

Cambridge University Press & Assessment

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Edited by Alexandre Joosten , Maxime Cannesson , Robert G. Hahn

Frontmatter

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## Foreword

Surgical interventions were documented for trauma already in prehistoric times, but the development of effective anesthetic agents in the mid-1800s, and later of muscle relaxants, paved the way for increasingly complex surgeries to be performed. As these interventions became more difficult, invasive, and thus longer, the need to maintain hemodynamic homeostasis and ensure adequate tissue oxygen delivery gained importance.

The word “hemodynamic” is derived from the Greek words *haima*, meaning blood, and *dunamis*, meaning power, and thus reflects the force involved in moving the circulation around the body. The word “monitoring” is derived from the Latin verb *monere*, meaning to warn or remind. “Hemodynamic monitoring” therefore essentially involves the use of methods to indicate the status of the blood circulation and to alert the clinician to any abnormalities. The very earliest form of hemodynamic monitoring was measurement of the pulse to estimate heart rate. In 1828, blood pressure was measured for the first time in humans and the sphygmomanometer was developed in the 1880s. A major advance in monitoring, and in our understanding of more complex hemodynamic interactions, came with the development of the Swan–Ganz catheter in the 1970s, enabling multiple variables to be measured simultaneously. More recent technological advances have seen a move toward increasingly non-invasive monitoring, notably for cardiac output assessment. Open-loop and closed-loop devices are also becoming available, which can assess hemodynamic status and offer advice or alerts regarding appropriate treatment (open-loop) or automatically provide treatment (closed-loop). And with the rapid advances currently taking place in artificial (or “augmented”) intelligence, automatization of fluid therapy guided by continuous hemodynamic monitoring is likely to become a standard fixture in our operating rooms.

Indeed, among the multiple interventions used during surgery, fluid administration is one of the most frequent. Perioperative hypovolemia and fluid overload both impact negatively on patient outcomes, and appropriate administration of enough, but not too much, intravenous fluid is crucial to limit complications and ensure adequate tissue perfusion. Nevertheless, despite the widespread use of intravenous fluids questions still remain regarding the optimal approach to fluid administration, and there is wide variability in approaches to perioperative fluid management.

There are relatively few books specifically related to the combined notion of hemodynamic monitoring and fluid administration in the surgical patient, so this volume fills an important gap and provides a valuable up-to-date guide for all involved in the care of surgical patients. *Hemodynamic Monitoring and Fluid Therapy during Surgery*, a combined and updated version of two previous volumes, *Perioperative Hemodynamic Monitoring and Goal Directed Therapy: From Theory to Practice*<sup>1</sup> and *Clinical Fluid Therapy in the Perioperative Setting*,<sup>2</sup> is divided into four parts, providing comprehensive coverage of important aspects of hemodynamic monitoring and fluid therapy in chapters written by

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<sup>1</sup> Cannesson M, Pearse R (Eds). (2014). *Perioperative Hemodynamic Monitoring and Goal Directed Therapy: From Theory to Practice*. Cambridge: Cambridge University Press. doi: 10.1017/CBO9781107257115

<sup>2</sup> Hahn RG (Ed). (2016). *Clinical Fluid Therapy in the Perioperative Setting* (2nd ed.). Cambridge: Cambridge University Press. doi: 10.1017/CBO9781316401972

an international panel of experts in their field. Part 1 sets the scene in terms of current concepts and aspects of hemodynamic monitoring. In Part 2, basic physiology of body volume distributions, fluid administration, and acid–base balance are revisited along with discussion of different fluid types. Part 3 focuses on the practicalities and complications of perioperative fluid infusion, including measures of fluid responsiveness and the role of goal-directed hemodynamic therapy. Several chapters in this section are then dedicated to specific types of surgery, trauma patients, and the pediatric population. Finally, Part 4 provides a vision of how the field is likely to advance in the future as new technology is employed to improve monitoring and provide more personalized patient care.

Despite the ever-increasing amounts of online material, books such as this, which gather together in one place chapters on related aspects of a specific topic written by known experts, are still valuable in providing an accurate and reliable source of information. The editors and authors are to be congratulated on this comprehensive volume, which covers the underlying physiology, available tools, current approaches, and a view of the future, to help improve knowledge about the appropriate use and application of hemodynamic monitoring to guide perioperative fluid therapy.

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## Preface

Over the past two decades, Cambridge University Press has published several books focused on perioperative hemodynamic care. Our present work incorporates and updates two of these texts. The first, *Clinical Fluid Therapy in the Perioperative Setting*, provided a means to understand fluid therapy and apply it to various perioperative situations. The second, *Perioperative Hemodynamic Monitoring and Goal Directed Therapy: From Theory to Practice*, established the importance of setting targets using monitors to improve perioperative vasopressor and fluid therapies. Our aims in the present work are similar to its predecessors: to convey a physiological foundation that will allow readers to transition with ease towards contemporary applications of perioperative hemodynamic therapy while simultaneously providing the knowledge required for advances in clinical hemodynamic research.

These messages are fundamental because hemodynamic monitoring and therapy have now become an integral part of perioperative care. Almost every patient who undergoes anesthesia receives intravenous fluids and many also require vasopressors. Every patient has blood pressure and heart rate monitoring, and higher risk patients benefit from continuous cardiac output monitoring. Physicians, nurses, patients, and even their families are thus faced with information and complex therapies that can be lifesaving. However, improper use can also be devastating and lead to severe iatrogenic morbidity. Today in perioperative medicine, it is indispensable to know the details of hemodynamics not only to give our patients the best quality of care but also to identify the limitations of these therapies and the potential of improvement through research.

Our work stems from a strong collaboration of world-renowned experts in the field of hemodynamics. We would like to wholeheartedly thank them for their contributions to both the updated and new chapters that will undoubtedly provide cutting-edge information for both clinicians and researchers. Although we provide detailed information on specialized topics, this text also provides a solid foundation for residents in anesthesia and critical care medicine as well as medical students who have a special focus on perioperative medicine.

*Alexandre Joosten, Sean Coeckelenbergh, Robert Hahn and Maxime Cannesson*