EXHIBIT 5

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ice to the scientific community

The MERCK Manual

Of Diagnosis and Therapy

NINETEENTH EDITION

Robert S. Porter, MD, *Editor-in-Chief*
Justin L. Kaplan, MD, *Senior Assistant Editor*

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Illustrators: Christopher C. Butts
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Indexers: Keryn A.G. Lane
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Preface

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nt primary: Palliation
tic: Depends on tumor origin

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hy over 5 to 6 yr to monitor for re-
umors are excised unless another
g, dementia) contraindicates sur-
gery is usually curative (95%
3 yr). Exceptions are rhabdomyo-
of which regress spontaneously
require treatment, and pericardial
hich may require urgent pericar-
Patients with fibroelastoma may
valvular repair or replacement.
domyomas or fibromas are multi-
cal excision is usually ineffective,
sis is poor after the first year of
l at 5 yr may be as low as 15%.
t of malignant primary tumors is
ative (eg, radiation therapy, che-
management of complications)
gnosis is poor.
t of metastatic cardiac tumors
tumor origin. It may include
motherapy or palliation.

SECTION 16

Critical Care Medicine

GYN 18 | PED 19 | GER 20 | Rx 21 | INJ 22 | SPS 23 | APP | IND | CRC 16 | GU 17

222 Approach to the Critically Ill Patient

Critical care medicine specializes in caring for the most seriously ill patients. These patients are best treated in an ICU staffed by experienced personnel. Some hospitals maintain separate units for special populations (eg, cardiac, surgical, neurologic, pediatric, or neonatal patients). ICUs have a high nurse:patient ratio to provide the necessary high intensity of service, including treatment and monitoring of physiologic parameters.

Supportive care for the ICU patient includes provision of adequate nutrition (see p. 21) and prevention of infection, stress ulcers and gastritis (see p. 131), and pulmonary embolism (see p. 1920). Because 15 to 25% of patients admitted to ICUs die there, physicians should know how to minimize suffering and help dying patients maintain dignity (see p. 3480).

PATIENT MONITORING AND TESTING

Some monitoring is manual (ie, by direct observation and physical examination) and intermittent, with the frequency depending on the patient's illness. This monitoring usually includes measurement of vital signs (temperature, BP, pulse, and respiration rate), quantification of all fluid intake and output, and often daily weight. BP may be recorded by an automated sphygmomanometer; a transcutaneous sensor for pulse oximetry is used as well.

Other monitoring is ongoing and continuous, provided by complex devices that require special training and experience to operate. Most such devices generate an alarm if certain physiologic parameters are exceeded. Every ICU should strictly follow protocols for investigating alarms.

Blood Tests

Although frequent blood draws can destroy veins, cause pain, and lead to anemia, ICU patients typically have routine daily blood tests to help detect problems early. Generally, patients need a daily set of electrolytes and a CBC. Patients with arrhythmias should also have Mg, phosphate, and Ca levels measured. Patients receiving TPN need weekly liver enzymes and coagulation profiles. Other tests (eg, blood culture for fever, CBC after a bleeding episode) are done as needed.

Point-of-care testing uses miniaturized, highly automated devices to do certain blood tests at the patient's bedside or unit (particularly ICU, emergency department, and operating room). Commonly available tests include blood chemistries, glucose, ABGs, CBC, cardiac markers, and coagulation tests. Many are done in < 2 min and require < 0.5 mL blood.

Cardiac Monitoring

Most critical care patients have cardiac activity monitored by a 3-lead system; signals are usually sent to a central monitoring station by a small radio transmitter worn by the patient. Automated systems generate alarms for abnormal rates and rhythms and store abnormal tracings for subsequent review.

Some specialized cardiac monitors track advanced parameters associated with coronary ischemia, although their clinical benefit is unclear. These parameters include continuous ST-segment monitoring and heart rate variability. Loss of normal beat-to-beat variability signals a reduction in autonomic activity and possibly coronary ischemia and increased risk of death.

Pulmonary Artery Catheter Monitoring

Use of a pulmonary artery catheter (PAC) is becoming less common in ICU patients. This balloon-tipped, flow-directed catheter is inserted via central veins through the right side of the heart into the pulmonary artery. The catheter typically contains several ports that can monitor pressure or inject fluids. Some PACs also include a sensor to measure central (mixed) venous O_2 saturation. Data from PACs are used mainly to determine cardiac output and preload. Preload is most commonly estimated by the pulmonary artery occlusion pressure (see p. 2245). However, preload may be more accurately determined by right ventricular end-diastolic volume, which is measured using fast-response thermistors gated to heart rate.

Despite longstanding use, PACs have not been shown to reduce morbidity and mortality. Rather, PAC use has been associated with excess mortality. This finding may be explained by complications of PAC use and misinterpretation of the data obtained. Nevertheless, some physicians believe PACs, when combined with other objective and clinical data, aid in the management of certain critically ill patients. As with many physiologic measurements, a changing trend is typically more significant than a single abnormal value. Possible indications for PACs are listed in Table 222–1.

Procedure: The PAC is inserted through a special catheter in the subclavian or internal jugular vein with the balloon deflated. Once the catheter tip reaches the superior vena cava, partial inflation of the balloon permits blood flow to guide the catheter. The position of the catheter tip is usually determined by pressure monitoring (see Table 222–2 for intracardiac and great vessel pressures) or occasionally by fluoroscopy. Entry into the right ventricle is indicated by a sudden increase in systolic pressure to about 30 mm Hg; diastolic pressure remains unchanged from right atrial or vena caval pressure. When the catheter enters the pulmonary artery, systolic pressure does not change, but diastolic pressure rises above right ventricular end-diastolic pressure or central venous pressure (CVP); ie, the pulse pressure narrows. Further movement of the catheter wedges the balloon in a distal pulmonary artery. A chest x-ray confirms proper placement.

The systolic pressure (normal, 15 to 30 mm Hg) and diastolic pressure (normal, 5 to 13 mm Hg) are recorded with the catheter balloon deflated. The diastolic pressure corresponds well to the occlusion pressure, although diastolic pressure can exceed occlusion pressure when pulmonary vascular resistance is elevated secondary to primary pulmonary disease (eg, pulmonary fibrosis, pulmonary hypertension).

Pulmonary artery occlusion pressure (PAOP): With the balloon inflated, pressure at the tip of the catheter reflects the static back pressure of the pulmonary veins. The balloon must not remain inflated for > 30 sec to prevent pulmonary infarction. Normally, PAOP approximates left atrial pressure, which in turn approximates left ventricular end-diastolic pressure (LVEDP). LVEDP reflects left ventricular end-diastolic volume (LVEDV). The LVEDV represents preload, which is the actual target parameter. Many factors cause PAOP to reflect LVEDV inaccurately. These factors include mitral stenosis, high levels of positive end-expiratory pressure (> 10 cm H_2O), and

Table 222–1. POTENTIAL INDICATIONS FOR PULMONARY ARTERY CATHETERIZATION

Cardiac disorders
Acute valvular regurgitation
Cardiac tamponade
Complicated heart failure
Complicated MI
Ventricular septal rupture
Hemodynamic instability*
Assessment of volume status
Shock
Hemodynamic monitoring
Cardiac surgery
Postoperative care in critically ill patients
Surgery and postoperative care in patients with significant heart disease
Pulmonary disorders
Complicated pulmonary embolism
Pulmonary hypertension

*Particularly if inotropic drugs are required.

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