

A P P E N D I X

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**Overview of new hospital
technologies for fiscal year 2001**

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In recent years, the Commission has qualitatively estimated our allowance for scientific and technological advances by evaluating the changes in technologies identified in previous analyses, examining industry trends, having informal discussions with industry representatives, and reviewing the current medical literature to identify new advancements for this year's update. We began our review by evaluating the categories we identified as significant contributors to costs in the fiscal year (FY) 2000 update:

- information systems,
- cardiovascular drugs, devices, and techniques,
- biotechnology,
- radiology, imaging, and nuclear medicine, and
- other devices and technologies.

We used numerous data sources to identify new technological advancements, including peer-reviewed published literature, federal agencies and private organizations, and various periodicals.

Information systems

Hospital health care information systems play a significant role in the trend toward

coordinated care delivery. They include financial, pharmacy, radiology, patient-care, and laboratory systems, and clinical data repositories and related enabling software. The Commission believes that information systems will continue to be an important source of increased costs in FY 2001, as they were in our FY 2000 assessment. This assessment is based on continued investment in new, quality-enhancing information systems, particularly telemedicine, clinical data repositories, and multisite integrated data networks. Hospitals are adopting these technologies in response to greater information needs in an increasingly competitive environment.

Telemedicine is becoming an important technology for rural hospitals. The Food and Drug Administration (FDA) has predicted that the use of telemedicine—the electronic delivery of health care information and services—will significantly increase over the next five years (Herman et al. 1998). The number of telemedicine programs nationwide rose from 132 in 1997 to about 160 in 1998 (BNA 1999). The Balanced Budget Act of 1997 (BBA) expanded the use of telemedicine by requiring Medicare to cover interactive telemedicine consultations in areas designated as health professional shortage areas.

Hospitals continue to develop clinical data repositories (also called electronic medical records), which capture data from many sources, store the information consistently, and present results in tabular and graphical formats. Hospitals are investing in systems that can standardize identification and aggregation of data. Hospitals are also continuing to invest in multisite networks that integrate their clinical and financial computer systems and permit transfer of data through secure connections across multiple providers within a health care system, as well as to parties outside the health care system, including Medicare. Transmitting Medicare claims to HCFA via the Internet is increasing, due to HCFA's reversal of its ban on this practice. Finally, with the publication of the Institute of Medicine's report on medical errors (IOM 2000), hospitals may increase investments in information systems—such as physician order entry and computer-assisted decisionmaking systems—that can detect medication errors and diagnostic inaccuracies.

Cardiovascular drugs, devices, and techniques

Advances in cardiovascular drugs, devices, and techniques continue.

MedPAC believes that the diffusion of these advances will have a modest impact on hospital costs in FY 2001. Specific advancements include:

- two platelet aggregation inhibitors to treat acute coronary syndrome,
- three antiarrhythmics to treat irregular heartbeat,
- a protease inhibitor to reduce perioperative blood loss in patients undergoing cardiopulmonary bypass,
- a quinolone derivative to treat intermittent claudication,
- an agent to treat acute deep-vein thrombosis,
- laser treatments to open tiny channels in the heart muscle, which helps restore blood flow in patients with severe angina,
- left ventricular assist devices that can support patients awaiting a heart transplant for at least one year,
- fibrin sealants, a new class of commercially available blood-derived products, that stop oozing from small blood vessels during cardiopulmonary bypass and colostomy operations,
- catheter-based devices that remove blood clots from blocked heart arteries or bypass grafts before angioplasty,
- endovascular devices that reinforce weakened, bulging sections of the abdominal aorta, and
- laser angioplasty that ablates arterial plaque, as an alternative or adjunct to other angioplasty procedures.

Biotechnology

Advances in molecular medicine continue, including genetic diagnostics, gene therapy, and biosensor technologies. Recent advancements include the use of monoclonal antibodies to treat various cancers, lymphomas, and Crohn's disease.

MedPAC believes that the diffusion of these advances will have a small impact on hospital costs in FY 2001. Specific biotechnology advancements include:

- an injectable sustained-release formulation to treat lymphomatous meningitis,
- a retinoid and a fusion protein to treat certain lymphomas,
- a genetically engineered protein that reduces the symptoms of moderate to severe rheumatoid arthritis,
- a recombinant thrombin inhibitor to treat anticoagulation in patients with heparin-induced thrombocytopenia,
- a synthetic plasma expander to treat hypovolemia (abnormally low blood volume during surgery), and
- a skin construct for treatment of venous leg ulcers.

Radiology, imaging, and nuclear medicine

The past three decades have seen enormous growth in the field of radiology, imaging, and nuclear medicine. During the upcoming fiscal year, we anticipate continued advances in this area, especially improvements and further applications for magnetic resonance imaging, positron emission tomography, ultrasound, and computed tomography. Nearly all hospitals are continuing to invest in ultrasound and computed tomography equipment (AHA 1999). MedPAC believes that the diffusion of these advances will have a modest impact on hospital costs in FY 2001. Specific advances in this area include:

- digital mammography and breast imaging devices for clarification of ambiguous mammograms,
- mini-magnetic resonance imaging to view internal body structures,
- handheld ultrasound devices,

- electron-beam computed tomography to detect blockages in arteries,
- functional anatomic mapping systems,
- positron emission tomography to diagnose certain cancers and lymphomas,
- radiosurgery devices that direct radiation to treat certain solid tumors, and
- new imaging agents to detect certain lung tumors and certain brain and spinal lesions.

Other devices and technologies

A variety of other devices and technologies have recently been developed, and MedPAC anticipates that these devices will have a collectively small impact on hospital costs in the coming fiscal year. These technologies include new drugs (antibiotics and anti-neoplastics), microprocessor-based intelligent devices, combination drug-devices, and robotic aides. Specific advancements include:

- four anti-infectives that treat infections caused by susceptible strains of gram-negative bacteria, drug-resistant bloodstream and skin infections, and certain acute bacterial infections,
- two cyclooxygenase-2 (cox-2) inhibitors for osteoarthritis and rheumatoid arthritis,
- an anticoagulant used to prevent the formation of clots after surgery,
- anti-neoplastics for certain cancers, and agents to reduce the side effects of some cancer therapies,
- three agents for surgical anesthesia and sedation,
- a fully automated blood testing system, and
- an electronic device for postoperative nausea.

Based on a review of the literature and the findings of an FDA expert panel, we also anticipate an escalating trend toward microprocessor-based intelligent devices used in hospitals. These technologies include cardiac and drug-delivery implants and robotics used during minimally invasive surgery. The Commission also anticipates continued

advances in the development of devices designed for implanted delivery of drugs—including intelligent devices with biosensors to monitor concentrations in body fluids and make adjustments in delivery rates—and in the use of microchips in devices for various indications, including restoring vision in

patients with diseases of the retina. Finally, the Commission anticipates advances in the development of robotic aides over the next 10 years. These advances may lead to diffusion of telesurgery and the use of nontraditional settings as surgical sites and in the development of prosthetic limbs for paralyzed patients. ■

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