

Chapter 8. Health System Infrastructure

Ensuring well-coordinated, high-quality health care requires the establishment of a supportive health system infrastructure. High-performance health systems require a well-distributed workforce, information systems for data collection, quality improvement analysis, and clinical communication support, as well as the organizational capacity to support culturally competent services and ongoing improvement efforts.¹

Health care models such as Wagner’s Chronic Care Model (CCM) and Patient-Centered Medical Home (PCMH) promote a safety culture for patients. CCM promotes health care delivery systems designed to support community-based resources, self-management of care, and information support systems. Information support systems provide the basis for much of the continuity in patient records and clinician communication. PCMH uses a team-based model led by a primary care physician who provides continuous and coordinated care throughout the patient’s life. Features such as open scheduling, expanded hours, and new options for communication between patients and their personal physicians and practice staff enhance patient experiences and improve the quality of care.

A well-integrated, culturally competent health care delivery system that allows patient information to be readily available to providers positively affects the quality and efficiency of care and therefore patient outcomes. The adoption and use of health information technology (IT) can be an effective way to manage health care costs and improve the quality of care. Since the publication of the Institute of Medicine (IOM) report *Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare*,ⁱ which emphasized the need for standardized collection and reporting of racial and ethnic data, the need for more granular detail on racial and ethnic subgroups has become apparent. This is an area where the adoption and use of health IT can be beneficial.

Another area of patient care that could be improved with the adoption and use of health IT is care coordination. A Commonwealth Fund study found that health IT can facilitate care coordination within a practice, but a lack of interoperability makes exchange of information between health care facilities difficult. Evidence has also shown that the adoption and effective use of health IT can help reduce medical errors and adverse events, enable better documentation and file organization, provide patients with information that assists their adherence to medication regimens and scheduled appointments, and assist doctors in tracking their treatment protocol.¹

Having an adequate number of providers is an important aspect of the health system infrastructure and can be an indicator of quality of care. It is also important to have a large enough and appropriately distributed workforce to respond to expected increases in patient demand. Previous reports have presented data on diversity in the physician, nursing, and dental professions workforce. This year, the National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR) present data on the geographic and racial/ethnic distribution of the pharmacy workforce.

ⁱ Available at the National Academies Press Web site at <http://www.nap.edu/openbook.php?isbn=030908265X>.

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Measures

The IOM acknowledges that health system infrastructure measures such as adoption and effective use of health IT are likely to be in the developmental stage, and evidence of the impact on quality improvement has not yet been strongly established. The IOM highlighted three infrastructure capabilities that should be further evaluated for reporting. These capabilities include care management processes, adoption and use of health IT, and workforce distribution and its relevance to minority and other underserved populations.

Previous reports have included information on the culture of patient safety in hospitals, and this information is updated here. Previous reports have also included information on the health care workforce and information about pharmacists is presented in this report. A new area where there is growing evidence of impact on health care quality is electronic prescribing (e-prescribing). Taking this into account, the 2010 reports include new e-prescribing measures for both hospital and ambulatory settings.

Findings

Care Management Processes: Focus on Patient Safety Culture

The 2010 NHQR and NHDR highlight the organizational capacity—resources, knowledge, and processes—of hospitals in the area of patient safety. High-reliability organizations that achieve low rates of adverse events establish “cultures of safety.” A culture of safety is characterized by shared dedication to making work safe, blame-free reporting and communication about error, collaboration and teamwork across disciplines, and adequate resources to prevent adverse events.

AHRQ developed the Hospital Survey on Patient Safety Culture to help hospitals assess the culture of safety in their facilities. AHRQ began producing comparative database reports in 2007 to help hospitals assess their performance relative to similar institutions.

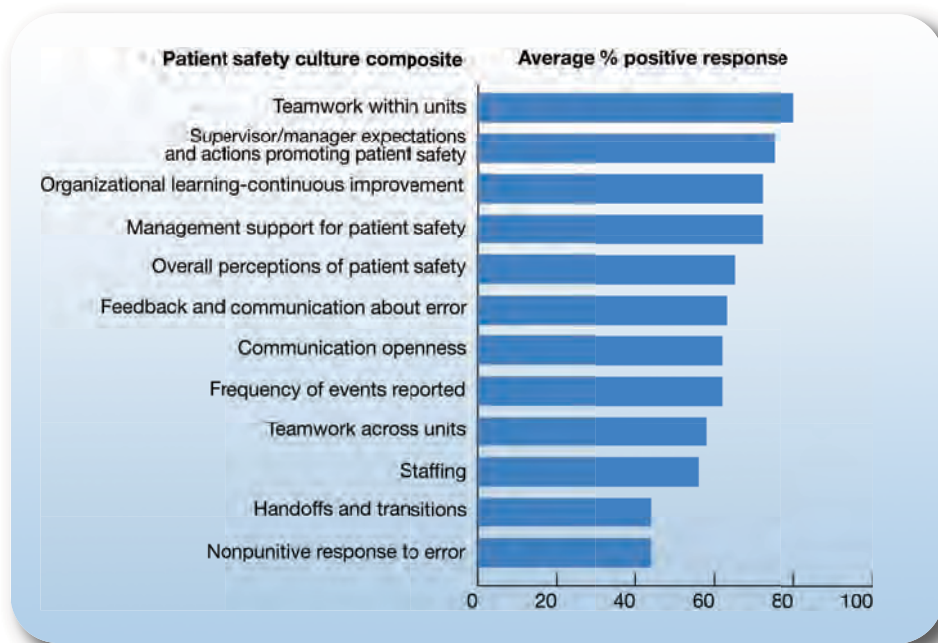
In this NHQR, we present data from the *Hospital Survey on Patient Safety Culture: 2010 Comparative Database Report*.² This report is based on survey responses collected in 2009 from more than 330,000 hospital staff in 885 hospitals representing 15% of the Nation’s hospitals. The average hospital response rate was 56%, with an average of 383 completed surveys per hospital.

Most hospitals administered Web surveys, which resulted in lower response rates (50%) compared with response rates from paper (63%) or mixed-mode surveys (56%). In addition, most hospitals administered the survey to all staff or a sample of all staff from all hospital departments. Nurses accounted for more than one-third of respondents, followed by “other.” More than three-quarters of respondents had direct interaction with patients.

Results are presented for the 12 patient safety culture composites addressed in the survey, expressed as average percent positive response. Percent positive refers to the percentage of responses that agree or strongly agree with a positively worded item (e.g., “People support one another in this work area”) and the percentage that disagree or disagree strongly with a negatively worded item (e.g., “We have safety problems in this work area”). Hospitals contributing data to the comparative database mirror the population of U.S. hospitals as a whole, but participation is entirely voluntary. Thus, it may not be possible to generalize findings to all types of facilities.

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Figure 8.1. Patient safety culture composites for all hospitals, 2009



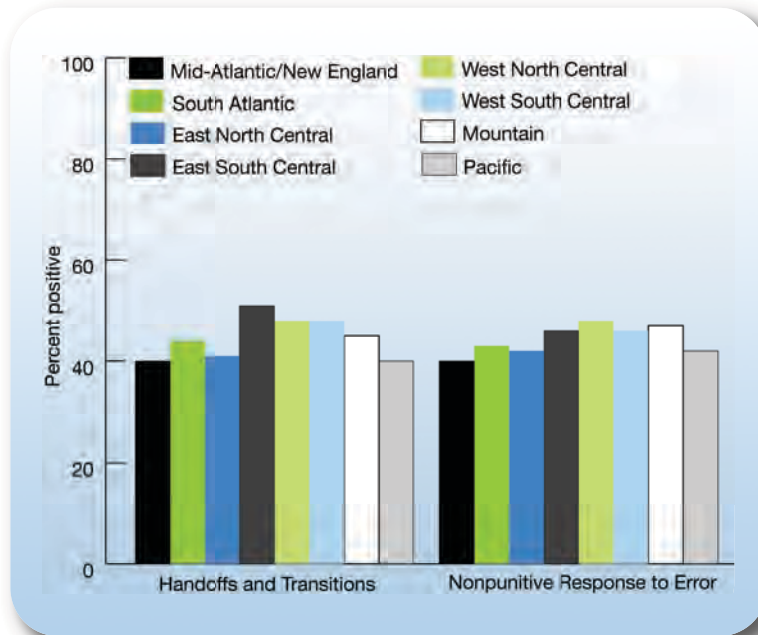
Source: Agency for Healthcare Research and Quality, Hospital Survey on Patient Safety Culture: 2010 Comparative Database Report.

- One strength for most hospitals was Teamwork Within Units, the extent to which staff support each other, treat each other with respect, and work together. Another strong area for hospitals overall was Supervisor/Manager Expectations and Actions Promoting Patient Safety (Figure 8.1). This composite refers to the extent to which supervisors/managers consider staff suggestions for improving patient safety, praise staff for following patient safety procedures, and do not overlook patient safety problems.
- Hospitals in the East South Central and West South Central regions had higher percentages of positive response for Teamwork Within Units (81%) and Supervisor Expectations and Actions Promoting Patient Safety (78%) than hospitals in other regions (data not shown).

Handoffs and Transitions as well as Nonpunitive Response to Error are highlighted due to the consistently low percentage of positive response given by hospital staff. These two areas had the lowest percent positive response across all geographic regions.

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Figure 8.2. Patient safety culture composites, by region, 2009



Source: Agency for Healthcare Research and Quality, Hospital Survey on Patient Safety Culture: 2010 Comparative Database Report.
Note: States are categorized into census divisions except New England and Mid-Atlantic regions, which are merged.

- Overall, many hospitals performed poorly on Nonpunitive Response to Error, the extent to which staff feel that their mistakes and event reports are not held against them and that mistakes are not kept in their personnel file. The Mid-Atlantic/New England (40%), Pacific (42%), and East North Central (42%) regions had the lowest percentages of positive response for Nonpunitive Response to Error (Figure 8.2).
- Similar results were seen for Handoffs and Transitions, the extent to which important patient care information is transferred across hospital units and during shift changes.
- The East South Central hospitals had higher average percent positive scores while the Mid-Atlantic/New England region had lower average percent positive scores across composites.

Also, in the NHDR:

- Government hospitals had higher percentages of positive response for Handoffs and Transitions (47%) compared with nongovernment hospitals (44%). For Nonpunitive Response to Error, both government and nongovernment hospitals had 44% positive response.

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Health Information Technology: Focus on Medication Management

E-prescribing uses technology to allow prescribers to electronically transmit prescriptions. The IOM report *Future Directions for the National Healthcare Quality and Disparities Reports* highlights the adoption and use of health IT as a tool to manage cost and improve the quality of care delivered. Medication errors occur during the prescribing, dispensing, administering, and monitoring phases of patient care. Adoption and use of e-prescribing can be a major step in reducing medical errors by improving the prescribing and dispensing aspects of medication management.³

Studies show that the elimination of handwriting interpretation decreases medication error rates and reduces communication time between pharmacies and office staff. It also can avoid costs resulting from adverse drug events.⁴ It is estimated that between 380,000 and 450,000 adverse drug events occur annually in hospital settings, resulting in a cost of \$3.5 billion annually in the United States.⁵

One aspect of e-prescribing, clinical decision support, encompasses a wide range of computerized tools directed at improving patient care, including computerized reminders and advice regarding drug selection, dosage, interactions, allergies, and the need for subsequent orders.⁶ In addition, once an e-prescription is in the system, it will follow the patient, avoiding many of the “handoff errors.”

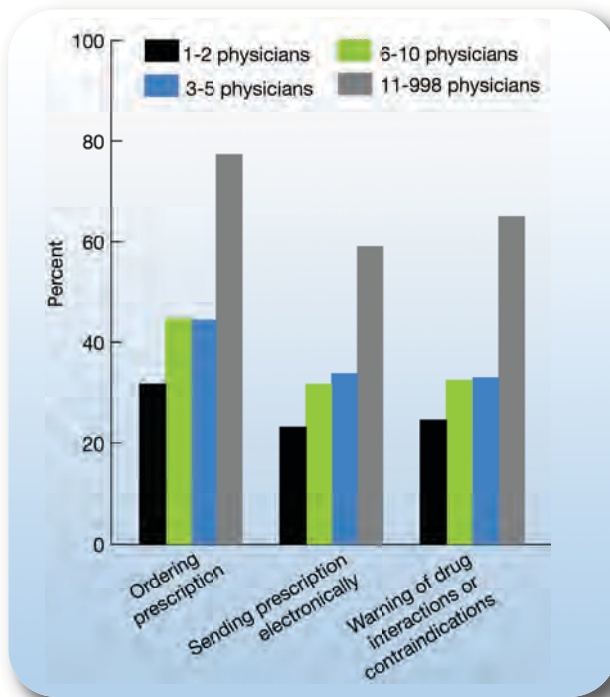
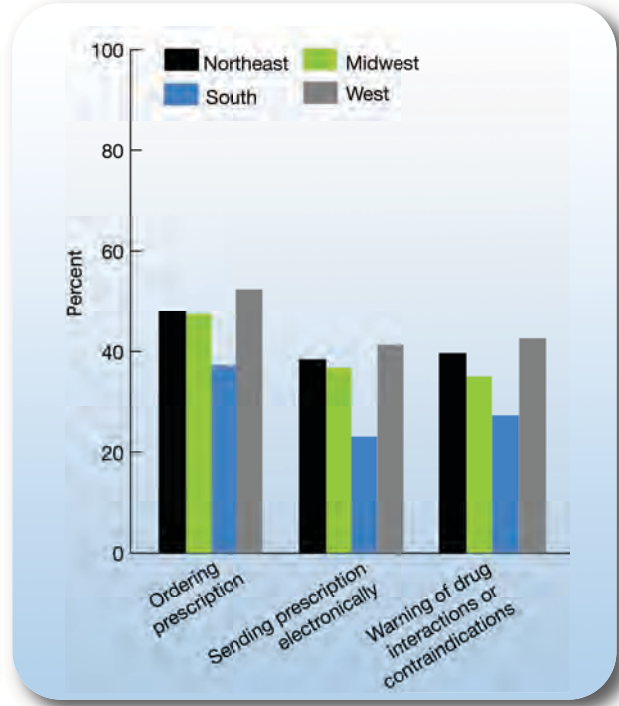
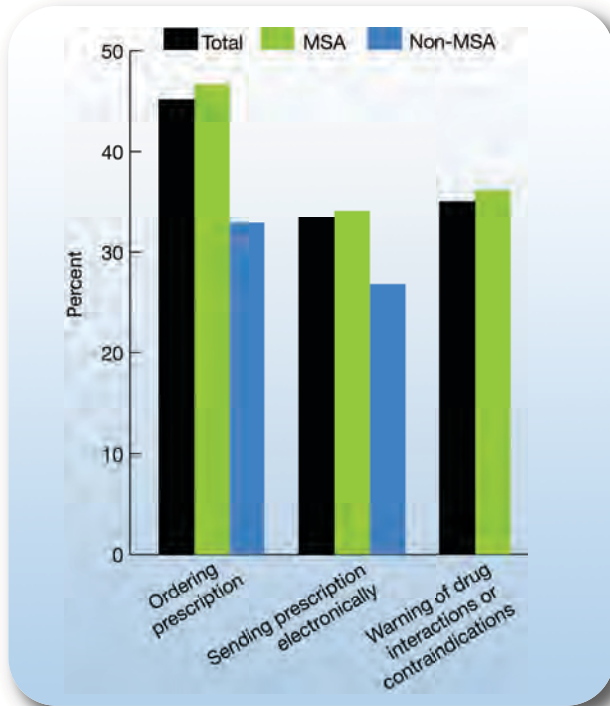
Office-Based Physicians With Electronic Prescribing Systems

E-prescribing provides physicians with a tool to improve medication management. Using an e-prescribing system, physicians can readily check for contraindications, drug allergies and harmful interactions, treatment duplication, body weight, patient age, and medication appropriateness before prescribing a new medication.



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Figure 8.3. Office-based physicians with electronic prescribing systems, by metropolitan status, region, and practice size, 2009 (preliminary)



Key: MSA = metropolitan statistical area.
Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Ambulatory Medical Care Survey, Electronic Medical Record Mail Survey Supplement, preliminary, 2009.
Note: For Warning of Drug Interactions or Contraindications, data for non-MSAs did not meet standards of reliability or precision.

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Adopting Computerized Systems

- Preliminary estimates from 2009 indicate that office-based physicians are more likely to have computerized systems for ordering prescriptions, sending prescriptions electronically, and warning of drug interactions or contraindications if they are part of practices with 11 or more physicians or if they practice in the West (Figure 8.3).

Ordering Prescriptions

- Preliminary estimates from 2009 indicate that the percentage of office-based physicians practicing in metropolitan areas who had a computerized system for ordering prescriptions was significantly higher than that of physicians in nonmetropolitan areas.
- Physicians in the West had a significantly higher percentage of computerized systems for ordering prescriptions than physicians in the South.
- Practices with 11 or more physicians had a significantly higher percentage of computerized systems for ordering prescriptions than practices with 10 or fewer physicians.

Sending Prescriptions Electronically

- Preliminary estimates from 2009 indicate that physicians in the West had a significantly higher percentage of computerized systems for sending prescriptions electronically than physicians in the South.
- Practices with 11 or more physicians had a significantly higher percentage of computerized systems for sending prescriptions electronically than practices with 10 or fewer physicians.

Providing Drug Warnings

- Preliminary estimates from 2009 indicate that physicians in the West had a significantly higher percentage of computerized systems for warning of drug interactions or contraindications than physicians in the South.
- Practices with 11 or more physicians had a significantly higher percentage of computerized systems for warning of drug interactions or contraindications than practices with 10 or fewer physicians.

Also, in the NHDR:

- Preliminary estimates from 2009 indicate that the percentage of office-based physicians ages 35–44 who had a computerized system for warning of drug interactions or contraindications was significantly higher than the percentage of physicians age 55 and over.
- The percentage of physicians in areas with populations of less than 50% non-Hispanic Whites that had a computerized system for warning of drug interactions or contraindications was similar to physicians in areas with populations of 50% or more non-Hispanic Whites.

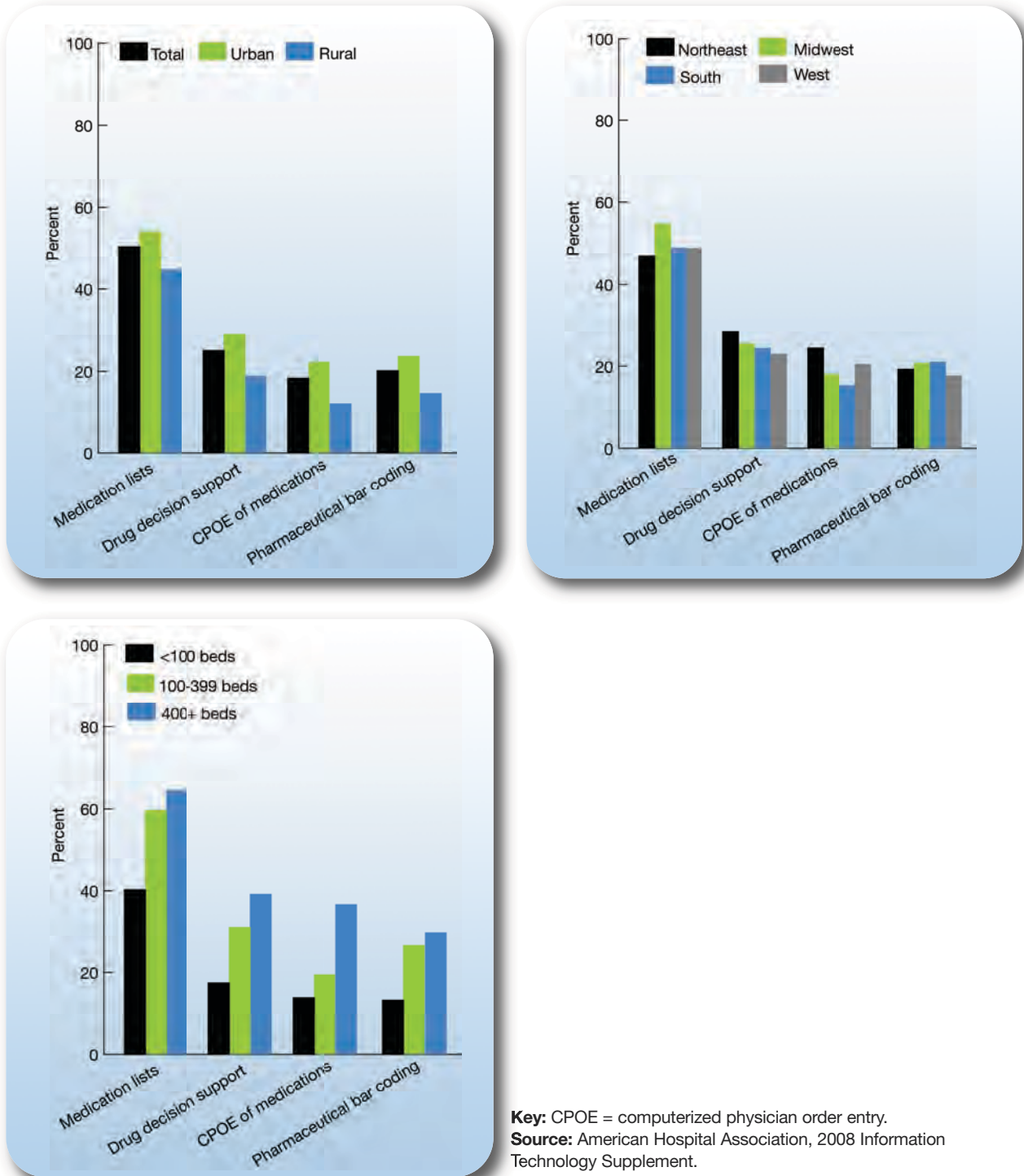
Medication Management in Hospitals

Patient handoffs and transitions of care have been identified as placing patients at increased risk of adverse events. Once a patient is admitted to the hospital, medication plays a vital role in his or her recovery. Doses of patients' medications may be altered, new drugs added, and others discontinued. Electronic medication

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management can aid in the reduction of adverse events by providing accurate, current medication information as patient care is transferred from one health care team to another.

Figure 8.4. Electronic management of medication in hospitals, by metropolitan status, geographic region, and hospital size, 2008



Key: CPOE = computerized physician order entry.
Source: American Hospital Association, 2008 Information Technology Supplement.

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Overall Computerized System Adoption

- In 2008, hospitals that had the highest percentage of adoption of a fully implemented computerized system for electronic medication lists, drug decision support, computerized physician order entry (CPOE), and pharmaceutical bar coding were hospitals with 400 or more beds, located in urban areas (data not shown).

Medication Lists

- In 2008, 50.5% of hospitals had an electronic system that supports medication lists (Figure 8.4).
- Fifty-four percent of urban hospitals and 45% of rural hospitals had an electronic system that supports medication lists. Hospitals in the Midwest had the highest percentage of electronic systems that support medication lists (54.8%). In the West and South, 49%, and in the Northeast, 47% of hospitals had an electronic system that supports medication lists.
- Hospitals with 400 or more beds had a higher percentage of electronic systems that support medication lists (64.6%) compared with hospitals with 100-399 beds (59.7%) and hospitals with fewer than 100 beds (40.4%).

Drug Decision Support

- In 2008, 25.1% of hospitals had a fully implemented electronic system for drug decision support.
- The largest difference in implementation was observed between large and small hospitals. Nearly 40% of hospitals with 400 or more beds had a fully implemented electronic system for drug decision support but only 17.5% of hospitals with fewer than 100 beds had a fully implemented system.
- The Northeast had the highest percentage, 28.6%, of hospitals with a fully implemented electronic system for drug decision support. In the Midwest, 25.6% of hospitals had a fully implemented electronic system for drug decision support. In the South, 24.4%, and in the West, 23% of hospitals had a fully implemented electronic system for drug decision support.

CPOE of Medications

- In 2008, 18.4% of hospitals had fully implemented CPOE systems.
- Urban areas had almost double the percentage of hospitals with a fully implemented CPOE system (22.3%) compared with rural areas (12.2%).
- The Northeast had the highest percentage, 24.4%, of hospitals with a fully implemented CPOE system. The West had 20.5%, the Midwest had 18.2%, and the South had 15.4% of hospitals with a fully implemented CPOE system.
- There was a large discrepancy in implementation between small and large hospitals. Only 13.9% of hospitals with fewer than 100 beds had a fully implemented CPOE system while 36.7% of hospitals with 400 or more beds had a fully implemented CPOE system.

Pharmaceutical Bar Coding

- In 2008, 20.2% of hospitals had fully implemented pharmaceutical bar coding systems.
- Approximately 24% of urban hospitals and 15% of rural hospitals had fully implemented pharmaceutical bar coding systems.

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- In the South, 21.1% of hospitals had fully implemented pharmaceutical bar coding systems; in the Midwest, 20.8%; in the Northeast, 19.3%; and in the West, 17.8%.
- The largest difference in implementation was observed between large and small hospitals. While 29.8% of hospitals with 400 or more beds had a fully implemented pharmaceutical bar coding system, only 13.3% of hospitals with fewer than 100 beds had a fully implemented system.

Also, in the NHDR:

- Hospitals that were members of the Council of Teaching Hospitals (COTH) had a much higher percentage of electronic systems that support medication lists than hospitals that were not members of COTH (72.6% compared with 48.8%).
- Hospitals run by the Federal Government also had a much higher percentage (84.4%) of electronic systems that support medication lists than non-Federal (43.8%), not-for-profit (56.5%), and investor-owned hospitals (34.8%).
- Nearly 70% of children's general hospitals and 53.9% of general medical and surgical hospitals had an electronic system that supports medication lists. Between 24% and 36% of psychiatric, rehabilitation, and acute long-term care hospitals had an electronic system that supports medication lists.

Workforce Distribution

Pharmacists distribute prescription drugs to individuals. They also advise their patients, physicians, and other health practitioners on the selection, dosages, interactions, and side effects of medications. In addition, they monitor the health and progress of patients to ensure that they are using their medications safely and effectively. Most pharmacists work in a community setting, such as a retail drugstore, or in a health care facility, such as a hospital.

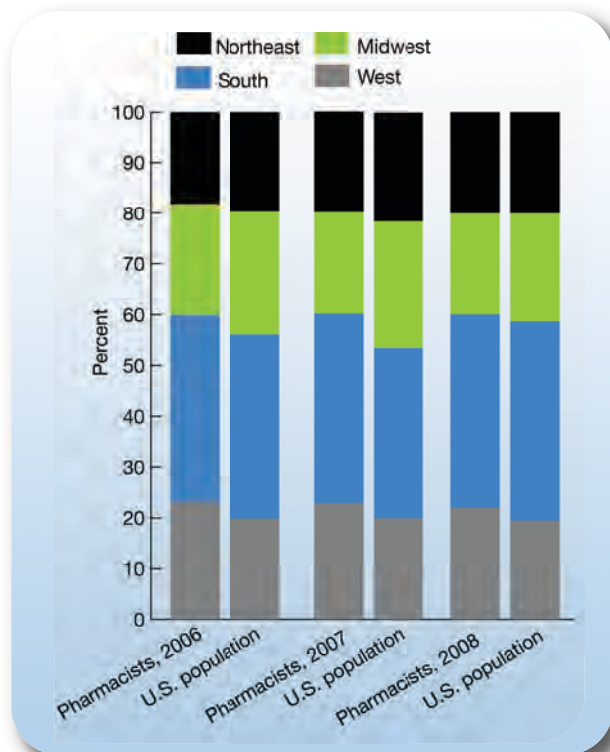
Pharmacists are an important part of the health care infrastructure, and as treatment protocols become more complicated, the role that pharmacists have in providing quality care increases. Pharmacists are engaged in efforts to improve the quality of the drug use process and to identify ways to reduce medication errors.⁷ Studies have shown that pharmacist involvement in patient care can result in better diabetes and hypertension management as well as a decrease in heart failure events and mortality.⁸ Also, pharmacist involvement in patient care can reduce adverse drug reactions or medication errors and increase patient comprehension of treatment protocols and medication adherence.

In 2008, more than 12% of the United States population was over the age of 65 and this number is expected to grow. This changing demographic is expected to increase the demand for pharmacists. In addition, the advent of new drugs for the treatment of more conditions and the growth in the number of people with chronic conditions will increase the demand for pharmacists.

This year, the NHQR presents the geographic distribution of pharmacists to examine access to this vital health care service in various areas.

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Figure 8.5. U.S. pharmacy professionals compared with the U.S. population, by geographic region, 2006-2008



Source: U.S. Census, American Community Survey, 2006-2008

- In 2008, 37.8% of the approximately 301,000 pharmacists in the United States practiced in the South; 23.7% in the Midwest, 20.2% in the West, and 18.3% in the Northeast (Figure 8.5). The pharmacist workforce was representative of the U.S. population in each region. No region had a disproportionate percentage of pharmacists. This follows a similar pattern observed in 2006 and 2007.

Also, in the NHDR:

- In 2008, 74.3% of the approximately 301,000 pharmacists in the United States were White; 6.2% were Black, 14.4% were Asian, and 3.7% were Hispanic. Compared with the general U.S. population, Whites and Asians were overrepresented and Blacks and Hispanics were underrepresented.

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