

Book Reviews

Cardiac Mechanical Assistance Beyond Balloon Pumping

Edited by Susan J. Quaal

Mosby-Year Book, Inc.
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72 contributors

Susan J. Quaal wrote the first edition of *Comprehensive Intra-Aortic Balloon Pumping* in 1983. At the end of that book, she included two chapters on ventricular assist devices (VADs) and the Jarvik-7 total artificial heart (TAH). As a follow-up to that book, she has edited *Cardiac Mechanical Assistance Beyond Balloon Pumping*.

In this monograph she has attempted, and for the most part has succeeded, to put together a reference intended for anyone involved in the care of patients supported by VADs and TAHs. To do this, she has recruited the help of many health professionals, including physicians, nurses, engineers and perfusionists.

Part One reviews the causes of adult and pediatric heart failure and presents an overview of the various types of VADs and their application. A review of the status of TAH development by Dr. Willem Kolff, one of the pioneers of artificial organ development, is also included.

Part Two discusses specific types of mechanical assist devices, including roller pumps, centrifugal pumps, Thoratec, Hemopump, Novacor, HeartMate and Abiomed ventricular assist systems. Descriptions of the Bard Cardiopulmonary Support System, external counterpulsation, and the Symbion and Utah TAHs are also included.

A brief description of the operation of the device, along with discussions on patient selection, insertion techniques, patient transport, anticoagulation, complications, weaning, and clinical results is contained in each of these chapters. Although some of the statistics and product information data are slightly dated now, the book does a good job of explaining the basics of how each device works and presents unique aspects of caring for patients on each assist device. In fact, each chapter contains a brief nursing management section.

Part Two also reviews the Japanese and former Soviet Union's experience with circulatory support and concludes with an in-depth description of the evolution of the Food and Drug Administration's (FDA) role in evaluating VAD and TAH clinical

trials in the U.S. This chapter explains the involved process of getting FDA approval for clinical trials and explains why the process of getting final FDA approval for a device often takes so long.

Part Three presents some guidelines for setting up a cardiac mechanical assist device clinical trial. Chapters are included that describe the role that the clinical engineer, perfusionist, and nurse play in implementing a ventricular assist device program. Although the chapter on the perfusionist's role specifically describes a centrifugal ventricular assist program, it contains information on procedures and general patient care than can be applied to other support devices as well.

Part Four, entitled "Ethical and Psychological Issues," is rather unique in a monograph on cardiac assist devices. This section raises questions ranging from the allocation of scarce resources to the spiritual support of patients requiring VADs. One chapter, written by Una Loy Clark Furrer, wife of artificial heart recipient Barney Clark, gives a touching and insightful look at how the decision to use a mechanical cardiac assist device can impact on the family of the recipient.

The last part of the book completes the review of cardiac mechanical assistance by discussing aspects of developing a mobile VAD team and by reviewing cardiomyoplasty and skeletal muscle-powered mechanical assistance.

While not presenting information that is not available from other sources, this book does a very good job at presenting a rather complete and concise review of the various types of VADs that are currently available and presenting other related issues involved in running an assist device program. Even though the discussions on device operation are not intended to be in depth, enough detail is given to get a general idea of how each device is controlled and operates.

In conclusion, the sections are logically arranged and easy to read with references listed at the end of most chapters. This book will be an especially valuable reference for perfusionists or perfusion students who want to learn about specific assist devices or who want guidelines on how to care for patients on these assist devices.

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The Manual of Clinical Perfusion - The Pocket Guide to Perfusion

John E. Brodie, MS, CCP, PA and Ronald B. Johnson, CCP
Glendale Medical Corporation

PO Box 15774
Augusta, GA, 30919-1774

Price \$28
23 chapters; 237 pages

In the field of cardiovascular perfusion, the number of current reference books written by, and for, perfusionists, is few in number. Anesthesia manuals provide useful information about certain aspects of intraoperative patient care, but the perfusion aspects of the case are often general and provide little in the way of practical knowledge. Clinical perfusionists and students alike should find *The Manual of Clinical Perfusion* a useful and needed addition to their personal libraries.

A wealth of useful and practical information is contained in the manual, and its size makes it portable enough to carry in a lab coat pocket. Performance specifications on membrane surface area, rated flow and gas transfer rates for hollow fiber and silicone membrane oxygenators are presented in table format. Several chapters include useful formulas and sample calculations of patient blood volume, post-dilutional hematocrit, fibrinogen and platelet concentrations.

The authors begin with a discussion of circuit design and circuitry components, including oxygenators, tubing packs, filters, and cannulae. Manufacturers' performance data is presented, in addition to recommendations on safe limits of operation. The section on solutions contains information on predicting dilutional effect on osmolarity, hematocrit and fibrinogen levels, as well as formulas and sample calculations for their correction. Hemostasis management is presented in the chapter on blood, following a concise review of the composition and function of plasma and the formed elements.

Cardioplegia solution composition, delivery systems and infusion techniques are examined in the chapter on myocardial protection. The authors present current views of the advantages and disadvantages of warm vs. cold delivery. A chapter on the conduct of perfusion discusses the initiation, maintenance and termination of bypass, including aspects of physiological monitoring such as assessment of adequacy of blood and sweep gas flowrates, and FIO_2 at various core temperatures. The section on pediatric perfusion provides useful information on methods of calculating blood volume by patient weight, blood flowrate by weight and BSA, and choosing the correct size of circuit components such as tubing, cannulae and oxygenator. A condensed listing of congenital pathology and surgical corrective procedures follows.

Perfusion accidents are dealt with in a logical, step-by-step fashion, beginning with a list of clinical signs that may be manifested, followed by suggested courses of corrective action. Massive air embolism, water-to-blood leak, oxygenator failure/changeout, methemoglobinemia, and malignant hyperthermia are covered. A chapter is included on dealing with special cases such as perfusion of the pregnant patient, cold agglutinins, sickle cell disease, hereditary spherocytosis, thalassemia, ascending

and descending aortic aneurysm repair, circulatory arrest, the Jehovah's Witness patient, accidental hypothermia, erythroblastosis fetalis, pulmonary embolectomy, and isolated limb perfusion. I would have liked to have seen a section in this chapter dealing with hemostasis management problems and possible corrective solutions.

Blood conservation techniques including intra- and post-operative scavenging techniques using autotransfusion processors, preoperative autologous blood removal, and hemoconcentration are discussed in terms of circuit requirements, placement, and effects on hemostasis management.

Intra-aortic balloon counterpulsation is presented in a clear, stepwise manner, beginning with indications and contraindications of IABC, catheter insertion techniques, console and transducer preparation, establishment of timing and triggers, anticoagulation requirements and weaning parameters. There is also a list of basic steps required of the perfusionist to prepare for initiation of IABC. Centrifugal ventricular assist devices are presented with a look at equipment requirements, priming and cannulation procedures, flow and volume requirements, anticoagulation and hemodynamic management, as well as weaning criteria and procedures. Arterial-veno and veno-veno ECMO are similarly presented, with a section on monitoring and maintaining blood gases, fibrinogen, platelets, hematocrit and colloid oncotic pressure.

The chapter on pharmacology provides essential information on more than eighty agents used in the perioperative period. These drugs are very concisely presented, with information pertaining to classification, trade names, generic name, indications, mechanism/site of action, and dosage. There are templates at the end of the chapter for additional drugs. The final two chapters provide information on cardiac anatomy and diagnostic procedures, specifically electrocardiographic interpretation and cardiac angiography.

Appendices provide formulas, conversion factors, charts of normal values, normal heart pressures and oxygen saturation, cannulation sites, and a nomogram to determine BSA. A list of the names and addresses of perfusion education programs, professional organizations, and supply companies is also included. The book is concisely written and presents a wealth of current and practical information contained in a pocket-size format. The index is extensive and complete, and in combination with the bold chapter headings printed at the top of each page, required information is easily accessed. Space is provided at the end of each chapter for notes. The price tag is surprisingly modest in the high-priced medical book market. I recommend this book as a valuable and useful tool for perfusion trainees and practicing clinicians.

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