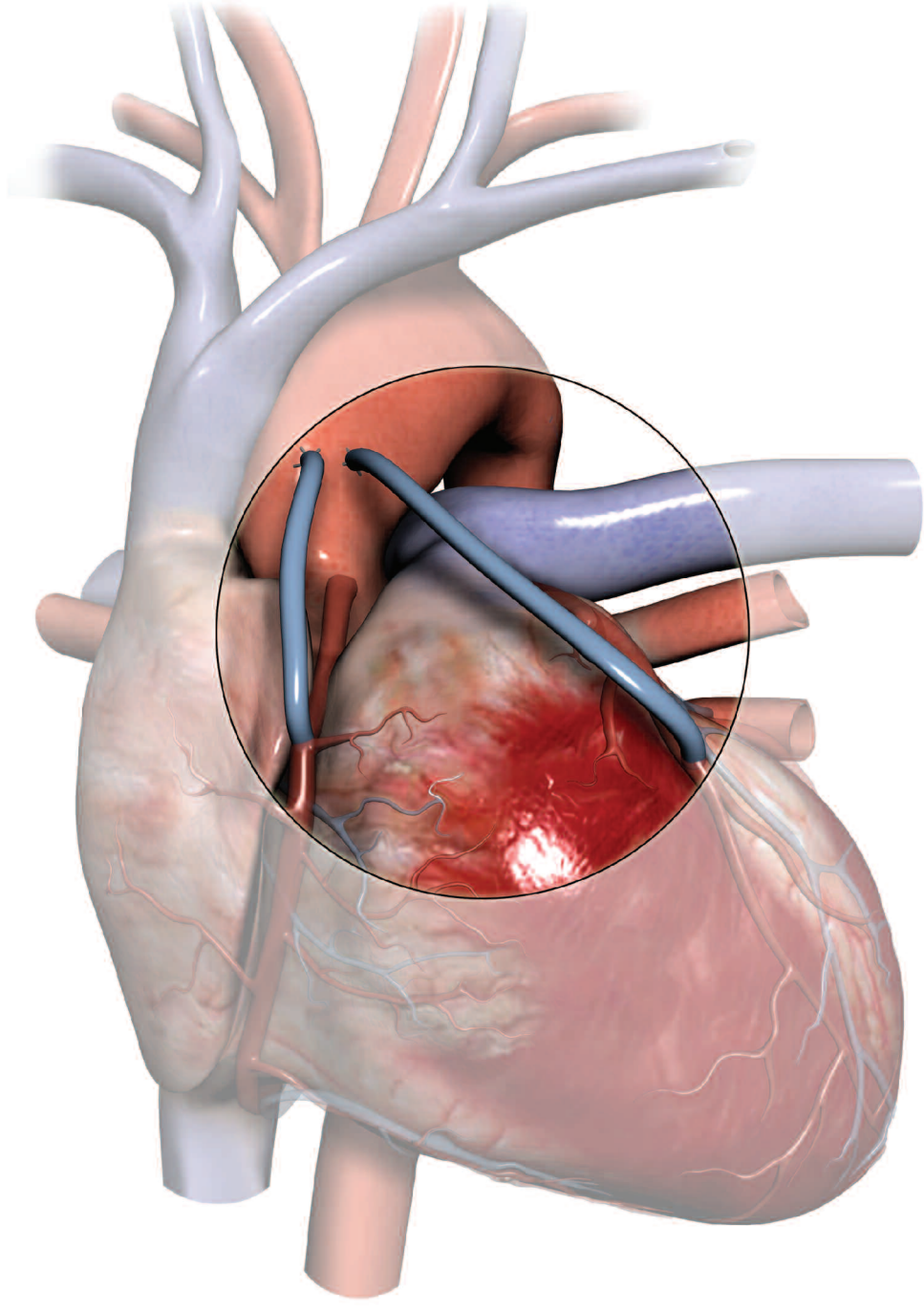
Caring for a patient after coronary artery bypass graft



CE 2.0 AACN/ANCC CONTACT HOURS

Follow this system-by-system approach to keep your patient stable and steering clear of complications.

By Margaret Mullen-Fortino, RN, MSN, and Noreen O'Brien, RN, MSN

Every year, some 427,000 patients in the United States have coronary artery bypass graft (CABG) surgery.[1] Whether the surgery is done with the patient on or off the cardiopulmonary bypass (CPB) machine (see "On pump or off?"), the postoperative nursing care is the same. In this article, we'll outline your role in patient care by body system.

Reducing risks for surgical patients is one goal of the Institute for Healthcare Improvement's (IHI's) 5 Million Lives Campaign, which aims to prevent 5 million incidents of medical harm in the period from December 2006 to December 2008. See the resources list at the end of this article for more information.

Safeguarding cardiac function

Twenty-four to 48 hours after surgery, your patient will be transferred from the intensive care unit (ICU) to the cardiac surgical unit and placed on continuous telemetry monitoring. Your top priority is to keep him hemodynamically stable so his vital organs are adequately perfused. Check his vital signs according to your facility's protocol, or at least every 4 hours, and assess for signs and symptoms of adequate cardiac output. Investigate even subtle signs of trouble, such as tachycardia and cool extremities. Other signs of reduced cardiac output include diminished peripheral pulses, changes in mentation, decreased urine output, and hypotension.

Dysrhythmias, most often tachydysrhythmias, are common after CABG and usually occur on the second or third postoperative day. Atrial fibrillation (AF) occurs in 15% to 40% of patients after CABG, in 37% to 50% of patients after valve surgery, and in up to 60% of patients who've had CABG and valve surgery. A rapid ventricular response and loss of atrial kick can cause myocardial ischemia or reduce cardiac output and BP. Patients with hypokalemia and hypomagnesemia may be more prone to AF. Factors that increase your patient's risk of AF include:

- older age
- mitral valve disease
- history of AF
- chronic obstructive pulmonary disease (COPD)
- not having received preoperative beta-blocker or angiotensin-converting enzyme inhibitor therapy or withdrawal of previous therapy.[2]

Preoperative or early postoperative administration of beta-blockers is considered standard therapy to reduce the risk of AF after CABG.[3] Amiodarone is an alternative for patients who have contraindications to beta-blockers. Rate control for AF is best achieved with beta-blockers. Digoxin or calcium channel blockers are used to control ventricular rate but haven't shown a consistent benefit in reducing the incidence of AF after CABG.

If your patient develops AF, his stroke risk is two to five times higher. The American College of Cardiology/American Heart Association provides consensus guidelines for administering anticoagulation to patients with AF lasting more than 24 hours.[4] Because heparin is associated with increased bleeding risk, the patient may start warfarin therapy without also starting heparin. However, for high-risk patients, such as those with history of stroke or transient ischemic attack, heparin should be considered a bridging thera-

On pump or off?

During "on pump" CABG surgery, a CPB machine circulates oxygenated blood while diverting most of the patient's blood from the heart and lungs. This provides a bloodless, motionless surgical field while preserving tissue perfusion to vital organs. The blocked coronary artery is bypassed using a graft from the saphenous vein or the internal mammary artery or radial artery. However, CPB puts patients at risk for various problems related to the blood being in contact with the machine, including atrial fibrillation, systemic inflammatory response syndrome, stroke, cognitive changes, renal failure, dysrhythmias, coagulopathies, and microemboli.

The older "off pump" technique, in which surgery is performed on the beating heart, reduces the adverse reactions associated with CPB and the need for RBC transfusions and positive inotropes. However, a meta-analysis found no significant differences in mortality rates, myocardial infarction, stroke, or renal dysfunction between the two types of CABG, and no consensus has been reached on which procedure is better.

Source: Keenan TD, et al. Bypassing the pump: changing practices in coronary artery surgery. *Chest.* 2005;128:363-369.

py to oral warfarin until the patient's international normalized ratio is therapeutic.

Ventricular dysrhythmias can occur any time after CABG surgery but are more common in the early postoperative period. Hypothermia, electrolyte disturbances (especially hypokalemia and hypomagnesemia), acidosis, manipulation of the heart, and myocardial ischemia may be factors in postoperative dysrhythmias. Bradycardias and transient heart blocks usually resolve within several hours after surgery. The patient will come out of the operating room with epicardial pacing wires and a temporary pacemaker, which are used for atrioventricular pacing until normal conduction returns.

A pericardial effusion can result in *cardiac tamponade*, a rare but potentially lethal complication following CABG. Most cases occur in the early postoperative period, but tamponade can occur as late as 6 months postoperatively. Pericardial effusion puts pressure on the heart, prevents diastole and filling of the chambers, and reduces cardiac output. The hallmark of cardiac tamponade is the Beck triad: muffled heart sounds, distended jugular neck veins, and hypotension (see "Assessing for cardiac tamponade"). Pulsus paradoxus greater than 12 mm Hg is a classic sign of tamponade. Patients may experience dyspnea, chest pain, and dizziness.

If your patient has signs and symptoms of cardiac tamponade, the physician may order a bedside echocardiogram. If it confirms tamponade, prepare your patient to return to the operating room for evacuation of the clot and repair of the bleeding site. But if the patient's condition deteriorates to the point that he's at risk for cardiac arrest, the physician may perform an emergency bedside reexploration sternotomy.

Pulmonary problems

Between 30% and 60% of patients have pulmonary dysfunction and hypoxemia after CABG, usually as a result of fluid volume overload, poor inspiratory effort, and atelectasis. Risk factors for pulmonary problems include a history of heart failure, COPD, smoking, or diabetes; age over 65; and endotracheal intubation. Common signs of respiratory impairment are shortness of breath and decreased oxygen saturation as shown on pulse oximetry.

Atelectasis, a common postoperative complication, may be related to CPB, effects of general anesthesia, and decreased surfactant production from the patient being on CPB.

Pleural effusion, another common complication, occurs in the immediate postoperative period in 41% to 87% of patients. Effusions can result from bleeding secondary to internal mammary artery (IMA) harvesting. Small effusions (less than 500 mL) can be managed conservatively and will usually resolve spontaneously. Larger effusions may require thoracentesis, especially if they cause dyspnea or other signs and symptoms. (See "Picking up on pleural effusion.")

To reduce your patient's risk of postoperative pulmonary complications, assess breath sounds frequently, monitor his Spo_2, administer supplemental oxygen as needed, and encourage him to perform incentive spirometry every hour while he's awake. Teach him to splint his incision when coughing and moving. Be sure to provide optimal pain control so he can move freely. Assisting the patient with early, aggressive ambulation, coughing and deep breathing, and turning from side to side while in bed are simple but effective nursing interventions that help prevent postoperative pulmonary complications. Patients with copious pulmonary secretions or bronchospasm

may also need chest physical therapy and nebulized bronchodilators.

Patients who need mechanical ventilation are at risk for ventilator-associated pneumonia (VAP). The IHI recommends a four-pronged ventilator bundle of interventions:

- elevating the head of the bed 30 to 45 degrees except when care is being given or if contraindicated; for example, because of hemodynamic instability
- providing a daily "sedation vacation" to evaluate the patient's readiness for weaning
- taking steps to prevent venous thromboembolism (VTE) (more on this later)
- administering daily medication (such as a histamine$_2$-receptor inhibitor) to prevent peptic ulcer disease.[5]

Keeping pain under control

Besides keeping the patient comfortable, effective pain control helps maintain hemodynamic stability and prevent pulmonary complications. (The pain of a sternotomy can impair breathing patterns.) The typical patient will receive I.V. push opioids in the immediate postoperative period, then switch to oral forms by the second or third postoperative day as tolerated. Analgesics, positioning, distraction, and relaxation techniques also can be used to control pain.

Monitor the patient for adverse drug reactions, such as oversedation and respiratory depression. Balance his need for pain control without respiratory depression with his need to cough and deep-breathe. Individualize pain management and frequently evaluate the patient's pain, using an appropriate pain intensity rating scale, to check the effectiveness of interventions. Also use a sedation-rating tool to monitor for sedation and respiratory depression.

Besides opioids, I.V. ketorolac, a nonsteroidal anti-inflammatory drug (NSAID), may be used with caution in patients who don't receive adequate pain control from opioids alone. Check the patient's renal function before administering this drug and expect to discontinue it if his serum creatinine increases. Also remember that NSAIDs can increase the patient's risk of gastrointestinal (GI) bleeding. Monitor for signs and symptoms of occult bleeding.

Another source of moderate to severe pain is chest tube removal, which usually occurs on the first or second postoperative day. Administer adequate analgesia before chest tube removal.

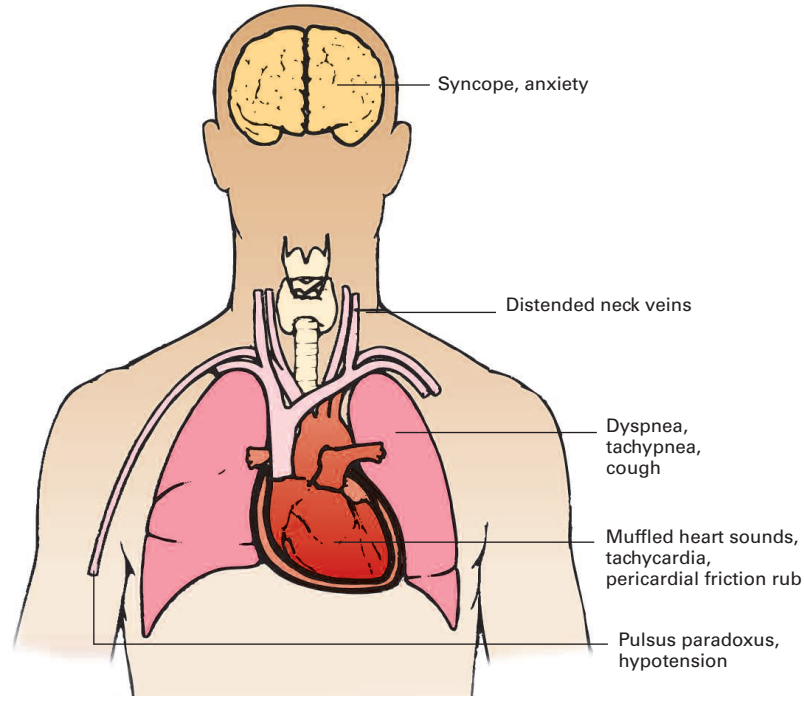
Staying alert for coagulation problems

Bleeding is a common complication after CABG surgery and can have many causes, including platelet dysfunction from prolonged contact with the artificial surface of the CPB machine, high doses of heparin given during surgery, and hypothermia.

A patient who's actively bleeding and has a hematocrit less than 26% needs a transfusion of red blood cells (RBCs) to improve the blood's oxygen-carrying capabilities and to limit myocardial ischemia or infarction.[6] These benefits must be balanced with the risks of RBC transfusion, including acute lung injury, pro-

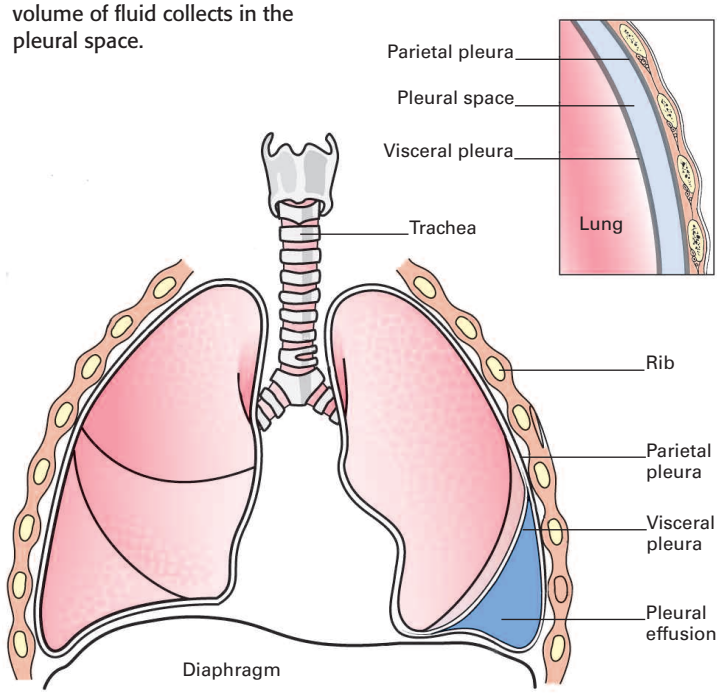
Assessing for cardiac tamponade

You may note these assessment findings in a patient with cardiac tamponade.



Picking up on pleural effusion

In pleural effusion, an abnormal volume of fluid collects in the pleural space.



longed mechanical ventilation, infection, sepsis, and renal dysfunction. Six- to 12-month follow-up studies of patients who'd undergone cardiothoracic surgery have shown that the more packed RBCs a patient receives, the worse his postoperative functional status.[7]

Also take steps to prevent VTE, which encompasses deep vein thrombosis and pulmonary embolism. The Surgical Care Improvement Project's guidelines, which are supported by IHI, call for prophylactic drug and mechanical therapy to prevent VTE. As ordered, use intermittent pneumatic compression devices and graduated compression stockings and administer low-dose unfractionated heparin, low-molecular-weight heparin, factor Xa inhibitor (fondaparinux), or warfarin. Aspirin-only therapy isn't recommended, and early ambulation isn't included in the recommendations because most patients only make trips to the bathroom or take short walks down the hall—insufficient activity to prevent VTE.[8]

Renal troubles

Postoperative renal dysfunction occurs in as many as 8% of patients after CABG. Predictors of renal dysfunction include advanced age, history of moderate or severe heart failure, prior bypass surgery, type 1 diabetes, and preexisting renal disease.

Because of fluid retention, most patients are still significantly above their preoperative weight when they're transferred to the medical/surgical unit after CABG. A comparison of the patient's postoperative daily weights to his preoperative weight guides the use of diuretics. Monitor his urine output, blood urea nitrogen level, and serum creatinine level to assess renal function.

Diuretics typically are given on the first postoperative day and are continued until the patient reaches his preoperative weight (usually in 5 to 7 days). Patients who needed diuretics before CABG may need to continue taking them after discharge. If the patient develops oliguria (urine output of less than 0.5 mL/kg/hour), assess his cardiac function and perfusion, vital signs, and lab results. He may need fluids or medication dose adjustments.

GI glitches

Less common, GI complications affect 1% to 2% of patients after CABG. The most common major complications are upper GI bleeding from gastritis or peptic ulcer disease, pancreatitis, hollow viscus perforation, mesenteric ischemia, and cholecystitis.[6] Monitor the patient's bowel sounds and notify the healthcare provider if the patient develops abdominal pain, distension, nausea, and vomiting. The patient may need diagnostic tests including an abdominal X-ray, electrolyte panel, and complete blood cell count.

Most patients have a nasogastric (NG) tube immediately after CABG surgery. The NG tube usually is removed after the patient is extubated and after his bowel sounds return. He then can be started on clear liquids and his diet advanced as tolerated.

Anorexia and nausea are common postoperative complaints and may be adverse drug reactions. Administer antiemetics if the patient is nauseated and give histamine blockers as prescribed to minimize gastric acid secretion. Treat constipation, another com-

Reassure the patient that temporary feelings of sadness are normal and should go away within a few weeks as he gets back to normal routines and activities.

mon postoperative problem, with stool softeners or bulk laxatives as ordered.

Fighting infection

Superficial infections and deep sternal wound infection (also called mediastinitis) occur infrequently but can have a profound effect on patient morbidity, length of stay, and cost of care. Infections usually occur within the first 2 weeks after surgery. A patient is at increased risk if he's obese, if he has diabetes or COPD, if bilateral IMA grafts were used, or if surgery was prolonged (more than 90 minutes).

Although no consensus has been reached on best practice for postoperative wound care, best-practice guidelines recommend keeping a sterile dressing on the wound for 24 to 48 hours after surgery.[9] Follow your facility's policy for performing incision care and changing dressings. Monitor your patient for signs and symptoms of infection, including fever, increased chest wall pain or tenderness, an unstable sternum, and purulent discharge from the wound.

Administering prophylactic antibiotics for 48 hours after cardiac surgery has been shown to minimize infection.[10] The risk of deep sternal wound infections can be reduced with continuous I.V. insulin infusions to aggressively control perioperative hyperglycemia. Major infections such as mediastinitis require surgical debridement and weeks to months of I.V. antibiotic therapy. Minor wound infections can be treated with oral antibiotics and local wound care. The choice of antibiotic and duration of therapy depend on patient-risk factors and healthcare provider preference.

Heading home

As the length of hospitalization decreases for patients who've had CABG, patients go home sooner. As discharge approaches, your patient and his family may be anxious about how they'll manage at home, so try to ease the transition. Appropriate discharge planning should involve the patient, caregivers, nurses, physicians, and nutritionists because a team approach is the best way to treat factors that contribute to heart disease. Give the patient detailed instructions about:

- when to contact the hospital or healthcare provider. Tell the patient to seek immediate medical attention if he has chest pain, shortness of breath not relieved by rest, a fast or irregular heartbeat, chills, fever, severe headache, numbness or tingling in his arms or legs, fainting spells, or if he coughs up bright red blood.
- what to expect and what's normal after surgery. Mood swings, diminished appetite, and difficulty sleeping are common after CABG, but usually resolve in 4 to 6 weeks.
- lifestyle changes such as stopping smoking, eating a low-fat diet, controlling BP, and losing weight. For example, patients who continue to smoke have more myocardial infarctions and reoperations. Smoking cessation interventions should be individualized and may include drug therapy if the patient needs it.
- activity progression. For the first 6 weeks postoperatively, the patient can engage in light activities such as setting the table, folding clothes, walking, and climbing stairs. He can return to work part-time after 6 weeks and can gradually increase his activity level to normal by 3 months after surgery.
- incision care, as directed by the surgeon.
- medication education. Most patients are discharged on antiplatelet therapy, typically aspirin, which significantly reduces saphenous vein graft closure through the first year.[4] Patients with dyslipidemia will also receive lipid-lowering therapy. Explain what the drugs are for, how to take them correctly, how to recognize signs and symptoms of adverse drug reactions, and what to report to his healthcare provider.
- cardiac rehabilitation. Unless contraindicated, all patients should receive cardiac rehabilitation after CABG. This includes early, aggressive ambulation during hospitalization, outpatient exercise training, patient and family education, and counseling about postsurgical sexual activity and lifestyle modifications. Patients who participate in cardiac rehabilitation have increased physical mobility, feel in better health, and generally have a more positive outlook on life.

About 20% of patients are depressed after a major

cardiac event such as CABG surgery. Reassure the patient that temporary feelings of sadness are normal and should go away within a few weeks as he gets back to normal routines and activities. Tell the patient and his family that if depression is persistent or severe and disrupts activities of daily living, he should discuss this with his healthcare provider.

A new beginning

A patient undergoing CABG has complex healthcare needs. Knowing about the multiple system changes caused by surgery will help you and the rest of the care team anticipate postoperative problems and intervene quickly and appropriately so that your patient can have the best possible outcome. M

References

1. Heart disease and stroke statistics-2007 update: A report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation.* 115(5):e69-e171, February 6, 2007.
2. Mathew JP, et al. A multicenter risk index for atrial fibrillation after cardiac surgery. *JAMA.* 291(14):1720-1729, April 14, 2004.
3. Eagle KA, et al. ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to update the 1999 guidelines for coronary artery bypass graft surgery). http://acc.org/qualityandscience/ clinical/guidelines/cabg/index.pdf. Accessed November 13, 2007.
4. Fuster V, et al. ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation—executive summary: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing committee to revise the 2001 guidelines for the management of patients with atrial fibrillation). *J Am Col Cardiol.* 48(4):854-906, August 15, 2006.
5. Pruitt B, Jacobs M. Best-practice interventions: How can you prevent ventilator-associated pneumonia? *Nursing2006.* 36(2):36-41, February 2006.
6. Bojar RM. *Manual of Perioperative Care in Adult Cardiac Surgery,* 4th edition. Blackwell Publishing, Inc., 2005.
7. Koch CG, et al. Morbidity and mortality risk associated with red blood cell and blood-component transfusion in isolated coronary artery bypass grafting. *Critical Care Medicine.* 34(6):1608-1616, June 2006.
8. Daniels SM. Protecting patients from harm: Improving hospital care for surgical patients. *Nursing2007.* 37(8):36-41, August 2007.
9. Odom-Forren J. Best-practice interventions: Preventing surgical site infections. *Nursing2006.* 36(6):58-63, June 2006.
10. The Society of Thoracic Surgeons. Practice Guideline Series. Antibiotic Prophylaxis in Cardiac Surgery. Part I: Duration of prophylaxis, and Part II: Antibiotic choice (http://www.sts.org/sections/resources/practiceguidelines/antibioticguideline). Accessed December 5, 2007.

About the author

Margaret Mullen-Fortino and **Noreen O'Brien** are clinical nurse specialists at Penn at Presbyterian Medical Center in Philadelphia, Pa.

The authors have disclosed that they have no significant relationship or financial interest in any commercial companies that pertain to this educational activity.

CE CONNECTION

Earn CE credit online:
Go to http://www.nursingcenter.com/CE/MIN and receive a certificate *within minutes*.

INSTRUCTIONS

Caring for a patient after coronary artery bypass graft surgery

TEST INSTRUCTIONS

- To take the test online, go to our secure Web site at **http://www.nursingcenter.com/ce/MIN**.
- On the print form, record your answers in the test answer section of the CE enrollment form on page 19. Each question has only one correct answer. You may make copies of these forms.
- Complete the registration information and course evaluation. Mail the completed form and registration fee of $24.95 to: **Lippincott Williams & Wilkins, CE Group**, 2710 Yorktowne Blvd., Brick, NJ 08723. We will mail your certificate in 4 to 6 weeks. For faster service, include a fax number and we will fax your certificate within 2 business days of receiving your enrollment form.
- You will receive your CE certificate of earned contact hours and an answer key to review your results. There is no minimum passing grade.
- Registration deadline is November 30, 2010.

DISCOUNTS and CUSTOMER SERVICE

- Send two or more tests in any nursing journal published by Lippincott Williams & Wilkins together and deduct $0.95 from the price of each test.
- We also offer CE accounts for hospitals and other health care facilities on nursingcenter.com. Call **1-800-787-8985** for details.

PROVIDER ACCREDITATION:

Lippincott Williams & Wilkins, publisher of *Men in Nursing*, will award 2.0 contact hours for this continuing nursing education activity.

Lippincott Williams & Wilkins is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

Lippincott Williams & Wilkins is also an approved provider of continuing nursing education by the American Association of Critical-Care Nurses #00012278 (CERP category A), District of Columbia, Florida #FBN2454, and Iowa #75. Lippincott Williams & Wilkins home study activities are classified for Texas nursing continuing education requirements as Type 1. This activity is also provider approved by the California Board of Registered Nursing, Provider Number CEP 11749 for 2.0 contact hours.

Your certificate is valid in all states.