HOSPITAL PHYSICIAN®

CRITICAL CARE MEDICINE BOARD REVIEW MANUAL

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Hemodynamic Monitoring in the Intensive Care Unit

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I. INTRODUCTION

The ability to accurately evaluate oxygen transport and intravascular volume is essential to the management of patients in the intensive care unit (ICU). Bedside clinical evaluation is vague or nondiagnostic. Even when the clinician has the correct diagnosis or management plan, it can be difficult to assess how conservatively or aggressively to apply the appropriate intervention. Hemodynamic monitoring allows the clinician to obtain data for a quantitative analysis of physiologic parameters that can affect cardiac output, cardiovascular performance, gas exchange, and ultimately, tissue oxygenation.

The well-equipped ICU uses many different technologies that yield important information about adequacy of perfusion. Some techniques evaluate cardiac output directly; others evaluate the effects that adequate or inadequate perfusion have on end-organ function. This review concentrates on four of the more commonly used modalities.

It is important to emphasize that these measurements must be made accurately, interpreted appropriately, and then acted upon in the context of the patient's illness if they are to have a positive effect on the patient's outcome. Therefore it is insufficient to understand only how to make the measurements; the clinician must understand how to interpret the data, understand the limitations of the technology, and apply the information obtained to a sound treatment regimen that makes sense for the individual patient.

Normal values for commonly used hemodynamic parameters are provided in **Table 1**. Formulae necessary to calculate derived hemodynamic parameters are provided in **Table 2**.

II. CASE 1 PRESENTATION

Case patient 1 is a 55-year-old man who presents to the emergency department complaining of dizziness. His past medical history is significant for long-standing insulin-dependent diabetes mellitus, alcohol abuse, hypertension, and a myocardial infarction he sustained 2 years previously. On examination, he is lethargic and diaphoretic. His pulse rate is 130 bpm and regular, his respiratory rate is 26 breaths/min and hyperpneic. His blood pressure is 90/60 mm Hg supine and 70/50 mm Hg sitting upright. The remainder of his