a particular patient's condition is taking. Is the patient becoming more stable or less stable? Is mechanical ventilation providing adequate support of physiologic function, or is the patient so agitated or distressed by being unable to speak that expenditure of unnecessary energy is occurring? Is the patient failing to respond to any treatment approach such that multiple organ dysfunction syndrome is occurring? Seeing the whole of a situation comes with experience. It can lead to intuition, the topic of the next subsection.

Intuition

Once the nurse is oriented to critical care, the patterns of human response to challenges faced in critical situations become more evident and easily recognizable. Eventually, the

nurse is able to see the wholeness of a situation. The pieces of data are not seen discretely, but rather as patterns indicative of the whole. The nurse may simply look at the patient and recognize impending loss of stability or the loss of the will to live. At times, experienced nurses will see a pattern or feel a "gut" response to a clinical situation that allows them to "know" the situation of the patient without spending time processing individual pieces of data. Of course, to provide the data that an interdisciplinary team needs to set up a treatment plan, nurses must generate data and check on those "gut" feelings they have about the patient. What is interesting is that the intuition precedes the action. Nurses can develop their intuitive skills by discussing their "hunches" about patients, by analyzing which indicators led them to their intuitive sense, and by checking their own accuracy. Experienced nurses can do this in unit nursing rounds or in clinical case discussions.

The AACN Synergy Model for Patient Care recognizes that as nurses gain expertise, they move from Level 1, which focuses on data collection, following decision trees, and using standard protocols, to Level 3, where nurses are able to see the wholeness of situations quickly. A sense of understanding of the direction of processes is part of the competency of these nurses. At Level 5, nurses synthesize large amounts of data and help the entire team to recognize the "big picture" of what is happening with the patient (Reed et al., 2007).

Decision Analysis

Decision analysis is an approach to decision making based on mathematical models that take into consideration the likelihood of specific responses given action options. What is the likelihood that a patient who is intubated will develop pneumonia? What is the likelihood that the same intubation will allow for physiologic support during response from trauma or surgery? On a larger scale, if a new closed system suction device is used, what will be the reduced cost of care if the rate of ventilator-associated pneumonia is reduced? Decision analysis uses frequency and cost data to weigh options in care. It can be used for either individuals or groups of patients. Many current guidelines for practice are based on this kind of mathematical analysis.

RELATIONSHIP-CENTERED CARING IN CRITICAL CARE

All nursing is carried out in the setting of relationships. Despite the fact that many critically ill patients are intubated and unable to speak, nurses form relationships with their patients and their families. Such relationships are not just "being nice"; rather, they are central to coming to know patients and how they respond to the challenges of illness. Critical care nurses learn to recognize the patterns of patient responses. How one patient responds to the physical challenge of weaning from mechanical ventilation is different from how another patient does. For example, one patient may become tachypneic in response to the increased work of breathing during weaning, whereas another patient may experience an increased heart rate. Recognizing and communicating patient response patterns is important to excellence in critical care nursing. Recognizing the patterns of how patients respond to challenges can help the nurse decide when in the day is best to provide physical care or to attempt a weaning trial. If a patient did not sleep the previous night, for example, then rest before weaning may result in a better response.

The relationships formed by nurses also extend to patients' families. Family members can provide needed comfort and a quiet presence, or they can spread their own anxiety to the patient. Supporting the family and managing their responses and connection to the

patient are important interventions for optimal outcomes. Family members can assist CCNs in coming to know their patients, thereby helping ensure that the nurses can understand what matters most to the patients.

Now that we have explored the various ways of thinking that can be used in clinical judgment situations, we will see how CCNs can use these models in day-to-day practice.

DAY-TO-DAY PRACTICE

Critical care units are areas where specialized equipment allows for the continuous collection of data related to a patient's status. The quality of the data being collected and recorded is a central issue. If an intra-arterial line is improperly zeroed, the readings will be consistent—but they will be consistently inaccurate, which can lead to improper treatment plans being established. Critical care nurses learn during orientation how to set up monitoring systems in anticipation of patient admission to the unit, and they learn routines of validating systems as they assume responsibility. In many units, technicians are available to set up lines and equipment, but verifying the accuracy of readings is the responsibility of the nurse. In addition, over time, readings can drift for various reasons such as lines moving, patient position changes, or mechanical equipment problems. Experienced nurses learn to constantly assess the reliability of the data they collect. If a data pattern does not match the apparent condition of the patient, the nurse rechecks the source of the data for accuracy. The adage, "Treat the patient, not the numbers," is good to remember regardless of whether the numbers are accurate. Other data that might not be reliable include arterial blood gas values if the sample is not read immediately or if the patient has leukocytosis. Serum chemistry values may also be inaccurate depending on the quality of the sample and the precision of the analysis.

Establishing and verifying the data collection and monitoring system are important first steps in critical care judgment. The next step is establishing regular monitoring routines. Most critical care units have unit-specific routines for data collection, and some establish routines for monitoring particular types of clinical problems. These routines are important because a patient's status may change frequently in critical care, and regular monitoring allows the nurse to detect changes early, when intervention can prevent clinical deterioration. The nurse should consider, however, that each decision about data collection also has its own cost. For example, frequent blood draws over time can result in noticeable blood loss, particularly in pediatric settings. Awakening a patient hourly for days and nights in a row can result in sleep deprivation, which prevents healing and can lead to delirium. Sending samples for lab analysis costs the patient and the entire system financially as well.

The timing of data collection is one of the judgments that nurses should make by considering the entire situation of the patient. Additionally, unit protocols for assessment should be periodically reviewed after considering published reports and patient data. At which phase of recovery from major surgery is the patient most likely to have specific complications? When would data collection be appropriately timed to detect a specific complication? Unit-level practice committees can address questions such as these.

Too often, data collection becomes a mindless routine. The numbers are generated and the flowsheet is filled in, but no one really considers what the data mean. This situation represents a failure of the nurse to exert clinical judgment. It results in wasted energy and resources, and it does not protect the patient. Several ways that the CCN can be thoughtful about the data that are routinely collected are discussed next.

Trending and Knowing the Patient

Flowsheets are developed for specific critical care units to help organize data for processing purposes. By seeing how individual data bits change over time, "trends" can be detected. These trends are more important in determining the status of the patient than any individual piece of data would be. Is the blood pressure making a slow decline over the past two hours? Is this patient's heart rate generally slower than baseline? Identifying such patterns helps to determine the clinical significance of a change in any data reading. For a patient with a normally slow heart rate, a new rate of 80 might be worrisome; for another patient, a rate of 80 would not be a reason for clinical concern. Flowsheets also allow the nurse to see how readings of one parameter change along with other parameters. Blood pressure readings that are gradually decreasing but remain in the acceptable range might not be of concern. However, if the urine output is dropping during the same period, a condition of low cardiac output must be considered. Additional data about recent fluid loss, rates of fluid replacement, and an assessment for crackles in lungs would be needed. Critical care nurses spend much of their time collecting data. This is not the end of task, however, but just the beginning. Taking time to reflect on the "movement" or trend of the data is essential for critical care clinical judgment.

Even in critical care, contextual patient-related factors are important in coming to know the patient. The AACN Synergy Model for Patient Care points out patient characteristics that are part of each encounter. Central to critical care are consideration of patient stability and the predictability of the course of recovery. Other key characteristics include patient resiliency, vulnerability, complexity, and resource availability. The Synergy Model also incorporates a consideration of the patient's ability to participate in decision making and care (Reed et al., 2007). Clearly, coming to know the patient involves more than just gathering physiologic data.

Common Trajectories

Making sense of data requires knowing the individual patient, but it also requires knowing pathophysiology and understanding the workings of the body's compensatory mechanisms for a variety of critical care conditions. Nurses know for their own particular specialty unit—be it cardiovascular surgical, trauma, coronary care, neurosurgical, medical, transplant, or some other unit—the particular problems typically faced by patients in that unit. Critical care judgments are formed through a blend of knowing individual patients and knowing the trajectories that patients are likely to experience in a particular setting. In individual orientation programs or staff meetings, the particularities of units can be discussed and a common understanding developed by nurses or, even more powerfully, in an interdisciplinary perspective.

A trajectory is a predictable path or sequence of events that is commonly seen in a particular setting. For example, following open heart surgery for coronary revascularization with cardiopulmonary bypass, patients commonly require vasopressor administration to maintain blood pressure to support patency of newly implanted vessels. In addition, patients may experience tachycardia that can decrease cardiac output. Patients may be mechanically ventilated and have multiple chest tubes and pacing wires implanted directly in the myocardium. They will have central vascular access to facilitate fluid and medication administration. A common trajectory includes weaning the patient from vasopressors on the first night following surgery, weaning from mechanical ventilation by the morning after surgery (if not extubated before), and a gradual reduction in chest tube drainage. Deviation from this expected trajec-

tory, such as decreased oxygenation when weaning from mechanical ventilation is attempted or continued blood loss from chest tubes, indicates that this particular patient will require an individualized approach to support. Experienced CCNs recognize patients' progress along specific trajectories. A sense of how the patient is progressing down the predictable path of recovery is one way that the CCN sees patterns and senses the wholeness of the situation.

Surveillance

In critical care areas, nurses use a type of thinking that assesses for problems that do not yet exist. This is a different style of thinking than problem identification. It is a continual scanning for signs that a problem is developing. This method of thinking requires several kinds of knowledge, data collection, and processing. CCNs who wait until a problem becomes obvious before they intervene have missed a chance to prevent a cascade of events.

Knowledge that supports effective surveillance includes a deep understanding of the physiologic responses to the critical care setting and to the particular patient problems being addressed. Knowing that tracheal intubation exposes a patient to risk of ventilator associated pneumonia, the CCN with a high level of clinical judgment monitors arterial blood gas results, breath sounds, airway pressures, and vital signs. Waiting until pneumonia is fully evident would result in risk of hemodynamic instability and sepsis, both of which can lead to longer ICU stays or death.

Regular data collection for evidence of stability or signs of problems is essential to the process of surveillance. Most important, though, is the nurse's ability to recognize patterns that indicate deviation from the normal trajectory.

Investigating Problems

Experienced CCNs read their "gut" reactions. When patient responses indicate that things are going as predicted, nurses can alter their vigilance. Conversely, if the patient is not following the predicted trajectory, then the nurse considers appropriately other data sources, and discusses possible meanings of this divergent pattern. The nurse does not "rest" until the picture becomes clearer. Even "hunches" about what is going on can be explored and discussed until the patient's picture becomes clearer and data indicate an appropriate direction for decision.

One practice that critical care nurses use is that of "running possibilities." This process is a form of hypothesis generation, referred to earlier in this chapter. What could be a possible explanation for this finding? Could this person have an unusual presentation of a treatable problem? What if we try a treatment option for a while and see how the patient responds? This sort of thinking frequently happens in conversation with other nurses or with physicians (Chase, 1995).

Communicating Findings

Nurses in critical care have more autonomy than nurses in many other practice settings regarding data collection and treatment decisions such as weaning from various types of support. CCNs do not work in isolation, however, and they contribute to excellence in patient care by working collaboratively with a team of other healthcare providers. One of the skills that CCNs develop is effective communication of their impressions of the status of the patient to other members of the team. Many nurses have had the frustrating experience of believing that the patient needs to be managed in a certain way, but other members of the team do not agree. When the direction of the care and support differs, nurses are obligated to clarify, verify, and question the appropriateness of the treatment plan (if they believe that harm will come to the patient). Learning to communicate data and impressions in ways that allow others to understand

the basis for the CCN's judgment can minimize this source of frustration.

Assembly of data into patterns that have meaning will assist CCNs in communicating their overall impressions. Calling a physician and offering random bits of data will often not result in a positive response. The nurse can better organize this process by coming to know the types of data that individual clinicians value. For example, even if the findings are not abnormal, the amount of chest tube drainage will be important to a cardiac surgeon. When working with new teams of physicians, an anticipatory question can help to establish communication, such as, "Is there any particular parameter that you want us to pay special attention to this evening?" or "I've noticed a downward trend in blood pressure. Is there a level at which you want us to notify you?" Then, should a call be necessary, it has a context. This kind of communication requires "thinking forward."

One method that has been established in healthcare settings to assist with the assembly of data into meaningful patterns is the SBAR (Situation–Background–Assessment–Recommendation) technique. This framework facilitates communication among healthcare providers by providing a focused approach for communicating essential patient information in a usable context so that accurate care decisions can be made (Institute for Healthcare Improvement, 2008).

By understanding the competing hypotheses for the patient's condition, the CCN will be better able to present data in a way that assists the entire team in making good decisions. One kind of data that must be considered is "pertinent negative" data—that is, showing that certain data are normal to reduce the likelihood of one of the diagnostic options. For example, if the blood pressure is trending down, but breath sounds and arterial blood gas results are normal, that combination of findings would decrease the likelihood of left ventricular failure and increase the likelihood that the patient is volume depleted. The breath sounds and arterial blood gas results should be reported even though they are normal because they assist the other clinicians to understand the whole picture: They are "pertinent" even though they are normal.

Mobilizing the Team

Sometimes a CCN may detect that the patient's condition is changing rapidly and must assemble the necessary team members to respond appropriately. To do so, the nurse may need to page respiratory therapy, anesthesia, or other airway management teams, as well as the primary physician or designee. Making the decision to mobilize the team can be a daunting one for new CCNs. Experienced nurses and leaders can assist the new CCN in making this decision in a timely fashion. On the one hand, waiting until the situation becomes obvious would be dangerous for the patient. On the other hand, if the nurse calls the team in unnecessarily, that decision has costs, both financial and personal. It is possible that the CCN's clinical judgment was at a lower level in the AACN Synergy Model and that the call came prematurely or in error.

To deal with such issues, CCNs can discuss the process of mobilizing the team on individual units and reflect on how the process went: Did the nurse assemble sufficient data to generate the calls? Was the potential patient problem severe enough to warrant the call? Was the presentation of findings sufficiently clear? Did other members of the team respond appropriately? In hindsight, would any aspect of the patient's care be managed differently?

Team Decision Making

Ultimately, the critical care process is a team process. Data support the idea that good communication on a unit results in better

patient outcomes (Baggs et al., 1999; Knaus, Draper, Wagner, & Zimmerman, 1986; Kohn, Corrigan, & Donaldson, 2000; Larson, 1999; Page, 2004; Tammelleo, 2001). Units vary widely in how effectively communication occurs. Several possible problems can occur that the CCN should be aware of and try to correct.

The first consideration is nurse-to-nurse communication. Are experienced nurses helpful to new orientees, or do they require the new nurse to "pay their dues"? This kind of hazing should be recognized as such and should be dealt with by unit leadership. Other nurse-to-nurse difficulties can come at change of shift report, where one shift does not help establish the new shift nurses' understanding of patient baselines due to emotionally charged communication.

Other issues that arise may relate to whether the patient unit is orderly, with supplies on hand, and with essential data already assembled. Small things like this can lead to difficult communication and ultimately can result in poor nursing care.

Additional nurse-to-nurse difficulties can happen at the time of patient transfer. It is essential to the clinical judgment process that open and clear communication be established between patient care areas. By sharing with healthcare providers in the new unit what the patient's clinical course or trajectory has been, how this patient is unique, and which approaches have worked best, better clinical judgment is promoted on the new unit.

Choosing Interventional Approaches

Much of our consideration thus far has focused on clinical judgment as it relates to the status of the patient, patient stability, patient movement along a recovery trajectory, or the identification of problems. Judgment is also required regarding how best to respond to the issues that are identified in the assessment process. All management choices should be goal oriented and contextually appropriate. The AACN Synergy Model provides for a way of matching the CCN's competencies to the patient's needs. "Synergy results when the needs and characteristics of a patient, clinical unit, or system are matched with a nurse's competencies" (Hardin & Kaplow, 2005, p. 4). Even given the same medical condition, the CCN's response to the patient should reflect numerous factors, including those described in the Synergy Model. For example, a patient who has high levels of resiliency, as evidenced by return to baseline data after treatments, can be expected to recover more quickly and need less aggressive support than a patient who, because of longstanding concurrent conditions, might not be capable of rallying. A patient with few external resources might require aggressive advocacy on the part of the CCN.

Goal-Oriented Decisions

In line with the concept of trajectory, CCNs should always have a goal in mind when planning specific nursing actions. If the goal is stability, then support of basic physiologic functioning will support that goal. If the goal is to increase participation in care so as to support the patient–family unit, then adjusting visiting times to allow for prolonged contact might be chosen, provided that patient stability is not compromised. The CCN can then reflect on the effectiveness of those interventions in accomplishing the goal.

CCNs can actively support the unit in developing documentation systems that include goals and nursing actions. If a patient is anxious about how the family is responding to critical illness, for example, being able to see and be with a family member can reduce stress and the related catecholamine release that can have negative effects on the cardiovascular system. Nursing actions can have real effects on overall patient status. Promoting comfort and dignity for patients is a requirement for humanistic care and healing.

Supporting the Dying

As discussed earlier, the experienced CCN develops a sense of the big picture of the patient's condition and the direction of the trajectory. Often, critically ill patients have life-threatening conditions that can result in death. Death sometimes happens during aggressive resuscitative efforts. Frequently, however, an impending death is recognized by at least one member of the team. The goals of care may then shift to allow for patient comfort and family communication. The transition to caring for the dying patient can be one that provides the ultimate meaningful contribution on the part of the staff. Too often, however, an impending death is a time of competing goals, shifting direction of care, and difficult communication.

The CCN can assist in the dying process by maintaining a consideration of "Where are we going?" Asking that question during team meetings can assist the entire team in addressing the futility of care. The patient's and family members' goals will also need to be determined as part of this process, and it is often the nurse who assists in clarifying these values (Hiltunen, Medich, Chase, Peterson, & Forrow, 1999).

SUMMARY

A critical care nurse is not a technician. As a professional nurse, the CCN's focus of care is on the whole person and family at a vulnerable time. The focus of care on the physical problems patients face in critical care is obvious. More is known by clinicians about the functioning of the human body of patients in a critical care unit than by providers in almost any other environment of the healthcare system. Critical care nurses learn over time, however, that more is going on in a critical care unit than simply the care of physical bodies. Critically ill patients are whole human beings. Their fear or trust, their will to live, their ability to participate in care, and family support can make a real difference in patient outcomes. Ultimately, the clinical judgments made by CCNs are pivotal to providing care to acute and critically ill patients. Nurses are essential to the process of providing care by virtue of their perspective on meeting the needs of the whole patient. These needs can be based on the eight patient characteristics outlined in the Synergy Model. Nurses' constant presence provides for a way of seeing and knowing the person who is experiencing critical illness. Growing in ability to form exquisitely appropriate clinical judgments is a lifetime challenge—but it is one that is rewarding to both patient and nurse.

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Chapter 2

Cardiovascular Anatomy and Physiology

Susan K. Chase

INTRODUCTION

The heart is a muscular organ located beneath the sternum, between and slightly anterior to the lungs, in a section of the thorax known as the mediastinum. The mediastinum also contains the great blood vessels—the vena cavae, the pulmonary artery, and the aorta—as well as the esophagus and (in children) the thymus gland. Figure 2–1 illustrates the location of the heart.

The heart is surrounded by the pericardium, a dual-layer sac that is minimally elastic. This sac allows for smooth movement of the cardiac muscle within the pericardium. If fluid or blood fills the pericardium, it puts pressure on the heart from the outside and prevents normal filling of heart chambers. The main function of the heart is to pump blood throughout the body, thereby allowing for the delivery of oxygen and nutrients to the body cells and for the transport of waste products to processing or removal organs. Other functions of the cardiovascular system flow from the blood itself: The blood consists of cells that support the body's ability to fight off infection as well as chemicals such as hormones that control processes of bodily systems. In addition, the heart releases hormones that assist in controlling blood flow and pressures.

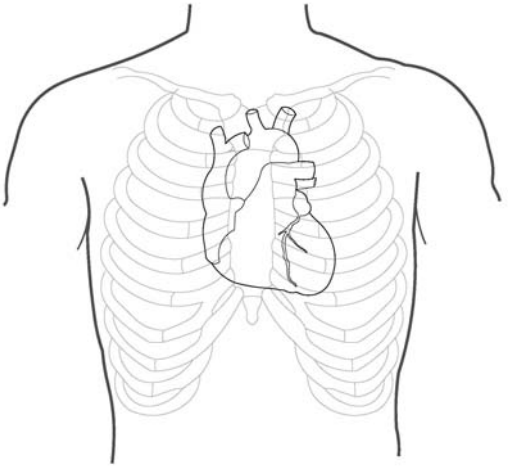

Figure 2–1 The heart and its location in the thoracic cavity.

Source: Illustrated by James R. Perron

CHAMBERS AND VALVES OF THE HEART

The structure of the heart supports its functions. The heart consists of four chambers, each with muscular walls (Figure 2–2). It also has four valves that control the direction of the blood flow through these chambers. The two upper chambers of the heart are the atria; the two lower chambers are the ventricles. Actually, the terminology of "upper" and "lower" refers to a conceptual picture of the heart, with the most anterior chambers of the heart being the right and left ventricles. The muscle walls of the four chambers vary widely in thickness. Because

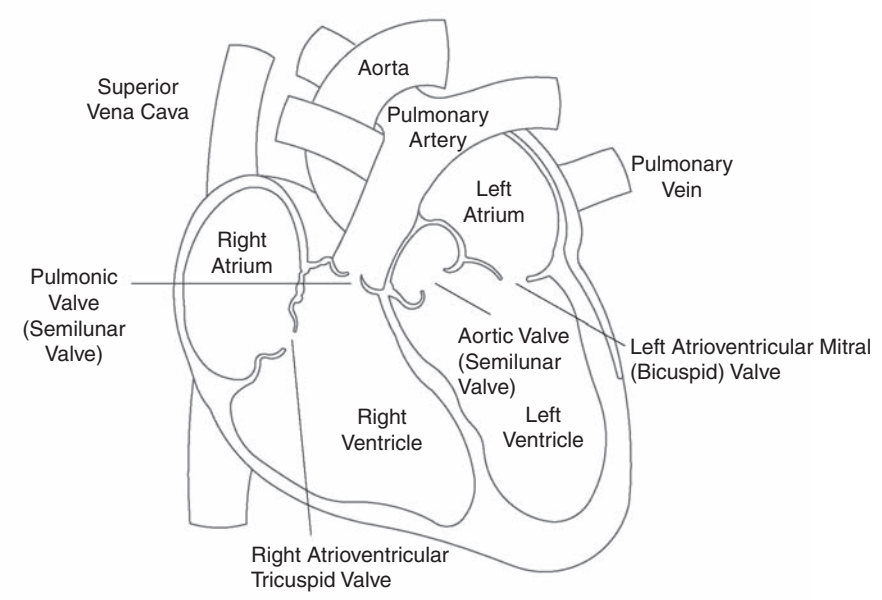

Figure 2–2 Chambers of the heart and valves.

Source: Illustrated by James R. Perron

the left ventricle must pump blood into the systemic circulation, which has relatively higher pressure than the pulmonary system, the wall of the left ventricle is the thickest (13–15 mm). The right ventricle is only 3–5 mm thick. The atria have the thinnest walls (2–5 mm).

POINT OF MAXIMAL IMPULSE

The tip of the left ventricle is positioned anterior and to the left in the mediastinum. When the left ventricle contracts, its tip is forced even more anteriorly toward the chest wall. This movement can be palpated as the "point of maximal impulse" (PMI). The PMI is normally located in the midclavicular line at the fifth intercostal space, but can sometimes vary. Abnormalities in the shape and size of the heart, for example, can alter the position and location of the heart itself. A distended abdomen can flatten and elevate the level of the heart. Hyperextended lungs can depress the level of the heart. Enlargement of the heart can cause the PMI to shift to the left in the chest. Noting the position of the PMI can, therefore, give some indication of the size or position of the heart (Woods, Froelicher, Motzer, & Bridges, 2004).

Although most of the heart tissue is muscle, this organ also has a fibrous band that separates the atria from the ventricles and contains the four cardiac valves, which are themselves made up of connective tissue. The cardiac valves consist of fibrous rings to which valve leaflets are attached. The tricuspid valve contains three flat valve leaflets. The pulmonic and aortic valves each have three leaflets that are termed "semilunar" because of their crescent-like shape. The mitral valve has two flat leaflets that resemble the pointed shape of a bishop's miter. The valves themselves are covered with epithelial tissue. The tricuspid and mitral valves (collectively termed the atrioventricular [AV] valves because of their location) are attached to chordae tendinae, which are connected on their opposite ends to papillary muscles in the ventricles. The muscles prevent the valve leaflets from being pushed backward into the atria when pressure rises in the ventricular chambers during ventricular contraction. Proper functioning of the valves depends on all these features being intact.