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Thank you very much for the invitation to speak with you this morning. I have been asked to discuss the role of handheld devices in improving the safety of prescription drug prescribing. I am speaking on behalf of the American Medical Informatics Association; I am an elected member of the American College of Medical Informatics. I have spent much of the last 7 years doing research on the magnitude of the problem of prescribing errors and on the impact of computerization of prescribing to prevent those errors and the associated injuries. Much of this research has been sponsored by the Agency for Healthcare Research and Quality, or AHRQ. I am also a member of the board of the Institute for Safe Medication Practices, which has prepared a white paper on this topic, which I have brought with me today.

Errors in prescribing are a major healthcare problem, and can often result in injuries and even death. This is a particularly important problem in older patients, who take more drugs, have more illnesses, and are thus more likely to experience problems with their medications than younger patients. In an AHRQ sponsored study we did in hospitalized patients, there were 6.5 adverse drug events or injuries due to drugs per 100 admissions, among which 28% were preventable. Prescribing errors caused most preventable ADEs.

Computerization of prescribing has major benefits. In one study, we found that that computerizing prescribing on desktop computers with even simple decision support reduced the serious medication error rate by 55%. In another, we found that computerization of prescribing on desktops with more advanced technology reduced the overall medication error rate by more than 80%.

Compared to data about inpatients, we have much less information about the frequency of medication errors and adverse drug events outside hospitals, where handheld devices are likely to see their greatest use, at least at first. However, the available data suggest that such problems are frequent in this setting as well.

Computerization of outpatient prescribing can occur via handhelds or desktop technology. The desktop approach is now more prevalent, although this may change, and many companies now are building applications that will allow electronic prescribing via multiple platforms.

Handheld devices represent an exciting development in information technology and healthcare. Because of their small size, they can be taken anywhere and providers are using them enthusiastically. One way that they can be used is to hold information, for example information about drugs.

However, stand-alone applications are limited: to have a major impact on errors it is essential to computerize the entire prescribing process, and handhelds can make this possible. A number of companies have developed applications that allow physicians to write prescriptions electronically using handheld devices.

This approach eliminates the problem of hand-writing, which has accounted for about 10% of errors in inpatient studies. The devices can display ranges of doses, and require that all prescriptions include a dose, route and frequency. No published studies to date that I am aware of address the impact of prescribing using a handheld on medication errors or adverse drug events.

However, based on inpatient experiences, such devices will have a much greater impact on prescribing errors if patient-specific information such as the patient's age, allergies, other medications, insurer and medical conditions are available to the device. Hand-held devices can use wireless, infrared or direct electronic links to communicate with the health care organization's applications. Electronic prescriptions can also be transmitted to pharmacies.

This is technically possible today, though it must clearly be done in ways that protect consumers' privacy and confidentiality. If patient-specific information is available, the device can improve safety by doing things such as suggesting a dose appropriate for the patient's age and kidney function, and checking for allergies. Drug costs can also be substantially reduced because the prescription can be compared to the formulary of the patient's insurer. Most of the applications available today provide some but not all of these features; it is challenging to do all the computing required on a handheld device.

In the long run, I think hand-held devices will represent an extremely valuable adjunct to information systems, but their potential will depend on having effective links to key data. In the short run, hand-held devices represent one option for computerizing prescribing and are especially attractive for physicians who are currently only using paper prescriptions, which are the vast majority of physicians in America. My guess based on the inpatient experience with computerizing of prescribing is that devices that have minimal patient information will reduce medication error rates by up to 50%, but will have only a small impact on the adverse drug event or injury rate. To affect the injury rate, wireless or other types of links, which bring patient information to the point of care, are essential.

To summarize, computerization of prescribing is a very important goal. However, computerization will be most beneficial only if sophisticated decision support is provided. More research on the actual impact of these devices is needed. If computerization of prescribing can be accomplished, patients will be safer, and our healthcare costs will also be substantially reduced.

Once again, thanks very much for inviting me here today.

Additional Testimony (written only):

Based in part on the data I presented regarding inpatients, a coalition of employers called the Leapfrog Group sponsored by the Business Roundtable and including GM and GE and representing 24 million Americans, has identified computerization of prescribing in hospitalized patients as one of the three changes in care that would most improve the quality of healthcare in America. They estimate that this would prevent 522,000 serious medication errors in hospitals per year, and have challenged healthcare organizations to adopt computerized prescribing in hospitals. In addition, California has enacted a law mandating computerization of prescribing or other error reduction technology in all non-rural hospitals by 2005.

In one outpatient study, 31.5% of patients recently discharged from a hospital had an adverse drug event, and in another they occurred in 5% of all patients per year.

One of several popular stand-alone drug databases is called qRx, made by ePocrates, which can be downloaded free from the Web. In a survey we did of 870 users, 60% reported using it more than twice daily, 90% said they could find the information they needed in less than a minute, it answered more than three quarters of their questions for 88% of users, and 46% said it changed more than 3 drug decisions per week.

Most devices use standard technology such as Casio's Casseiopeia, the Hewlett-Packard Jornada, or 3Com's Palm Pilot. The typical operating system is Windows CE or Palm OS. The devices are easy to use and can be mastered in about a half-hour.

Electronic prescribing will also be most attractive to physicians when prescriptions can be electronically communicated to pharmacies because it will reduce their workload; for this to occur, legislative reform is needed in many states.

Major research needs in general in this area are support for studies on the impact of computerization of prescribing in general and on prescribing on handheld devices in particular on medication error rates, and on the general problem of medication errors and adverse drug events outside the hospital.