The Permanente Journal is always interested in considering artwork by Kaiser Permanente clinicians and employees. If you would like to submit art for consideration for the cover or interior of The Permanente Journal, please use the following guidelines:

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The Human-Machine Interface: Inviting Your Computer Into Your Patient-Clinician Relationship

Tom Janisse, MD, Editor-in-Chief

In this issue featuring new technology in medicine, there should be one article reminding us of the importance of “high touch” to balance “high tech.” Marshall McLuhan offered a metaphor to describe the pace of change that disturbs our equilibrium: “The entire world, past and present, now reveals itself to us like a growing plant in an enormously accelerated movie.”

We must attend to the way new technologies touch us and make us feel, and to how the use of technology in a patient setting demands a complementary personal touch from clinicians. This is required to make certain the patient’s experience isn’t too cold, rational, distant, hard-edged, or impersonal. Though you will read about many new technologies in this issue—video CME, genetic therapies, investigational procedures, electronic records, sensor technology—I will focus on the most ubiquitous phenomenon: the human interface with technology, most specifically the human interaction with the computer. You and it. And how you relate.

McLuhan’s dictum, “The medium is the message,” raises the question: With the computer becoming the predominant medium in our clinician-patient interactions, what is the message? Is the computer yet another machine driving a wedge between patient and clinician, or, because the computer can be so animate, is this a machine that can help build communication and relationship?

The Chart

The patient’s medical record has long played a part in the patient-clinician interaction in the exam room. Even after the mystery inside the dog-eared paper chart was opened to the patient, the chart was never alive like the computer on the desk, which now holds the electronic medical record. The computer, initially animate with color, fly-down menus, flashing arrows, pictures, and the perception of remote control by a moving mouse, is now a portal to an enormous, interconnected world of information and people. Stepping into this experience of electronic connection reenacts that moment in film when the cave wall rolls back revealing an exotic world beyond. The patient’s chart never had a person so vividly on the other end of a paragraph of text as it does now with immediate electronic communication. This mechanical and electronic tool has morphed imperceptibly into an entity with a personality, at the least of a servant and assistant. As you use this tool, what doesn’t break through into your everyday awareness is the computer’s ability to elicit emotion and provoke a response in both you and your patient.

Human–Computer Research

The human–computer interface is an interactive space—a field between two entities. What occurs in this interface, if ignored or misunderstood, can have significant consequences. In a recent book, “The Media Equation: How People Treat Computers, Television, and New Media Like Real People,” authors Byron Reeves and Clifford Nass take a psychological rather than a technical perspective and describe through psychological experiments that more is going on in this person-computer interaction than meets the eye. “People’s response to computers is fundamentally social and natural.”

Many of the authors’ experiments were based on theories and experiments about human-human interactions.

Our normal social responses are now unconscious and automatic, having developed from ancient times. As such, computers, a modern medium, engage our “old” brains, which apply these social rules. Our primitive brains have not evolved to recognize that an inanimate technology, which acts animate, like a computer, is not human. “The human brain evolved in a world in which only humans exhibited rich social behaviors, and in which all perceived objects were real physical objects.” So the human brain is evolutionarily set to respond to “interactions” as interpersonal. When the computer asks us questions, sounds like a man or woman, or displays an animated picture, we respond socially. “People have done some amazing things in our labs. They have taken great care not to make a computer feel bad, they’ve felt physically threatened by mere pictures, and they’ve attributed to an animated line drawing a personality as rich as that of their best friend. What seems to be true is often more influential than what is really true. Perceptions are far more influential than reality defined more objectively.”

When a person asks for an evaluation by another person, people tend to respond politely. In one of Reeves and Nass’ experiments, a computer asked for an evaluation of itself, in the format of an interactive survey. The participant’s response was polite, as if the computer were human. It is fascinating that these people denied being polite, or influenced by the computer.

Steven Johnson, in “Interface Culture: How New Technology Transforms The Way We Create & Communicate,” notes “Apple’s Macintosh ushered in the entire rhetoric of visual metaphors: the desktop, the trash can, the folder, the mouse. Why not imagine the computer as a person? If we are going to be talking to our PCs, we might as well give them the opportunity to talk back.” To test just this concept, Reeves and Nass performed another experiment on personality expressed through sound, in which people were asked to purchase a book on a Web site by an extroverted synthesized voice. As is known to occur in humans, extroverted people classified this site as higher quality and more credible than did introverted people. “Psychologists would say that one of the most powerful cues to how I treat you/ regard you is the tone of your voice.” Both style and gender play into this. Females believe a female voice more than a male. All believe a male voice is more intelligent.

In a third experiment about the psychology of self-disclosure, Reeves and Nass found that when a computer discloses information about itself to users, it elicits more complete and detailed answers to questions from the users. This demonstrated that reciprocity is a strong impulse in a social interaction. The implications are obvious for patient-clinician interaction.
ever, what has been historically true is that the scientist-doctor withholds information, especially personal information, in order to maintain objectivity. The point is that the clinician-patient interaction is a social encounter and follows primitive social rules. By extension, your interaction with your computer follows the same social rules. When the computer is invited into this patient interaction it is perceived to be a person in spite of reality.

**Developing Computer Emotions**

Taken to the next level, in *Affective Computing*, Rosalind Picard, professor of Media Technology at MIT, writes “not about how people feel about computers, but giving emotional abilities to computers.” She presents “a compelling image, not only of how machines might come to have emotions, but why they must. Computers will recognize your emotions and use a shared emotional vocabulary for more natural, entertaining, and effective human-machine interactions.”

To that end, in a fourth experiment, Reeves and Nass determined that personalization and adaptation by a computer to a user’s habits during a test resulted in less confident users performing better on the examination. In addition to the implications this has for how we interact with computers in medicine, it relates to how we interact with more or less confident patients in our interactions.

My purpose here is not to review the emerging literature of artificial intelligence, but to heighten awareness of the interpersonal effects that this computer-machine can have on clinicians and their patient interactions. While considering that your computer is a tool is perfectly appropriate and realistic, understanding these important interface effects can help you to favorably alter your interaction, and ultimately your relationship, with your patients.

**The Patient, You, and the Computer: Permanente Learnings**

When a clinician or surgeon employs a new technologic device, their focus is first on technical mastery. At times, their focus is so intense on the device, they can lose sight of the secondary effect of distancing the patient, or even the team that supports them. Not everyone in the room is peering through the lens of the bronchoscope or laparoscope, which are not activities in isolation like using a microscope. The necessary teamwork for the highest performance requires that the clinician-technician include the team members in the procedure. Now with a computer in the exam room, it is not acceptable for the clinician to become lost in the computing process, ignoring the patient.

The impact can be even more significant to the patient, as Picard notes that “… emotions influence memory and memory retrieval.” For example, you are familiar with the patient’s amnesia of the oncologist’s or surgeon’s comments after first hearing that they have a diagnosis of cancer. Similarly, a patient could have diminished recall of a clinician’s explanation of test results if the patient feels estranged in the interaction because of the clinician’s preoccupation with the computer.

With the introduction of the electronic medical record into several regions, clinician experts are already aware of the need to acknowledge the presence of the computer in the room and take steps to include the patient in the interaction with the computer. It is categorically different than leafing through the chart for information. The chart isn’t plugged in.

“The source of any information affects people's trust in that information,” Picard notes. “We all have the experience of somebody believing something just because it came from a computer, sometimes according it higher trust for this reason, while others have the opposite response.” Furthermore, what is “information” to clinicians (who understand the data) is just unintelligible “data” to a patient. Data become information when the clinician and the patient together understand it, and when they can view it as familiar. For example, “Show your patient the graphs of the numbers you enter at this visit,” says Dr David Price, Colorado Director of Continuing Medical Education, who participated in a panel at this year’s Permanente Executive Conference (PEC). He added, “Instead of graphing the child’s growth chart by hand in the paper chart, we just turn the computer screen toward the mom, and show the new graph completed automatically. It’s all done for us. The turning of the computer screen is very important. As clinicians we must make sure that we talk to patients and don’t talk to the computer screen. Include the patient somehow. Physically get them proximate to you, turn the screen, show them what you are doing. And the patients love it. They really think it’s cool. And when you go online for patient information, you can prompt patient questions by explaining what you are doing. This actually promotes interactivity. You can look shoulder to shoulder at the monitor, seeking information together.” Also make sure the patient is in a comfortable position to participate in this interaction with the computer. Don’t leave them craning to see the screen from the exam table while you are comfortably in front of it.

When computers were first introduced into Colorado exam rooms, Dr Price made a point to ask patients, “How was this for you? Did you feel like you were part of the visit? Were we talking to you or paying attention to the computer?” He stopped asking because he was so focused on including them that they felt very engaged.

What complicates inclusion of the patient for some clinicians is that these clinicians are technophobic and initially unskilled at using a computer. Dr Andrew Lum, Colorado Assistant Medical Director for Service Quality and physician advisor to electronic medical record implementation, noted at the PEC, “In the training class, we had one person put the mouse on the floor to sort of step on it, and another person held the mouse to the screen like a phaser or something. However, a small amount of orientation can result in a high level of acceptance and participation.” What they have to work harder at is interacting with both the computer and the patient. Dr Lum comments on...
CIS training, in “The Electronic Medical Record: Barrier or Bridge to Effective Clinician-Patient Communication,” in this issue of TPJ: “Physicians with strong interpersonal skills engaged their patients during their learning (‘Bear with me while I do this on the computer’) while those with poor interpersonal skills were unable to mitigate the interference of the CIS on their patient interactions.” When they learn this skill, however, the outcome for patient and clinician is a superior care experience.

Another example of including the patient in a computer interaction occurs in Colorado’s call center. Dr Price, continuing his comments at the PEC, noted, “When patients are talking to us in the call center (we have doctors in our call center now), we can talk to them like we know them (with the information from the electronic record). It really, really breaks down barriers. Patients don’t feel as if they’re calling this great big, amorphous call center and getting somebody who doesn’t have a clue about what’s going on with them. We can pull up their record and, over the phone, say, ‘Oh, you’re a diabetic and I see you have some back pain, and you are taking these medications? We may be able to help you on the phone.’ And make no mistake, members think this is cool. I mean, it is way cool.” An added advantage is that patients don’t have to retell their story. This has always been a major frustration for them.

Dr Robert Pearl, Executive Director and CEO of The Permanente Medical Group, who addressed the PEC, made, in my opinion, the most important comment during the CIS session. “In the end, people won’t trust a system. They will trust a person.”

**Conclusion**

The computer holds enormous potential advantage for us, particularly if we understand our interaction with it, our patient’s interaction with it, and, in the context of the patient-clinician encounter, our inviting the computer into our interaction. Mastering these interface interactions will enhance patient-clinician communication and ultimately improve the satisfaction with the care experience for patients and clinicians. The additional important value for our members is the resulting improved quality of medical care.

**References**


**Senders**

“Some of us, after all, are very good at expressing emotions and feelings, which means that we are far more emotionally contagious than the rest of us. We infect each other with our emotions.”

*Elaine Hatfield and John Cacioppo, “Emotional Contagion,” Cambridge University Press*
In his book, *The Lexus and the Olive Tree*, Thomas Friedman describes a “fast world,” where nearly all humans on earth are touched in some way by high-speed Internet connections, worldwide telecommunications, interconnected financial markets, and ubiquitous fast-food restaurants. One only needs to hear the ring of a cell phone, the buzz of a fax machine, or the awkward diction generated by voice simulation software to recognize plentiful and sometimes painful examples of life in this fast world.

As health care professionals, we can easily believe that we have already glimpsed the future and are already living in the fast world Friedman describes. We recognize that we must become more familiar with the Internet and incorporate computing power into our practice. We are also aware that the widely publicized genetics revolution will soon bring a large number of screening and diagnostic tests our way. We understand—and generally believe—that new technology can greatly assist us in preventing, treating, and curing disease.

But recent developments in computing and genetics are important not only because they bring new possibilities for health care. The combination of computing power, biotechnology, distance technology, and sensor technology will make delivery of health care in the United States unrecognizable from the care we deliver today. As startling as this prediction seems, it describes the challenge that health care systems must face directly and without delay. This article briefly surveys this new technology and previews its future role in health care.

**Genetics**

These days, we cannot pick up a scientific journal, a newspaper, or a magazine without finding articles that view the accomplishments of the Human Genome Project as the “biological equivalent of landing a man on the moon.” Nor is it a large leap to appreciate that the ultimate goal of genetic medicine is to prevent or treat disease with gene therapy or with a drug developed specifically for any given underlying defect.

Using rapidly emerging discoveries in genomics (the study of all genes that make up an organism), scientists are perfecting methods of turning raw biological information into drugs, vaccines, and diagnostic tests. In the future, instead of wasting time on trial-and-error treatment, physicians will be able to use a genetic test to identify patients with the potential to respond to a drug. Pharmacogenomics will become key to individualized prescribing: A unique DNA signature will identify disease susceptibility, current disease status, and optimal drug treatment for a given person. Indeed, genotyping (or functional analysis) has already become standard practice in major cancer treatment centers such as the Mayo Clinic and St Jude Children’s Research Hospital.

Major developments in computer chip technology, nanotechnology, and combinatorial chemistry are signaling development of the “lab-on-a-chip.” Chip technology will enable quantitation and complex analyses on surfaces smaller than one square centimeter. Today, most molecular genetic tests are not automated, are labor-intensive, and are extremely expensive. Chip technology applications are already being tested to use cervical fluid, blood, buccal mucosal cells, and saliva.

Genetics operates under the conceptual framework that disease is an individual event and that all subjects are truly individual. The enormous genetic variability among humans suggests that the more we know about genetics, the more apparent will become the observation that “each pathological event is unique in the same individual, and unique on different occasions, because of the variables with the environmental conditions of each instance. Environmental factors include not only the natural world but also the selection of lifestyles, foods, work conditions, family interactions, pets, etc. This, of course, means the death of nosology as we know it.”

How will a focus on unique individuals and individualized therapy comport with the population-based perspective of Permanente Medicine? What impact does individualized therapy have on health care delivery systems? For example, how will we reshape current pharmacy services for an era when drugs are tailored to the biochemistry of a single individual? Powerful computers will be at the hub of instant DNA analysis as well as subsequent design, formulation, and even dispensing of drugs.

In the 21st century, we will be able to detect the risk of genetically caused diseases from the moment of conception throughout the lifespan. As part of structuring our health care system, we will have to decide if we will test the blood of all newborns as well as other current Health Plan members for all known diseases. We will have to address the fact that these children, adults, and their families may have the gene for the disease but may never manifest symptoms of the disease. We will struggle even harder with the cost of offering fruitless medical interventions (including those that become “community standards”) and with the ethical dilemma of telling patients that they have genetic mutations.

These are only the first-order effects of these developing technologies. Imagining the second-order effects is difficult, but these effects undoubtedly include the requirement that physicians, pharmacists, and nurses become computer-savvy technologists whose daily work may be far removed from the “laying-on of hands” common in traditional patient care.

**The World Wide Web**

Much has now been written about the impact of the Internet on health care. Much of this information is one of the most-retrieved types of information on the Web—with well over 100,000 medical Web sites. Entering the single word “health” into any of the major Web-based search engines will result in millions of “hits.”

The Web is now a commonly used tool in health care. A 1998 survey showed that 87 percent of health care organizations are using the Internet—a figure that by now has undoubtedly increased substantially. But although an estimated 80 percent of hospitals use the Internet, fewer than 20 percent use it to give information directly to patients. Consumers are obtaining medical information—lots of it—from the Internet, but not from us. This situation is a problem, and it will get worse.

One of most powerful developments in Web technology is the role of consumers. The...
Internet is an engine for change because it provides an infrastructure for health professionals and consumers to access resources and databases. Universal access to this vast store of knowledge—without regard to its quality or content—has made medical practice more complex. But the most potent part of the Internet’s power comes from the ability of consumers to gain access to the same knowledge base as providers of health care; in particular, this knowledge base includes peer-reviewed medical journals. For better or for worse, this access has increased consumers’ involvement in health care decisions.

This development has provoked a debate about whether the typical patient can translate science-based information into better health or will instead become lost in a stew of information (“cyberhypochondria”). At a minimum, patients use information to challenge the evidence base of physicians. This use of information can put new strains on the physician-patient relationship but can also serve as incentive for doctors to learn how to use electronic resources, remain up-to-date on knowledge, and become better informed about patients’ needs and preferences.

Meanwhile, outpatient care will be heavily influenced by the Web. Interactive video conferencing, educational programs, and the Internet will provide health care at a distance. A report of a cost-effective program featuring remote video technology for home monitoring of chronically ill members of Kaiser Permanente in Sacramento has recently been published in the scientific literature.14 Web technology will be used to match patients with monitoring devices and other “distance” technology in health care.13,16 Today, these technologies are at the same level of development as computers were in the 1970s but are advancing very rapidly.16 Today’s advanced technology unites sensing capability and data processing into a single integrated-circuit chip. Sensors detect physical, chemical, and biological signals and can also measure and record a wide range of physical properties (eg, temperature, pressure, sound level, intensity of light, weight, amplitude of magnetic and electronic fields, and concentration of substances such as gases, liquids, or solids).16 Americans have become accustomed to using a wide range of electronic sensor devices in homes, cars, and offices. Sensors are all around us—in alarm and security systems, timers, household appliances, and elsewhere. In the future, sensors will be embedded in walls and ceilings of homes and offices, woven into clothing, and given new applications not yet imagined.

Many applications are now being applied to health care. Remote transmission of pulse rate and blood pressure from the homes of patients with chronic illnesses is already available.19 Developers are awaiting commercialization of in vivo glucose sensors for detection of hypoglycemia in diabetic patients.20 In another small venture, diabetic patients wear a glucose sensor that looks like a watch and that produces small electric shocks which open a patient’s pores so that fluid can be extracted to monitor tissue glucose concentration.21 Other developers are working on an electronic “nose” that detects and differentiates the odors of growing bacteria that cause ear, nose, and throat infections.22 Perhaps even more stunning is the prediction that beds and tables in ICUs, hospital rooms, and operating rooms will soon be equipped with sensors and remote monitors to check vital signs and blood chemistry and with control sensors for mechanical ventilation, suction, intravenous transfusion, and cardiac defibrillation. In a 1999 issue of the British Medical Journal devoted to technology, Charles B Wilson, Director of the Institute of the Future, predicts that “inpatients may be implanted with tiny sensors as part of the admission process, and throughout the patient’s hospital stay the chip will provide values instantaneously for the 40 or so laboratory tests that constitute 90 percent of a hospital laboratory’s volume, thus changing the role of the central laboratory.”16,1200 Hospital lobbies can be vented with air monitors that detect and report any entrant who might transmit airborne infection.23

Once at home, patients may use a toilet (today designed by the Japanese company Toto) that analyzes urine for glucose concentrations, patient weight, and other measures and sends reports to the clinical information system or directly to the health care team.24 Clothing with embedded sensors will continuously monitor vital signs for patients at home or wherever else they may be.25

Issues Transforming Health Care

New technologies in health care are being introduced at blinding speed. These technologies are stunning in their breadth and scope and hold tremendous implications for the way health care will be delivered in the future. Although no one can guarantee exactly what the health care landscape will look like in the next 5, 10, or 20 years, several themes clearly emerge from the present trends.

Interdependence: An Outgrowth of the Information Explosion

No physician can practice medicine alone in this complex environment. The knowledge necessary to practice medicine has exceeded what any one individual can absorb. Most health care providers currently lack expertise in clinical or molecular genetics, and greater familiarity with these areas of science and medicine will be required in the future.
Knowledge of genetics will not be enough, however. Computer technologies, interpretation of complex risk algorithms, robotics, and other technologies based on microelectronics and miniaturization will invade surgery, specialty care, and—most notably—primary care. These medical advances and technological breakthroughs will profoundly change our idea of group medical practice. Individual providers and entire health care systems must prepare themselves now for these developments.

Navigating a New Universe of Information

Systems must be developed to guide genes and patients through the morass of available health information. This fact is perhaps most readily appreciated by every physician who has seen patients who are “armed” with information from many sources—scientific journals, newspaper ads, and the Internet, among others. Some patients are well informed about the risks and benefits of a treatment, whereas other patients have exaggerated expectations of receiving prompt medical benefits from an unproven or harmful treatment. This situation will become even more delicate and problematic as availability of genetic screening tests outstrips our ability to predict occurrence of disease.

We must build smart systems that evaluate and synthesize the content and quality of medical information and put it into usable formats. To cut through the forest of health-related information, patients and clinicians need guides based on good science and good sense. These guides must also reflect the value preferences of patients and physicians—the groups who will eventually accept one treatment choice over another.

The ability to express complex information face-to-face and through electronic means will be essential for clinicians. Because communicating and understanding these issues is so complex, genetic counselors and others who specialize in this work will be in great demand. However, primary care will remain the area where patients raise the most questions and demand clear and cogent answers.

Defining “Population-based” Health Care: A Future Dilemma

The individualization of medicine will complicate the notion of population-based care. Indeed, the ability to further identify individual human variation will eventually allow physicians to subclassify diseases and to adapt therapy to individual patients. Discoveries in genetics, combinatorial chemistry, and other developing scientific fields will reveal startling information about these individual differences. Pharmacogenomics will deliver on its promise to use information about genetic variation to predict responses to drug therapy. Gene therapy will be used to substitute healthy genes for nonactive or defective genes or to alter or control expression of a gene.20

The individualization of medicine will not eliminate the need to incorporate high-quality, empirically derived evidence into medical practice. Quite the contrary will be true. The need for “separating the wheat from the chaff” in analyzing evidence has never been greater. However, the individualization of medicine should increase the precision of prescribing and other types of medical decision-making. In the not-too-distant future, treatment “guidelines” may look more like instructions for highly specific, individually tailored treatment plans that reflect specific knowledge about a unique human being as well as about his or her environment.

Conclusion

Regardless of the accuracy of these specific predictions about the future, health care systems and physicians clearly have a great deal to do to prepare for a future where the only certainty is to change itself. "Kaiser Center for Health Research, Portland, Oregon.

References
New Technology—The Permanente Way!
Lee Jacobs, MD, Associate Editor, Health Systems

This special issue on new technology showcases a major competency of the Permanente community—successful integration of new technology while maintaining high-quality care and a world class cost structure.

Many of society’s new technologies have become a community standard without the application of a sound scientific approach, contributing greatly to the rising cost of medicine. Based on scientific approaches, and with a focus on patient-centered care—not technology-centered care—this Permanente-physician-led integration has partially insulated Kaiser Permanente from the escalating health care costs in the medical community. Our approach is a model that is not only applicable to the United States, but also around the world as countries struggle with developing health policy related to technology changes in environments with limited resources.¹ In the Health Systems section of this issue, KP’s process is the focus of Dr Tan’s review of Permanente’s approach to new technology acquisition as well as of Mr Sugarman’s description of the Interregional New Technology Committee.

I believe it is keeping our eyes on the patient that is the hallmark of KP’s new technology integration strategies. In 1938, Dr Arthur Hertzler, a “horse-and-buggy doctor” of the late 1800s, lectured a group of upstart, slightly arrogant young physicians on the importance of keeping one’s focus on the patient despite the advances of the time. Dr Hertzler admonished the physicians: “What concerns the individual doctor is not so much what medical science can achieve as how much of this he can deliver to his patients. That is the personal element, for which each doctor is responsible.”² These observations are probably still very relevant to clinicians today. In 1903, Dr Osler warned universities not to forget to keep the patient the center of learning: “The whole art of medicine is in observation, as the old motto goes, to educate the eye to see, the ear to hear, and the finger to feel …”³ “… the best teaching is that taught by the patient himself.”³ Technology should not replace the humanness and effectiveness of the exam room encounter, but rather should support the clinician-patient interaction. This is the focus of Dr Lum’s article on the impact of new technology—the computer—on patient communication in the exam room. With amazing automation of the care experience, can we still keep our eyes on the patient? [Patient—communication contributions will be a regular feature of the Health Systems section; Dr Lum’s article is the inaugural contribution.]

Finally, again in the spirit of new technology enhancing a Permanente competency, Dr Havens presents a view of the future of CME technology within Kaiser Permanente. It is one of our core values—the constant learning within our group model—that enables us to leverage technology enhancements.

I’m certain that you will enjoy this edition. We have all enjoyed this opportunity of highlighting new technology to again wave with pride the Permanente flag of excellence!

References

I am
“I am a part of all that I have met.”
“Ulysses,” Alfred, Lord Tennyson, 19th Century poet laureate of England
Moderate Drinking and Reduced Risk of Heart Disease

Although heavier drinkers are at increased risk for some heart diseases, moderate drinkers are at lower risk for the most common form of heart disease, coronary artery disease (CAD) than are either heavier drinkers or abstainers. This association has been demonstrated in large-scale epidemiological studies from many countries. Abstainers may share traits potentially related to CAD risk, such as psychological characteristics, dietary habits, and physical exercise patterns. However, evidence supports a direct protective effect of alcohol, even after data have been adjusted for the presence of these factors. The alcohol-CAD relationship is also independent of the hypothetically increased risk status among abstainers who stopped drinking for medical reasons. All alcoholic beverages protect against CAD, although some additional protection may be attributable to personal traits or drinking patterns among people who share some beverage preferences or to nonalcohol ingredients in specific beverages. Alcohol’s protective effect may result from favorable alterations in blood chemistry and the prevention of clot formation in arteries that deliver blood to the heart muscle. Because CAD accounts for a large proportion of total mortality, the risk of death from all causes is slightly lower among moderate drinkers than among abstainers, but heavier drinkers are at considerably higher total mortality risk.

The Relationship Between Drug Therapy Noncompliance and Patient Characteristics, Health-related Quality of Life, and Health Care Costs

The objectives of this study were to determine the relationship between drug therapy compliance and risk of hospitalization and economic outcomes, and to identify potential indicators of compliance.

We used computerized prescription records from 1054 patients at high risk for drug-related problems. We calculated a compliance ratio for a 12-month period and correlated it with health care use, demographic variables, drug-related variables, and scores for health-related quality of life. Univariate results suggested that increased age (p = 0.05), high number of chronic conditions (p < 0.001), and high number of concurrent drugs (p < 0.001) were positively correlated with compliance. That is, increased values for these variables were associated with better compliance. Using logistic regression, the odds of being noncompliant was 0.665 as the number of chronic conditions increased. Compliance was not a predictor of concurrent or future hospitalizations or mortality, nor was it a significant predictor of health care costs.

Protocol Weaning of Mechanical Ventilation in Medical and Surgical Patients by Respiratory Care Practitioners and Nurses: Effect on Weaning Time and Incidence of Ventilator-associated Pneumonia

STUDY OBJECTIVES: 1) To determine the effect of a single ventilator management protocol (VMP) used in medical and surgical ICUs on the duration of mechanical ventilation. 2) To determine the effect of a VMP on the incidence of ventilator-associated pneumonia (VAP).
DESIGN: Prospective, randomized, controlled study.
SETTING: University Medical Center.
PATIENTS: Three hundred eighty-five patients receiving mechanical ventilation between June 1997 and May 1998.
INTERVENTIONS: A respiratory care practitioner- and registered nurse-driven VMP.
RESULTS: Intervention and control groups were comparable with respect to age, sex, severity of illness and injury, and duration of respiratory failure at the time of randomization. The duration of mechanical ventilation for patients was decreased from a median of 124 h for the control group to 68 h in the VMP group (p = 0.0001). Thirty-one total instances of VAP were noted. Twelve patients in the surgical control group had VAP, compared with five in the surgical VMP group (p = 0.061). The impact of the VMP on VAP frequency was less for medical patients. Mortality and ventilator discontinuation failure rates were similar between control and VMP groups.
CONCLUSIONS: A VMP designed for multidisciplinary use was effective in reducing duration of mechanical ventilatory support without any adverse effects on patient outcome. The VMP was also associated with a decrease in incidence of VAP in trauma patients. These results, in conjunction with prior studies, suggest that VMPs are a highly effective means of improving care, even in university ICUs.

The Kaiser Permanente Prenatal Smoking-Cessation Trial: When More Isn’t Better, What is Enough?
INTRODUCTION: The effectiveness of low-cost smoking interventions targeted to pregnant women has been demonstrated, although few gains in absolute cessation rates have been reported in the past decade. Under conditions of typical clinical practice, this study examined whether outcomes achieved with brief counseling from prenatal care providers and a self-help booklet could be improved by adding more resource-intensive cognitive-behavioral programs.
DESIGN: Randomized Clinical Trial.
SETTING: A large-group-model managed care organization.
PARTICIPANTS: 390 English-speaking women 18 years of age or older who self-reported to be active smokers at their initial prenatal appointment.
INTERVENTION: Participants were randomized to one of three groups: 1) a self-help booklet tailored to smoking patterns, stage of change, and lifestyle of pregnant smokers; 2) the booklet plus access to a computerized telephone cessation program based on interactive voice response tech-
The Influence of Intrapartum Antibiotics on the Clinical Spectrum of Early-onset Group B Streptococcal Infection in Term Infants


OBJECTIVE: The use of intrapartum antibiotics to prevent early-onset group B streptococcal (EOGBS) infection has left pediatricians in a quandary about the appropriate evaluation and treatment of infants at risk for this infection. The aim of this study was to determine whether intrapartum antibiotic prophylaxis changed the constellation and timing of onset of clinical signs of group B streptococcal (GBS) infection in term infants.

METHODOLOGY: We conducted a retrospective chart review of infants who had EOGBS infection and were born in Southern California Kaiser Permanente Hospitals from 1988 through 1996. Objective criteria were used to ascertain maternal risk of infection, intrapartum antibiotic prophylaxis, and onset of clinical signs of infection.

RESULTS: Twenty percent of participants were confirmed as abstinent with no significant differences found between intervention groups. Multivariate baseline predictors of cessation included number of cigarettes smoked per day, confidence in ability to quit, exposure to passive smoke, and educational level. No differential intervention effects were found within strata of these predictors or by baseline stage of readiness to change. Cessation rates among heavier smokers were strikingly low in all intervention groups.

CONCLUSION: Neither a computerized telephone cessation program nor systematic provision of motivational counseling improved cessation rates over a tailored self-help booklet delivered within the context of brief advice from prenatal providers. Innovative strategies need to be developed to increase the effectiveness of existing prenatal smoking interventions. Special attention should be paid to the needs of heavier smokers.


Body Size, Physical Activity, and Breast Cancer Hormone Receptor Status: Results from Two Case-control Studies


We evaluated whether our previous reports of increased postmenopausal breast cancer risk with higher body mass index (BMI) or of reduced premenopausal and postmenopausal breast cancer risk with higher physical activity levels varied according to the tumor’s estrogen receptor (ER) and progesterone receptor (PR) status. Participants enrolled in either of two population-based case-control studies in Los Angeles County, California: one of premenopausal women (ages ≤40 years), and one of postmenopausal women (ages 55-64 years). Case participants were diagnosed for the first time with situ or invasive breast cancer from 7/1/83 through 12/31/88 (premenopausal women) or from 3/1/87 through 12/31/89 (postmenopausal women). Joint ER/PR status was collected for 424 premenopausal and 760 postmenopausal case participants. The analysis included 714 premenopausal and 1091 postmenopausal age-matched, race-matched (white or Hispanic), parity-matched (premenopausal women only), and residential neighborhood-matched control participants. Among the postmenopausal women, obesity was associated with an increased odds of ER+/PR+ breast cancer (odds ratio, 2.45 for women in the highest versus the lowest body mass index quartile; 95 percent confidence interval, 1.75-3.47). Body mass index was associated with neither ER-/PR- tumors among the postmenopausal women nor with any ER/PR subgroup among the premenopausal women. For both premenopausal and postmenopausal women, higher recreational physical activity levels (≥17.6 MET-hours/week versus no activity) were associated with a 30-60 percent reduction in risk of nearly all ER/PR subtypes, although the associations were generally of borderline statistical significance. Examining these potentially modifiable breast cancer risk factors by tumor ER and PR status may provide us with greater insight into breast cancer etiology and the mechanisms underlying the risk factor associations.

How Accurately Does the Medical Record Capture Maternal History of Cancer?


We sought to assess the reliability of information regarding the maternal history of cancer by comparing the medical
records of 214 women with breast cancer, ages 26-59 years and diagnosed in 1974-1995, and of their controls with the medical records of their mothers. Subjects were members of Kaiser Permanente, Northern California, selected for a study of early-life predictors of breast cancer. For any type of cancer identified in the mother’s medical record, the proportion noted in the daughter’s medical record at least six months before the daughter’s diagnosis or reference date was 56 percent among cases and 32 percent among controls. The odds ratio for the association of maternal cancer history with breast cancer risk was 2.1 using the maternal record and 3.5 using the subject’s record. For a maternal history of breast cancer, the proportion noted in the subject’s record was 79 percent among cases and 57 percent among controls, and the odds ratios were 4.0 and 6.5, respectively. We believe that the case-control difference in missing information was attributable to higher utilization of breast cancer screening among cases. This study illustrates the need to assess the impact of screening differences on the ascertainment of information from the medical records.

**Asking Women to See Nurses or Unfamiliar Physicians As Part of Primary Care Redesign**


**OBJECTIVE:** To gauge women’s flexibility about seeing a nurse or an unfamiliar physician, to assess their interest in telephone visits, and to identify the characteristics of women who are least flexible.

**STUDY DESIGN:** Telephone surveys, focus groups, and in-person interviews with women.

**PATIENTS AND METHODS:** A random, demographically stratified sample of 1500 English-speaking female members of a health maintenance organization (ages 18-80 years) completed a 20-minute telephone survey (with a 72% response rate). A random subgroup of 500 women were asked about care preferences during acute illness and routine visit scenarios. Women (n = 242) from the full sample with a chronic illness were asked about their openness to telephone visits and care managers. Qualitative information was gathered from ten focus groups and 75 in-person interviews.

**RESULTS:** Most women (72%) were open to seeing a different physician for a minor acute illness, but they were less so (35%) for a routine checkup. If their physician was not available, the majority said they would be willing to see a registered nurse for the flu (72%) or a nurse-practitioner for a checkup (64%). Half (59%) of the chronically ill women were comfortable with telephone visits, and one third (37%) were “very interested” in care managers. Across scenarios, approximately one third of the women were strongly committed to seeing only their regular physician. They were more likely to be middle-aged or older, to have lower health plan satisfaction and perceived coordination of care, and to recall rude encounters with clinicians.

**CONCLUSION:** The flexibility of most women regarding redesigned models of health care is encouraging. More attention needs to be paid, however, to education of women about multidisciplinary roles, enhancement of coordination of care, and customization of care to match patients’ preferences.

**Sexual Orientation and Health: Comparisons in the Women’s Health Initiative Sample**


**CONCEPT:** Little is known about older lesbian and bisexual women. Existing research rarely compares characteristics of these women with comparable heterosexual women.

**OBJECTIVE:** To compare heterosexual and nonheterosexual women 50 to 79 years on specific demographic characteristics, psychosocial risk factors, screening practices, and other health-related behaviors associated with increased risk for developing particular diseases or disease outcomes.

**DESIGN:** Analysis of data from 93,311 participants in the Women’s Health Initiative (WHI) study of health in postmenopausal women, comparing characteristics of five groups: heterosexuals, bisexuals, lifetime lesbians, adult lesbians, and those who never had sex as an adult.

**SETTING:** Subjects were recruited at 40 WHI study centers nationwide representing a range of geographic and ethnic diversity.

**PARTICIPANTS:** Postmenopausal women aged 50 to 79 years who met WHI eligibility criteria, signed an informed consent to participate in the WHI clinical trial(s) or observational study, and responded to the baseline questions on sexual orientation.

**MAIN OUTCOME MEASURES:** Demographic characteristics, psychosocial risk factors, recency of screening tests, and other health-related behaviors as assessed on the WHI baseline questionnaire.

**RESULTS:** Although of higher socioeconomic status than the heterosexuals, the lesbian and bisexual women more often used alcohol and cigarettes, exhibited other risk factors for reproductive cancers and cardiovascular disease, and scored lower on measures of mental health and social support. Notable is the 35 percent of lesbians and 81 percent of bisexual women who have been pregnant. Women reporting that they never had sex as an adult had lower rates of Papanicolaou screening and hormone replacement therapy use than other groups.

**CONCLUSIONS:** This sample of older lesbian and bisexual women from WHI shows many of the same health behaviors, demographic, and psychosocial risk factors reported in the literature for their younger counterparts, despite their higher socioeconomic status and access to health care. The lower rates of recommended screening services and higher prevalence of obesity, smoking, alcohol use, and lower intake of fruit and vegetables among these women compared with heterosexual women indicate unmet needs that require effective interactions between care providers and nonheterosexual women.

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Vertebral Fracture Prevalence Among Women Screened for the Fracture Intervention Trial and a Simple Clinical Tool to Screen for Undiagnosed Vertebral Fractures. Fracture Intervention Trial Research Group


OBJECTIVE: To evaluate the ability of self-reported risk factors to identify postmenopausal women likely to have extent vertebral fractures because approximately two thirds of women with radiographic evidence of vertebral fracture are unaware of the fracture.

PATIENTS AND METHODS: Questionnaire and spinal radiographic data were collected from postmenopausal women with a femoral neck bone mineral density T score of -1.6 or lower during screening for the Fracture Intervention Trial. Logistic regression was used to identify risk factors for extent vertebral fractures and to derive a final multivariable model.

RESULTS: Almost two thirds of 25,816 women 55 years and older met the bone density criterion, and 21 percent of those had an extent vertebral fracture. The final model consisted of five self-reported items: history of vertebral fracture, history of nonvertebral fracture, age, height loss, and diagnosis of osteoporosis. These were combined to yield a Prevalent Vertebral Fracture Index (PVFI). The prevalence of women with vertebral fracture varied from 3.8 percent to 62.3 percent over the range PVFI of zero to greater than five. Among the 13,051 women screened with spinal radiographs, a PVFI of four or greater identified 65.5 percent of women with vertebral fractures (sensitivity), with a specificity of 68.6 percent. Excluding 881 women who reported prior vertebral fractures reduced the sensitivity to 53.6 percent and increased the specificity to 70.7 percent but did not alter the fracture prevalence at PVFI values less than six.

CONCLUSION: In this population, five simple questions identified women who were likely to have undiagnosed vertebral fractures. Further research is needed to determine the validity of this index in other populations, including women without low bone mineral density.

Achieving Further Glycemic Control in Type 2 Diabetes Mellitus


OBJECTIVES: To identify patients with type 2 diabetes mellitus who were in poor glycemic control and therapeutic adjustments that might improve control.

DESIGN: Using electronic pharmacy data, we assigned subjects to one of four therapeutic categories. We then identified patients within each category who did not meet the recommended standard of glycemic control (glycosylated hemoglobin [Hb A1c] <0.08 [<=8.0%]) and studied their therapeutic regimens for possible improvements.

SUBJECTS: The subjects were 5061 members of a large group-model health maintenance organization who had type 2 diabetes and 12 months of 1997 health plan eligibility.

MAIN OUTCOME MEASURES: The dosage of antihyperglycemic agents (sulfonylureas, metformin, and insulin) in relation to glycemic control as measured by the Hb A1c.

RESULTS: A significant number (n = 1570 [31.0%]) of persons with type 2 diabetes might improve their glycemic control with simple adjustments to their pharmacologic therapy.

CONCLUSION: Busy clinicians with heavy workloads can improve their management of diabetes by identifying patients whose glycemic control could be improved through a change in medication or simple adjustment in dosage.

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Hospitalization for Suicide Attempt and Completed Suicide: Epidemiological Features in a Managed Care Population


BACKGROUND: Understanding factors that contribute to high suicide risk holds important implications for prevention. We aimed to examine the sociodemographic and medical predictors of attempted suicide (severe enough to require hospitalization) and of completed suicide in a large population-based sample from a health maintenance organization (HMO) in northern California, USA.

METHOD: We designed a cohort study, including 87,257 women and 70,570 men aged 15 through 89 years old at baseline (in 1977-1985) with follow-up for hospitalizations and mortality through the end of 1993.

RESULTS: After a median of ten years, 169 first hospitalizations for attempted suicide (111 among women, 58 among men) and 319 completed suicides (101 among women, 218 among men) were identified. There was a greater incidence of hospitalization for suicide attempt in men and, conversely, a greater incidence of completed suicide in men than in women. The predominant methods of attempted and completed suicides were ingestion of psychotropic agents and use of firearms, respectively. In gender-specific multivariate analysis of hospitalization for suicide attempt, statistically significant associations were seen for age 15-24 years (women), 65-89 years (men), white race (women), 12th grade or less education (both genders), technical/business school education (men), never being married (men), history of emotional problems (both genders), history of family problems (women), history of job problems (men), and presence of one or more comorbidities (men). The independent predictors of completed suicide were: age 15-24 years (both genders), Asian race (women), Caucasian race (both genders), never being married (both genders), being separated/divorced (women), prior inpatient hospitalization for suicide attempt (both genders) and history of emotional problems (both genders).

CONCLUSION: These findings could help health professionals be more effective in the prevention of suicide morbidity and mortality. ♦
Johann Gregor Mendel in the 21st Century: Genetic Science Fiction is Alive Today

In the Winter 1998 issue of The Permanente Journal, we reviewed the present role of Kaiser Permanente in clinical genetic care. We now attempt to bring the recent spectacular advances in genetics into practical focus, and to offer a glimpse of the future.

Our purpose is not to present an academic analysis with an extensive bibliography but rather to update the clinician on aspects of recent genetic breakthroughs that will interface with daily clinical practice. A brief reading list is appended. We would like all of you to be at least one step ahead of your patients, who often obtain medical information from the news media and from the Internet.

Mapping the Human Genome

By the year 2003, researchers expect, 99.9 percent of the nucleotide sequences—containing 3.1 billion base pairs per nucleotide—will have been identified.

With the mapping of the human genome, part of an effort which is currently incomplete, the practice of medicine will change forever. This mapping of the human genome is just “the end of the beginning;” full annotation of the human genome will probably require at least several decades. Given that genes and their interaction with the environment play a role in all diseases, physical disorders will be defined not on the basis of signs and symptoms but on underlying genetic variations, which interact with the environment and lead to disease. Diagnosis will be made before symptoms occur, and this advance timing will allow preventive measures to be taken. Treatment will be based on each person’s individual genetic makeup, thus maximizing therapeutic effect while minimizing untoward reactions.

Gene Chips

The basis for these medical miracles will be a “gene chip,” which will determine 5000 to 10,000 genes or DNA variations per person. A second gene chip will then guide the physician to a precise diagnosis and person-specific treatment. These high-tech weapons might seem to lead to a perfect health care system, but they are two-edged swords: New problems will arise concerning ethics, invasion of privacy, discrimination in employment and insurability, high costs, and the prospect of eugenics (in a medical context, the practice of “weeding out” the weakest, most disease-prone persons from a population).

Diagnosis and Prevention

This era of genetic research will introduce us to new forms of preventive health, diagnosis, and intervention as well as an entirely new medical approach and vocabulary. We must become familiar with techniques such as pharmacogenomics, cloning, gene and stem cell therapy, preimplantation diagnosis and treatment, and prevention of birth defects. Some of these activities are already in use and deserve illustration here.

Medical researchers have been using information from the federally sponsored Human Genome Project to help diagnose about 1000 rare syndromes (eg, Prader Willi, myotonic dystrophy, Friedreich’s ataxia) and are beginning to apply this new knowledge to more common disorders, such as breast cancer, ovarian cancer, and colon cancer. This technology can be used for current diagnosis and to help predict disorders that may manifest later (eg, presymptomatic diagnosis of both Huntington’s disease and predisposition to breast cancer). Insufficient space exists here to address the issues of stigmatization or genetic discrimination, although these are genuine concerns.

Pharmacogenomics

Every medication we take is metabolized according to our individual enzyme systems, which in turn are related to our genes and DNA. Ideally, choice of medicine and dosage should be based on each person’s genetic profile. Reactions to medication may be predicted according to analysis of single nucleotide polymorphism (SNP)—“snippets” of DNA that vary among individuals. In each of us, these SNPs occur once in about every 1000 nucleotides or base pairs. Using these new techniques in gene analysis will allow us to predict toxicity of powerful medications, such as those used in chemotherapy and psychiatric disorders. For example, certain psychotherapeutic medications, although extremely useful for schizophrenia, are toxic in certain individuals.

Some reactions to medications can currently be predicted genetically. For example, researchers have shown that 10 percent of people have a mutation in the gene that codes for the enzyme thiopurine methyltransferase and that this mutation prevents inactivation of azathioprine; the mutation thus can lead to severe side...
effects and even death. Molecular testing for this mutation can thus predict whether a person can or cannot take azathioprine safely. Of course, the genetic predisposition of certain individuals to have severe toxic reactions to specific substances is not news. From empirical evidence, clinicians have known for many years that red blood cells in certain persons and ethnic groups are deficient in the enzyme glucose-6-phosphate dehydrogenase (G6PD). This genetic defect causes severe hemolysis to develop after affected persons ingest fava beans, aspirin, sulfonamides, and other substances. New genetic techniques will allow identification of many other genetic defects before their corresponding idiosyncratic reactions occur.

Because pharmacogenetics has potential for efficacy in management of common chronic disorders, such as diabetes, hypertension, and asthma, this field will have a large clinical impact on future medical practice. Two patients with hypertension might each receive different therapeutic agents on the basis of their genetic profile.

To take advantage of these technical advances therapeutically and commercially, 14 major pharmaceutical companies, five academic centers, and the Wellcome Trust (in Great Britain) have formed a consortium. The purpose of the consortium is to create a giant map of genetic landmarks, which can become a potent tool for predicting certain diseases and drug reactions. An SNP map encompassing at least 300,000 markers will be developed for linkage studies. This map will permit personalized pharmacotherapy based on genetic makeup. Predisposition to major chronic disease (eg, diabetes, coronary disease, neurogenetic disorders) will be identifiable on the basis of “gene array” and variation in SNP patterns. To prevent commercial chaos, the pharmaceutical companies have agreed to keep all information in the public domain and nonpatented.

**Cloning**

The prospect of making exact copies of ourselves has exciting as well as frightening implications and allows for a free range of fantasies appropriate for science fiction, horror movies, or both. For now, we are still impressed by Dolly the Sheep and her bovine counterparts. But take heed: today the sheep, tomorrow the shepherd. The current situation may be an improvement on the Austrian-housepainter-turned-German-dictator, but the specter of eugenics rears its ugly head even though most of us doubt the likelihood of “designer babies.” The genetics of behavioral traits (eg, intelligence) is probably too complex, and cloning will therefore probably be used for more practical problems.

Until recently, scientific dogma held that cloning requires use of early pluripotential embryonic cells (perhaps before two weeks of fetal life). Dolly changed all that with a new technique that used mammary skin cells. This new cloning methodology involved four steps:

1. A donor nucleus is extracted from adult somatic or fetal cells.
2. The donor nucleus containing the genes is made dormant.
3. The inactivated donor cell nucleus is placed in a recipient cell (the “cell shell”), the nucleus from which has been removed.
4. The donor nucleus containing the genome is then activated by electrofusion, which synchronizes the growth cycle of the donor and recipient cells. When the genes have been “turned on,” the dividing cells are placed into a surrogate mother and voilà—Dolly, Molly, and Polly.

Cloning technology is already being used for medical purposes and for commercial advantage. Using this technology in combination with gene therapy has provided us a new avenue of therapy. The human gene for antihemophilic factor (factor IX) has already been introduced into the milk protein gene of fetal sheep. Similarly, in the case of George and Charlie—the bovine equivalents of Dolly the Sheep—the human gene for albumin has been placed into the milk protein gene of the cow. The future holds even greater potential: production of pluripotential stem cells (which could form the basis of a “body repair kit”) and treatment of infertility through DNA cloning of only one parent. Cloning technology could also allow use of animal organs for human tissue transplantation: Human genes will be introduced into cloned animals so that their organs can be used, without rejection, in human transplantation (xenotransplantation). How about calves being the donors for human liver transplantation, instead of just forming the basis for liver and onions?

**Ethical Concerns**

But the concerns about cloning present a formidable counterbalance. Here the specter of eugenics arises again, as do ethical issues about the sanctity of life. Use of human embryos for “tissue farming” is certain to engender strong opposition. As for the problem of safety, will we see an increase in congenital anomalies or cancer?
Cloning techniques, though impressive, are imperfect. Dolly was the only success in an experiment involving 277 donor nucleus and recipient cells. We could see loss of genetic variation and restriction of the human gene pool. Although cloning would select for traits that have been successful in the past, would these traits adapt to an unpredictable future? Will we be setting ourselves up for the equivalent of a measles virus, which caused only limited disease in European immigrants but wiped out large populations of Native Americans and Pacific Islanders?

Although we are proceeding at full speed with cloning research in humans and animals, real and potential dangers exist for which we must be prepared.

**Stem Cell Therapy**

Use of pluripotential stem cells to create any type of body cell—or even, theoretically, a whole person—is one of the most controversial aspects of the new genetics. The degree of concern is such that federal funds cannot currently be used in stem cell research. This situation could soon change, however. The National Institutes of Health has recently developed a draft proposal to relax prohibition of federal funding for stem cell research. A jointly sponsored bill is currently pending before Congress.

Stem cells can be created in a number of ways. One technology involves removing a nucleus (usually from an early fetal cell) transferring the nucleus to an egg cell, and inducing the new cell to divide. The dividing cell is then converted to a "primordial" (or "pluripotent") cell by addition of a gene to produce telomerase, an enzyme that continues the process of cell division indefinitely. This primordial cell is “instructed” to become the type of tissue needed by the patient and is then transplanted into the diseased tissue to reproduce and replace the abnormal cells.

**Utility of Stem Cell Technology**

The following is a partial list of possible uses of these "body repair kits":

1. Replacement of damaged brain cells in Alzheimer’s, Parkinson’s, and Huntington’s diseases.
2. Introduction of nerve cells to repair spinal cord injuries.
3. Production of bone marrow transplant cells for cancer and gene therapy.
4. Repair of myocardial damage by production of new, healthy heart cells.

Considering the magnitude of these therapeutic possibilities, stem cell research is bound to continue despite current limitations and concerns.

**Vitamins and Birth Defects**

Of more immediate practical interest than cloning is the possibility of using vitamin therapy to avoid birth defects. Demographic and clinical evidence show that neural tube defects are related to folic acid deficiency early in pregnancy; and the US Centers for Disease Control and Prevention (CDC) has recommended that women should take at least 0.4 mg folic acid daily before and during pregnancy. To help ensure adequate folic acid intake among prenatal women whose diet is inadequate in folic acid, this vitamin has been added to wheat flour and to other food substances. Recent advances have clarified the mechanism by which folic acid prevents neural tube defects, and this mechanism might play a role in preventing other birth defects (eg, cleft lip and palate, congenital heart disease, and Down syndrome). Researchers have recently clarified the molecular basis by which abnormalities in folic acid metabolism can lead to the birth defects mentioned above. The culprit in this scenario appears to be reduced levels of methylenetetrahydrofolate reductase (MTHFR), a key enzyme of folic acid metabolism. Although the mechanisms appear to be somewhat different, some evidence suggests that abnormalities of folate metabolism due to MTHFR deficiency play a role in development of neural tube defects, cleft lip and palate, congenital heart disease, and possibly nondisjunction (the basis of trisomy 21, commonly known as Down syndrome). The mechanism which causes trisomy 21 seems to be DNA hypomethylation and abnormal chromosomal segregation caused by defective folate metabolism. Conotruncal heart defects have been reduced 40 percent through use of periconceptual multivitamins, including folic acid. The defect in the MTHFR enzyme gene is in the C-to-T substitution at nucleotide G77 (G77C→T).

**Preimplantation Diagnosis and Treatment**

Preimplantation diagnosis for couples known to be at risk for genetic disease has been available for decades, but preimplantation treatment is still in the experimental stage. Preimplantation diagnosis is currently available for four types of “at-risk” couples:
1. Both parents are carriers of a similar autosomal recessive gene (eg, Tay-Sachs disease, cystic fibrosis, sickle cell disease, and thalassemia).
2. One parent carries an autosomal dominant disorder (eg, Marfan syndrome, myotonic dystrophy, and Huntington’s disease).
3. X-linked disorders (eg, Duchenne-Aran muscular dystrophy, hemophilia).
4. One parent carries a balanced translocation (eg, the 14/21 balanced translocation that causes a form of Down syndrome).

Transgenic Gene Therapy

To respond to preimplantation diagnosis, new technology, still imperfect, raises the possibility of transgenic gene therapy. This therapy involves in vitro fertilization using eggs and sperm, followed by removal of the blastomere in the morula stage (two-three days after conception). Polymerase chain reaction (PCR) then amplifies the DNA from each blastomere. Molecular study of the DNA raises the possibility of correcting the genetic defect.

This technology creates a number of risks, including the risk of embryo damage or death and risk of contaminating the DNA. Another potential problem is allele dropout (ADO), a situation in which PCR amplifies only one of two alleles and thus causes misdiagnosis of a gene mutation. As technology advances, however, imperfections in technique are likely to be resolved, thus opening up the likelihood of effective transgenic therapy.

No End in Sight

As we enter the 21st century, we stand on the shoulders of giants: We are beneficiaries of the 20th century explosion of genetic knowledge, an explosion which began with the discovery of the DNA double helix and which will end who-knows-where.

Representative Reading List

Possibility

“They don’t see the same world that the rest of us see. They see possibility.”

Malcolm Gladwell, “The Tipping Point,” Little, Brown, and Company
Our Toddler

One razor blade away from disaster, tripping with tip toes on edges of fatal chairs.

Blackberry stained fingers, apraised, imploring rescue and a simian embrace.

Wielding a toy like a club with bizarre calypso rhythm, in unrestrained joy.

On a rampage, you thrive on warm milk and soil, running naked, a savage in mockery of society.

Pilfering drawers with klepto cleverness, searching secret cupboards, upending laws.

Screaming like a dog raging blindly at a blood lit moon just for fun.

Astonished at what I have become: a straight man to your vaudeville con.

And mother weeps gently when, in night terror, you cry out, “Hommy!”

Whether filthy and tattered, or scrubbed clean, or wild, does not matter.

We need you now, more than water, fiercely adored, precious life, blessed child.

By Robert Hippen, MD
Clinical Management for Survivors of Sudden Cardiac Death

Sudden cardiac death is believed to affect as many as 400,000 people each year in the United States and is therefore an important public health problem. A common cause of sudden cardiac death is ventricular fibrillation. This article reviews the clinical and electrophysiologic aspects of sudden arrhythmic death and discusses current clinical management for survivors of sudden death. Particular emphasis is placed on the implantable cardioverter-defibrillator (ICD).

Introduction

Of the many possible cardiovascular causes of sudden death—arrhythmia, trauma, intracranial vascular catastrophes, and acute thrombosis or embolism affecting the heart or lungs—the present discussion is restricted to the arrhythmic causes and primarily to ventricular fibrillation. Not all episodes of ventricular fibrillation lead to death. As with atrial fibrillation, ventricular fibrillation may be both nonsustained and self-terminating or the patient may be rescued by bystanders or medical personnel who deliver a direct-current countershock to the patient's heart before irreversible cellular or organ damage intervenes. Nonetheless, sustained ventricular fibrillation inevitably leads to death within minutes unless the fibrillation is terminated. In contrast, monomorphic ventricular tachycardia may continue for many minutes, hours, or even days—depending on the rate of tachycardia—without development of clinically significant hemodynamic compromise. Although some cases of sudden arrhythmic death have been attributed to asystole or electromechanical dissociation, in general, these findings represent the natural evolution of untreated ventricular fibrillation and are not primary causes of sudden death.

Definition and Epidemiology

Many investigators have grappled with defining sudden death. Torp-Pedersen, et al, suggest: “Since all death is (eventually) sudden and associated with cardiac arrhythmias, the concept of sudden death is only meaningful if it is unexpected, while arrhythmic death is only meaningful if life could have continued had the arrhythmia been prevented or terminated.” The authors further state: “Any practical classification of death being sudden or arrhythmic is highly dependent on the quality of available data to ensure that the suddenness was unexpected and that life could have continued if the arrhythmia had been prevented or treated.”

Roberts has defined sudden death as “death which is nonviolent or nontraumatic, which is unexpected, which is witnessed, and which is instantaneous or occurs within a few minutes of an abrupt change in previous clinical state.” For current purposes, sudden cardiac death shall be defined as death occurring within minutes from unexpected ventricular fibrillation or as ventricular tachycardia that rapidly (within seconds) accelerates to ventricular fibrillation and that if prevented or immediately terminated, would allow the patient to return to their previous level of functioning for an indefinite period. Given this definition of sudden cardiac death, the task of declaring an unwitnessed death as sudden or nonsudden remains difficult; in many cases, the “suddenness”—as well as the actual mode of death—may well remain a mystery.

Because of these uncertainties, accurately establishing the scope of the problem of sudden cardiac death also remains difficult. Sudden cardiac death is believed to affect as many as 400,000 people each year in the United States and therefore is an important public health problem. The survival rate for out-of-hospital cardiac arrest is low: estimates range from 2% to 25% in the United States.

In addition, before the implantable cardioverter-defibrillator (ICD) or amiodarone became available, survivors of sudden cardiac death had a high rate of mortality after hospital discharge (24% mortality rate at one year; 34% at two years; 51% at four years) compared with an age-adjusted and gender-adjusted control group (20% mortality rate at four years) or for a similar control group discharged from the hospital after having acute myocardial infarction (34% mortality rate at four years).

Over the years, therefore, clinicians have been confronted by two issues: 1) how best to protect survivors of sudden cardiac death (ie, secondary prevention) and 2) how to identify on an a priori basis persons who have never had cardiac arrest but who are at highest risk for sudden cardiac death (ie, primary prevention).

Types of Arrhythmia Associated with Sudden Cardiac Death

For patients who have had an out-of-hospital cardiac arrest, the initial rhythm documented by para-
common in survivors of sudden cardiac death.11 Second, monomorphic ventricular tachycardia is detected in only 16 (1.2%) of 1287 patients who had both cardiac arrest and treatment using an automatic external defibrillator within two-three minutes thereafter. Third, among patients who had cardiac arrest while enrolled in a supervised cardiac rehabilitation program and who were resuscitated within 30 seconds, the initial arrhythmia documented was ventricular fibrillation in 92% of cases and was monomorphic ventricular tachycardia in only 8% of patients.12 Fourth, most reports suggesting that monomorphic ventricular tachycardia precedes ventricular fibrillation in patients with cardiac arrest are based on Holter monitor tracings. This population is subject to statistical bias inasmuch as the patients were undergoing monitoring because of known, recurrent (usually ventricular) tachyarrhythmia (a condition atypical of patients who have cardiac arrest). For many patients, inspection of these Holter monitor tracings shows that instead of classic monomorphic ventricular tachycardia, the onset of tachyarrhythmia is actually ventricular flutter, polymorphic ventricular tachycardia, or frank ventricular fibrillation.13-16 Further, because usually only one (or, at most, two) ECG leads are recorded for these patients, establishing monomorphic arrhythmia—even in the initial beats—is difficult. Even if the first few beats are known to be monomorphic, nearly all the Holter monitor tracings show rapid evolution to polymorphic arrhythmia or frank ventricular fibrillation. Evidence from the electrophysiology laboratory also supports the conclusion that monomorphic ventricular tachycardia is uncommon in these patients as a presenting arrhythmia.17

The Seattle investigators17 found that in only 27% of patients who survived cardiac arrest, monomorphic ventricular tachycardia was induced during electrophysiologic testing. Patients with coronary artery disease who survived an out-of-hospital cardiac arrest also have a distinctly different clinical profile than do patients with a history of coronary artery disease and recurrent monomorphic ventricular tachycardia. Patients who survived sudden cardiac death have a lower incidence of remote myocardial infarction and left ventricular aneurysm and a higher ejection fraction than patients who have monomorphic ventricular tachycardia.18

When seen at long-term follow-up, survivors of cardiac arrest who have implanted third-generation ICDs (which can store intracardiac electrograms) rarely have nonsustained or sustained monomorphic ventricular tachycardia.19 In addition, patients with a history of recurrent monomorphic ventricular tachycardia only rarely present with ventricular fibrillation when seen at long-term follow-up.19,20,21

Taken together, these data strongly suggest that relatively few patients who suffer a cardiac arrest do so as a result of monomorphic ventricular tachycardia. Further, the finding of asystole or electromechanical dissociation in such patients usually indicates that a long time has passed since initiation of tachyarrhythmia and initial electrocardiographic documentation of the arrhythmia; stated differently, prolonged untreated ventricular fibrillation leads to cardiac quiescence. Patients who have cardiac arrest almost certainly present with ventricular fibrillation or a brief run (<15-20 seconds) of monomorphic ventricular flutter (ventricular rate >250 beats/minute) or polymor-

### Table 1. Sudden cardiac death: causes and associated conditions

- Acute myocardial infarction
- Atherosclerotic coronary artery disease
- Coronary artery spasm
- Idiopathic dilated cardiomyopathy
- Hypertrophic cardiomyopathy
- Left ventricular hypertrophy
- Arrhythmogenic right ventricular dysplasia
- Congenital heart disease and coronary artery anomalies
- Valvular heart disease (primarily aortic stenosis)
- Congenital and acquired long QT syndromes (torsade de points)
- Antiarrhythmic drugs
- Severe electrolyte abnormalities
- Recreational drug use (eg, cocaine, methamphetamine)
- Infiltrative disorders (sarcoidosis, amyloidosis, hemochromatosis, myocarditis, cardiac tumors)
- Wolff-Parkinson-White syndrome
- Brugada syndrome
- Complete atrioventricular block
- Acute myocardial rupture/cardiac tamponade
- Massive pulmonary embolism
- Idiopathic ventricular fibrillation
- Massive pulmonary embolism
- Idiopathic ventricular fibrillation

Contrary to common belief, ventricular fibrillation is not commonly precipitated by monomorphic ventricular tachycardia. First, a history of sustained monomorphic ventricular tachycardia is extremely uncommon in survivors of sudden
Coronary artery disease is the most common clinical condition associated with cardiac arrest.

Patients with acute myocardial infarction who received β-adrenergic blockade during and after the acute phase of the infarct also had fewer episodes of early and intermediate-term ventricular fibrillation.

Clinical Profile: Survivors of Sudden Cardiac Death

Occurring at a rate of 64% to 90%, coronary artery disease is the most common clinical condition associated with cardiac arrest. In the experience of the Seattle investigators, the typical survivor of sudden cardiac death is a 60- to 70-year-old man with coronary artery disease (78% of cases) and a remote history of myocardial infarction (45% of cases). Other clinical conditions have also been associated with sudden cardiac death (Table 1).

Role of Autonomic Nervous System in Sudden Cardiac Death

Enhanced sympathetic tone or increased sensitivity to sympathetic input—possibly with reduced modulating parasympathetic influence—may have a role in sudden cardiac death. Clinical studies have shown that administration of β-adrenergic blocking agents soon after myocardial infarction results in reduced rates of sudden cardiac death, mortality, and recurrent infarction (Figure 1). Patients with acute myocardial infarction who received β-adrenergic blockade during and after the acute phase of the infarct also had fewer episodes of early and intermediate-term ventricular fibrillation. The role of the autonomic nervous system in triggering ventricular fibrillation in high-risk patients remains an intense area of ongoing research.

Risk Stratification and Predictors of Sudden Arrhythmic Death

Risk factors for sudden cardiac death include:

- Left ventricular dysfunction, in which those patients having the poorest left ventricular ejection fraction have the worst prognosis;
- Inducibility of monomorphic ventricular tachycardia by programmed electrical stimulation, especially in patients with reduced left ventricular ejection fraction;
- Ventricular ectopy, including single ventricular premature depolarizations (>10 ventricular premature depolarizations/hour) and asymptomatic nonsustained ventricular tachycardia, in the presence of left ventricular dysfunction;
- Presence of late potentials on signal-averaged electrocardiogram;
- Reduced variability of heart rate;
- Abnormal baroreceptor sensitivity.

Severity of left ventricular dysfunction is the strongest predictor of total (sudden and nonsudden) cardiac mortality. According to investigators for the Multicenter Investigation of the Limitation of Infarct Size (MILLIS) study, left ventricular ejection fraction <40% is a sensitive and specific predictor of sudden cardiac death. Left ventricular ejection fraction <30% is associated with a 3.5-fold increased chance of dying. Inducibility of monomorphic ventricular tachycardia by programmed electrical stimulation in the presence of reduced left ventricular function is well established as a powerful predictor for recurrence of sudden cardiac death. For example, survivors of sudden cardiac death who had ejection fraction >30% and in whom monomorphic ventricular tachycardia could not be induced at electrophysiologic study had a 2% risk of recurrence of sudden death or ICD shocks (used as a nonfatal equivalent of sudden death) at one year and had an 11% risk of recurrence at two years, whereas the risk of recurrent sudden cardiac death or ICD shock was 23% at one year.
and 35% at two years in survivors of sudden cardiac death who had ejection fraction <30%.17

Nonsustained ventricular tachycardia or frequent ventricular premature depolarizations in combination with reduced left ventricular ejection fraction (ie, ejection fraction <40%) identifies patients who are at high risk for sudden cardiac death.34,35

However, despite this finding, investigators in the Cardiac Arrhythmia Suppression Trial (CAST and CAST-II)36-40 found that suppression of ventricular ectopy with potent sodium ion channel blocking agents not only failed to reduce mortality but instead increased mortality rates in the population studied, possibly as a result of an ischemia-related proarrhythmic mechanism.41

Other predictors of sudden cardiac death include abnormal variability in heart rate,42-44 abnormal baroreceptor sensitivity,45-46 and abnormal signal-averaged electrocardiogram results.47,48 However, the lack of high predictive accuracy of these tests (even when they are used in combination) renders them unsuitable for use as a guide to identify patients who should receive aggressive, expensive preventive therapy (with an ICD, for example).

**Evaluation of Patients Who Survive Cardiac Arrest**

The main issue to be addressed regarding survival of sudden cardiac death is whether the patient has secondary ventricular fibrillation (ie, the cardiac arrest has a reliably identifiable cause) or primary ventricular fibrillation (ie, the cardiac arrest has no specifically identifiable precipitant). In the rare instance when a reliably identifiable cause can be established, elimination of that inciting influence may be all that is necessary to treat the patient and prevent further cardiac arrest episodes. For example, an episode of torsade de pointes leading to ventricular fibrillation may be clearly related to acute QT prolongation secondary to administration of quinidine or procainamide for treatment of atrial fibrillation. In such a case, especially if the patient has normal left ventricular function, the only required treatment would probably be discontinuation of the drug.

The most common identifiable cause of ventricular fibrillation is acute myocardial ischemia with infarction. For patients who experience cardiac arrest in the presence of new transmural myocardial infarction, the annual risk of having a subsequent cardiac arrest is low (<2%).22 Therefore, these patients usually require no specific treatment for arrhythmia; instead, further diagnostic evaluation and treatment should be directed at the underlying coronary artery disease.

A cardiac arrest caused by myocardial ischemia resulting from fixed coronary artery disease or coronary artery spasm is most reliably diagnosed in patients who have a history of either angina or documented ST change (elevation or depression). All patients who have ventricular fibrillation should receive coronary arteriography and left ventricular angiography to detect presence of coronary artery disease (or coronary anomalies) and to assess left ventricular function. If the patient has coronary artery disease, the clinician should consider using a functional test (eg, exercise-thallium study or stress echocardiography test) to establish whether the coronary artery disease is physiologically significant. The finding of high-grade, physiologically significant proximal coronary artery disease involving at least one major vessel (especially in the presence of normal left ventricular function) strongly suggests that the cardiac arrest resulted from ischemia and that treatment should therefore be directed solely at revascularization without treating the arrhythmia directly.

Other identifiable reversible causes of ventricular fibrillation are rare but include recreational drug use, severe electrolyte or acid-base disturbance (manifesting as hypokalemia with serum potassium ion level ≤3.0 mEq/L, especially in the presence of toxic or near-toxic levels of digoxin) or proarrhythmia resulting from use of antiarrhythmic drugs (Table 1). In general, however, cardiac arrest should be attributed to these factors only if myocardial ischemia and infarction are absent and ventricular function is entirely normal. Even focal or mild left ventricular abnormalities may cause cardiac arrest, therefore, use of an ICD to treat primary arrhythmia may be necessary in these patients, even though some secondary factors may have contributed to the cardiac arrest. Excluding long-QT syndromes (congenital or acquired) and the Brugada syndrome from the differential diagnosis is also important. Patients who survive an episode of torsade de pointes caused by congenital or acquired long-QT syndrome may require substantially different treatment than do patients with an old myocardial infarct scar. This treatment may range from simply withdrawing use of an offending pharmaceutical agent to implantation of an ICD.

Other diagnostic studies that are often useful in particular instances include standard transthoracic or transesophageal echocardiography, especially as used to assess valvar heart disease or to evaluate patients for presence of right ventricular dysplasia. However, definitive diagnosis in patients with suspected right ventricular dysplasia may require magnetic resonance imaging, right ventricular angiography, or endomyocardial biopsy. Diagnosis of infiltrative disorders (eg, sarcoidosis, amyloidosis, hemochromatosis, or myocarditis) usually requires right ventricular endomyocardial biopsy.

If this assessment of reversible or otherwise treatable causes fails to identify any such factors, the arrhythmic substrate should next be evaluated, usually by an electrophysiologic study. Noninvasive testing (eg, outpatient ambulatory electrocardiographic monitoring, signal-averaged electrocardiography, T-wave alternans, or assessment of variability in heart rate) are of little or no value in evaluating patients whose risk of sudden cardiac death has already been established by actual cardiac arrest. Nonetheless, an electrophysiologic study is often (if not always) done in these patients, even though it may have limited usefulness. The purpose of electrophysiologic study is not to prove that ventricular fibrillation is inducible; inducibility of ventricular fibrillation by pro-
Electrophysiologic study often can indicate whether the cardiac arrest may have a treatable precipitating arrhythmic cause.

Patients in whom cardiac arrest is clearly caused by ischemia or infarct may require only a revascularization procedure.

Use of antiarrhythmic drugs as sole treatment for ventricular tachyarrhythmia has become increasingly unpopular.

Programmed electrical stimulation is a nonspecific finding regardless of left ventricular function. Instead, the goal of an electrophysiologic study is to evaluate the arrhythmic substrate and to determine how this assessment may impact therapy (even though the patient is likely to receive an ICD). For example, electrophysiologic study often can indicate whether the cardiac arrest may have a treatable precipitating arrhythmic cause (e.g., bundle branch reentrant ventricular tachycardia or, especially in young people, Wolff-Parkinson-White syndrome). In these cases, catheter ablation therapy may be the primary (and possibly the only) treatment required. In addition, an electrophysiologic study can establish whether monomorphic ventricular tachycardia can be induced and whether overtdrive ventricular pacing can terminate it. These findings are useful when deciding whether to program the ICD to deliver antitachycardia pacing therapy for clinical monomorphic ventricular tachycardia. The finding of easily inducible monomorphic ventricular tachycardia may also indicate that the patient requires adjuvant antiarrhythmic drug therapy to avoid delivery of frequent ICD therapy. An electrophysiologic study requires minimal time and cost and is generally done immediately before implantation of the ICD without removing the patient from the procedure table in the electrophysiology laboratory. Consequently, electrophysiologic testing does not prolong the patient’s hospital stay.

Before ICD systems were developed and became widespread, the best available treatment for survivors of sudden arrhythmic death was revascularization (if indicated) and treatment with antiarrhythmic drugs. Upon development, validation, and standardization of programmed electrical stimulation as a reliable and reproducible means to induce monomorphic ventricular tachycardia in patients having the requisite substrate, this technique had become widely used to evaluate and guide the administration of antiarrhythmic drugs in these patients. Patients who had inducible ventricular tachycardia that was suppressed by antiarrhythmic drugs had improved survival compared with patients who had inducible ventricular tachycardia that was not suppressed by drugs. In patients who have experienced cardiac arrest, problems prevent this technique from being widely used today, especially given the success of the ICD in rescuing patients from sudden arrhythmic death. These problems include the relatively low inducibility of the clinical ventricular arrhythmia; lack of reliability, reproducibility, and significance of any induced arrhythmia; and questionable value and reliability of antiarrhythmic drug suppression in this high-risk patient population. In a patient who has suffered cardiac arrest, the clinical significance of inducing monomorphic ventricular tachycardia is unclear at best and possibly totally irrelevant, especially since monomorphic ventricular tachycardia appears only rarely to trigger cardiac arrest.

Treating Survivors of Sudden Arrhythmic Death: Secondary Prevention

Consensus has formed around several treatment principles applicable for certain broad groups of patients. However, in practice, clinicians should approach treatment of each patient individually and recognize that the standard of care can change over time.

Surgical Revascularization

As mentioned above, patients in whom cardiac arrest is clearly caused by ischemia or infarct may require only a revascularization procedure (e.g., coronary artery bypass, angioplasty, coronary stenting) as treatment—particularly if the patient’s collapse occurred during exercise, was preceded by angina, and is found associated with physiologically significant high-grade proximal coronary artery disease with normal ventricular function. Patients with this clinical profile have done well when treated with coronary revascularization and β-adrenergic blockers. Even if the cardiac arrest did not occur during exercise and left ventricular function is not absolutely normal, coronary revascularization therapy alone does appear to provide clinically significant protection to survivors of cardiac arrest: Survival rate for surgically treated patients is 92% at one-year follow-up and 82% at five-year follow-up, whereas patients treated with medical therapy have a survival rate of 80% at one year and 51% at five years.

Antiarrhythmic Drug Therapy

Ever since publication of the results of the Cardiac Arrhythmia Suppression Trial (CAST), use of antiarrhythmic drugs as sole treatment for ventricular tachyarrhythmia has become increasingly unpopular. However, the CAST³⁸ and CAST-II⁴⁰ were not designed to address the use of these agents for treating survivors of sudden cardiac death. Rather, CAST and CAST-II were designed to assess the effect of antiarrhythmic agents administered randomly without
electrophysiologic guidance) on survival rates in patients believed to be at high risk for sudden cardiac death because of their previous myocardial infarction and baseline ventricular ectopy. However, prospective and retrospective studies\(^5^4\)-\(^5^7\) have supported the conclusion that empirical use of class IA, IB, and IC antiarrhythmic drugs does not protect against sudden cardiac death. In fact, in patients who have ventricular tachyarrhythmias, these agents may increase mortality rates by a variety of mechanisms, including negative inotropic, increasing incidence of ventricular fibrillation during ischemia, proarrhythmia, or decreased variability in heart rate.\(^5^4\)-\(^5^7\) Meta-analysis suggests that \(\beta\)-adrenergic blockers and amiodarone are the only drugs that reduce mortality rates in patients who have had myocardial infarction (Figure 2).\(^5^8\) Taken together, these data argue strongly against routine empirical use of “conventional” (class I) antiarrhythmic drugs for primary prevention of cardiac arrest in patients who are at high risk for sudden cardiac death and against use of these agents for electrophysiologically guided suppression of inducible ventricular tachyarrhythmia in patients who have had (or who are at high risk for) ventricular arrhythmia or sudden arrhythmic death.

Two class III antiarrhythmic agents—amiodarone and sotalol—provide the greatest hope for achieving safe, effective primary and secondary prevention of cardiac arrest. In survivors of out-of-hospital cardiac arrest, total cardiac mortality and sudden cardiac death are reduced more effectively by amiodarone than by \(\beta\)-adrenergic blocking agents or Holter-guided or electrophysiologically guided antiarrhythmic drug therapy that uses conventional (ie, class I) antiarrhythmic drugs (Figure 3).\(^5^9\)-\(^6^1\) Unfortunately, in patients receiving amiodarone therapy, rates of recurrent sudden cardiac death (assessed by documented ventricular fibrillation or syncope with ICD shock) continue to range from 4.5% to 31% at two-year follow-up.\(^5^9\)-\(^6^4\) A class III drug with \(\beta\)-adrenergic blocking effects (d,l-sotalol) has gained some favor, especially after the ESVEM (Electrophysiologic Study Versus Electrocardiographic Monitoring) trial reported that d,l-sotalol reduced recurrence rates for arrhythmia and overall mortality clinically significantly more than conventional antiarrhythmic drugs.\(^6^5\),\(^6^6\) However, only about 20% of ESVEM patients were survivors of sudden cardiac death, and rates of arrhythmia recurrence with d,l-sotalol remained 21% at one-year follow-up and >40% at four-year follow-up.\(^6^5\),\(^6^6\) In addition, results of the recent SWORD (Survival With Oral d-Sotalol) Trial\(^6^7\),\(^6^8\) suggest that the survival benefit is likely to be conferred by the \(\beta\)-adrenergic blocking activity present in racemic sotalol. Among patients at high risk for sudden cardiac death, mortality rates are increased by d-sotalol, which lacks the \(\beta\)-adrenergic blocking effects of d,l-sotalol.\(^6^7\),\(^6^8\)

**Surgical Ablation of Ventricular Tachycardia**

Data from 483 patients who had map-directed surgery to eliminate ventricular tachycardia (including many patients who had concomitant coronary artery
Catheter Ablation

Patients with severe heart disease and inducible monomorphic ventricular tachycardia may not be adequately protected from sudden cardiac death by ablation of a single target form (or multiple target forms) of ventricular tachycardia, even though successful ablation may be possible 60% to 70% of the time. This finding is of concern particularly because only a minority of patients who have acutely successful ablation remain free of recurrent ventricular tachycardia. In addition, as mentioned earlier in this discussion, monomorphic ventricular tachycardia is rarely the provoking arrhythmia in victims of sudden cardiac death. Catheter ablation appears to have a role in treating survivors of sudden cardiac death only among patients with bundle branch reentrant ventricular tachycardia and among patients with right ventricular tachycardia resulting from right ventricular dysplasia. Even in these cases—and possibly on the basis of inducibility of other forms of ventricular tachycardia or severity of left ventricular dysfunction—the electrophysiologist must judge whether catheter ablation alone provides adequate protection for these patients; additional therapy with an ICD may be indicated.

Use of Implantable Cardioverter-Defibrillator

The basic ICD system (Table 2) consists of a pulse generator and a transvenous ventricular lead that incorporates sensing and pacing electrodes as well as high-energy defibrillation electrodes (Figure 4). The first ICDs (implanted in the early 1980s) weighed >290 g and had volume >160 cm³. Almost exclusively, those early devices required implantation in a subcutaneous or subrectus abdominal pocket. As with pacemakers, ICD size has decreased dramatically: Devices available today have volume <40 cm³. The small size of these devices allows routine implantation within a subcutaneous pocket in the pectoral region. The lead is inserted transvenously using the axillary, cephalic, or subclavian veins. Modern ICDs are extremely effective at terminating ventricular fibrillation within only a few seconds after onset (Figure 5). In addition to being smaller, ICD devices are incorporating an ever-
increasing array of features, including dual-chamber (atrial and ventricular) pacing; rate-responsive pacing; biventricular pacing for patients with clinically significant congestive heart failure and left bundle branch block; and even dual-chamber (atrial and ventricular) defibrillation capabilities for patients with atrial fibrillation and ventricular tachyarrhythmia. Most patients do not benefit from the increased capabilities of these devices, however, and the added cost of these systems should be considered when deciding on the best ICD for each patient.

Since the late 1980s, a number of studies75-82 have shown that ICDs are the most effective treatment for reducing rates of sudden cardiac death caused by ventricular fibrillation. In a series of 270 patients who received an ICD, the rate of surviving sudden cardiac death was 99% at one-year follow-up and 96% at five-year follow-up.75 The largest retrospective series of cardiac arrest survivors76 observed 331 patients who had received either electrophysiologically guided antiarrhythmic drug therapy or an ICD. This study showed that the total mortality rate was 29% in the 150 patients who received an ICD, whereas total mortality rate was 62% in the 181 patients who did not receive an ICD (Figure 6).76 The effect was most striking in patients with ejection fraction <40%. This study76 also showed that left ventricular function was more important in predicting long-term survival rates than was presence of an ICD, because patients with high left

diagram and table:

**Table 2. Basic functional components of implantable cardioverter-defibrillator systems**

<table>
<thead>
<tr>
<th>Component</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulse Generator</strong></td>
<td>• High-energy defibrillation</td>
</tr>
<tr>
<td></td>
<td>• Low-energy cardioversion</td>
</tr>
<tr>
<td></td>
<td>• Antitachycardia pacing</td>
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<tr>
<td></td>
<td>• Antibradycardia pacing</td>
</tr>
<tr>
<td></td>
<td>• Event recording and storage (e.g., tachycardia and bradyarrhythmia episodes, shocks/therapies, stored and real-time electrograms)</td>
</tr>
<tr>
<td><strong>Leads</strong></td>
<td>• Atrial sensing/pacing lead (dual-chamber system)</td>
</tr>
<tr>
<td></td>
<td>• Ventricular sensing/pacing/defibrillation lead (single- or dual-chamber system)</td>
</tr>
<tr>
<td><strong>External programming system</strong></td>
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ventricular ejection fraction (>40%) and no ICD device had better survival rates than did patients who received an ICD and had low left ventricular ejection fraction (<40%) (Figure 6).76

Although ICDs are clearly effective at reducing rates of sudden cardiac death resulting from ventricular fibrillation, a debate has evolved as to whether amiodarone is as effective as ICDs in reducing total mortality rates. Because almost all patients with ventricular tachyarrhythmia or a history of sudden arrhythmic death are elderly, have other chronic diseases, and have poor left ventricular function, these patients have a relatively high total (sudden, cardiac, and noncardiac) mortality rate. According to this argument, even if ICDs reduce the rate of sudden death, these patients nonetheless die from other diseases—or because of poor left ventricular function, these patients die an early cardiac death due to "pump failure." Are ICDs simply an expensive means to change the mode but not the rate of death in these patients? Unfortunately, until recently, the best study on this matter was a retrospective study in which patients receiving an ICD had better overall survival rates than did patients who received amiodarone therapy. The AVID (Antiarrhythmics Versus Implantable Defibrillators) trial is the first prospective study to address this question.84 The results of that multicenter study (which included survivors of cardiac arrest as well as patients who had a sustained or symptomatic episode of ventricular tachycardia) suggest that treatment with ICDs substantially reduces sudden and total mortality in these patients as compared with empirical amiodarone

Figure 6. Graph shows survival curves as a function of left ventricular ejection fraction in 331 patients (studied retrospectively) who had out-of-hospital cardiac arrest and were treated with an ICD. (Adapted and reproduced with the permission of the publisher and author from: Powell AC, Fuchs T, Finkelstein DM, et al. Influence of implantable cardioverter-fibrillators on the long-term prognosis of survivors of out-of-hospital cardiac arrest. Circulation 1993 Sep;88(3):1083-92, Figure 1.)76

Figure 7. Total mortality curve from the AVID (Antiarrhythmics Versus Implantable Defibrillators) trial, which was terminated prematurely when data indicated that improvement of total survival was clinically significant in patients who received an ICD when compared with those who received either amiodarone or electrophysiologically guided sotalol. AA = antiarrhythmic drug (amiodarone or sotalol) group. (Adapted and reproduced with the permission of the publisher and author from: A comparison of antiarrhythmic-drug therapy with implantable defibrillators in patients resuscitated from near-fatal ventricular arrhythmias. The Antiarrhythmic Versus Implantable Defibrillators (AVID) Investigators. N Engl J Med 1997 Nov 27;337(22):1576-83, Figure 1.)84
therapy or electrophysiologically guided treatment using racemic sotalol (Figure 7). From one perspective, implantation of ICDs is associated with a 39% decline in overall mortality rate at one-year follow-up as compared with amiodarone therapy; at two-year follow-up, mortality rate is 27%; at three-year follow-up, the rate is 31%. Viewed another way, however, patients who received an ICD had only 2.1 months longer mean survival than did patients who received amiodarone therapy. Although some patients clearly benefit greatly after receiving an ICD, other patients do not benefit at all compared with their counterparts who receive amiodarone therapy. The AVID trial was terminated prematurely after release of the follow-up data showing the statistically significant survival benefit of ICDs compared with amiodarone. The widespread, successful use of ICDs in survivors of cardiac arrest has largely provided secondary prevention for patients who do not have a treatable or reversible cause for that cardiac arrest. However, the tasks of reliably identifying patients at highest risk for a first episode of cardiac arrest and providing cost-effective primary prevention for these patients remains difficult. These tasks are further complicated by the difficulty of reaching consensus on the definition of “high risk.” “High risk” is a relative term; some clinicians may apply the term to any patient who has had an acute myocardial infarction or who has abnormal left ventricular function. Screening all such patients by using electrophysiologic testing or empirically treating them with ICDs will

**Primary Prevention of Sudden Cardiac Death**

The widespread, successful use of ICDs in survivors of cardiac arrest has largely provided secondary prevention for patients who do not have a treatable or reversible cause for that cardiac arrest. However, the tasks of reliably identifying patients at highest risk for a first episode of cardiac arrest and providing cost-effective primary prevention for these patients remains difficult. These tasks are further complicated by the difficulty of reaching consensus on the definition of “high risk.” “High risk” is a relative term; some clinicians may apply the term to any patient who has had an acute myocardial infarction or who has abnormal left ventricular function. Screening all such patients by using electrophysiologic testing or empirically treating them with ICDs will

**Adjunctive Therapy**

For decades, β-adrenergic blockers have been shown to reduce total mortality rates and sudden-death mortality rates after myocardial infarction. More recently, in patients with congestive heart failure, carvedilol has been shown to reduce risk of death from 7.8% (in untreated patients) to 3.2% (in treated patients). Although some debate remains, the consensus of most investigators is that angiotensin-converting enzyme (ACE) inhibitors effectively decrease total mortality rates by 18% to 27% in patients who have diminished left ventricular ejection fraction and heart failure.

**Figure 8. Graph shows survival curves for patients enrolled in MADIT (Multicenter Automatic Defibrillator Implantation Trial).** (Adapted and reproduced with the permission of the publishers and author from: Moss AJ, Hall WJ, Cannom DS, et al. Improved survival with an implanted defibrillator in patients with coronary disease at high risk for ventricular arrhythmia. Multicenter Automatic Defibrillator Implantation Trial Investigators. N Engl J Med 1996 Dec 26;335(26):1933-40, Figure 2.) [92]
have a substantial economic impact on even the wealthiest society, especially as its proportion of elderly members increases.

Notwithstanding the difficulty of defining “high risk” in this context, use of β-adrenergic blocking agents is universally considered an important aspect of preventive therapy in patients at high risk for cardiac arrest. Compelling data support the effectiveness of these agents in preventive therapy: Even part-time or occasional use of these agents is associated with a clinically significant reduction in total mortality in these patients. This effectiveness of β-adrenergic blockers strongly suggests that sympathetic tone (or balance of sympathetic and parasympathetic tone) may have a crucial role in precipitating sudden cardiac death.

A meta-analysis\(^9^1\) has shown the value of using electrophysiologic testing to identify patients at high risk for sudden arrhythmic death. Sustained ventricular tachycardia can be induced in 45% of patients with left ventricular dysfunction and nonsustained ventricular tachycardia.\(^9^1\) During a 20-month follow-up period, 18% of patients with induced tachycardia and 7% of patients without induced tachycardia had an arrhythmic event, regardless of type of antiarrhythmic drug therapy received.\(^9^1\) The calculated positive predictive accuracy of electrophysiologic testing is 18%, whereas the negative predictive value of this testing is 93%.\(^9^1\) Thus, electrophysiologic study can more reliably identify patients at low risk for sudden cardiac death than patients at high risk for this condition.

Two multicenter randomized controlled trials, the Multicenter Automatic Defibrillator Implantation Trial (MADIT) (Figure 8)\(^9^2\) and the Multicenter Unsustained Tachycardia Trial (MUSTT) (Figure 9),\(^9^3\) used electrophysiologic testing for risk stratification in patients who had clinically significant left ventricular dysfunction after myocardial infarction. The MADIT suggested that patients at high risk (ie, patients with poor left ventricular function, nonsustained ventricular tachycardia, and induced sustained ventricular tachycardia not suppressed by intravenous procainamide) have better clinical outcomes after receiving an ICD than after receiving “conventional medical therapy.”\(^9^2,9^3\) The MUSTT study\(^9^3\) showed that patients who received electrophysiologically guided antiarrhythmic treatment had lower rates of sudden cardiac death than did patients who received no treatment: Rates were 12% versus 18% at two-year follow-up and 25% versus 32% at five-year follow-up. However, the improved survival rates seen for patients who received electrophysiologically guided therapy occurred only in patients who received an ICD. Survival rates for patients with induced tachycardia did not differ according to whether patients were treated exclusively with antiarrhythmic drugs or received no antiarrhythmic drugs. The MUSTT study\(^9^3\) showed that electrophysiologically guided antiarrhythmic drug therapy has no value for patients with inducible sustained ventricular tachycardia. Instead, the study suggests that placement of an ICD is the only effective antiarrhythmic therapy for primary prevention of sudden cardiac death in patients with inducible sustained monomorphic ventricular tachycardia.\(^9^3\)

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**Figure 9.** Graph shows survival curves for patients enrolled in MUSTT (Multicenter Unsustained Tachycardia Trial). Survival rate was statistically improved (p < 0.001) in ICD patients compared with untreated patients or with patients receiving electrophysiologically guided drug therapy. AAD = antiarrhythmic drug; ICD = implantable cardioverter-defibrillator; VT = ventricular tachycardia.

In the recently completed CABG (Coronary Artery Bypass Graft) Patch Trial, patients having elective coronary artery bypass surgery who had coronary artery disease, left ventricular dysfunction, and positive results of signal-averaged electrocardiography were randomized to receive an ICD as preventive therapy for cardiac arrest. Unlike the MADIT, the CABG Patch Trial showed that implantation of an ICD did not confer a survival benefit to this high-risk group of patients compared with the control group who received bypass surgery but no defibrillator. Unlike the MADIT patients, enrollees in the CABG Patch Trial were not screened with an electrophysiologic study. Important multicenter studies currently underway include MADIT-II and SCD-HeFT (Sudden Cardiac Death in Heart Failure Trial). If empirically based ICD implantation becomes viewed as the standard of care in patients with ejection fraction <30% who have had myocardial infarction, the economic costs to society will be substantial, especially as the population ages.

**Current Clinical Management for Survivors of Sudden Cardiac Death**

The general treatment algorithm currently used by the Northern California Regional Cardiac Electrophysiology Service of the Kaiser Permanente Medical Care Program is summarized in Figure 10. In general, patients who have had ventricular fibrillation cardiac arrest should be treated with an ICD unless the tachyarrhythmia occurs in the presence of acute myocardial infarction or a reversible cause.

**Clinical Contributions**

If empirically based ICD implantation becomes viewed as the standard of care in patients with ejection fraction <30% who have had myocardial infarction, the economic costs to society will be substantial, especially as the population ages.
ischemia or drug-induced proarrhythmia) can be identified. Although this algorithm provides general management principles, emphasizing that each clinical situation is unique is crucial, and each diagnostic and therapeutic plan must be individualized for each patient. In addition, this treatment algorithm applies to survivors of cardiac arrest and excludes patients who have had an episode of sustained monomorphic ventricular tachycardia, for whom treatment options may include catheter ablation, drug therapy, or ICD implantation, depending on the cause of the monomorphic ventricular tachycardia and on an evaluation of left ventricular function. This algorithm does not address primary prevention in patients at high risk for sudden cardiac death; in this context, definitions for “high risk” and appropriate clinical management for patients so classified is still evolving. A complete discussion of these issues is beyond the scope of the present review.

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A Newer World

“Come, my friends.
'Tis not too late to seek a newer world.”

“Ulysses,” Alfred, Lord Tennyson, 19th Century poet laureate of England
Commentary by Joel S Richmon, MD

I am struck by how much the practice of medicine has changed in the half century since this article was written. In the 1940s, the medical subspecialties were sometimes practiced by general internists who had a special interest in another area of medicine and who gained knowledge in a subspecialty largely by observational experience. Dr Dannenberg was just such a practitioner, and he is to be lauded for acquiring enough experience to write an extensive review of migraine.

Another noteworthy observation is how much our knowledge about migraine has increased since those days, when Dr Dannenberg characterized migraine as a “big allergic reaction—akin to asthma or urticaria.” That characterization now seems quaint and is even considered erroneous. Dr Dannenberg’s reference to the “emotional immaturity” of the migraineur underlines a widely prevalent European view—still held today by many in both Europe and the United States—that migraine is a disease of rich, bored housewives. This characterization, of course, is also far from the truth.

Migraine affects a substantial percentage of the population, occurs in all civilizations, and has been recognized since the dawn of recorded history. By Thurman B Dannenberg, MD

Commentary continued on page 38.
trigeminal branches and the sensation of the head pain results. It is not within the scope of this paper to enumerate the various diseased states, altered physiological factors, or emotional disorders which may give rise to headaches—they are numerous.

Definition of Migraine

The older texts describing this type of headache included under its description all types of periodic headache that contained one or all of the following characteristics: familial origin, hemicrania, preceding aura, scotoma or other visual disturbances, nausea and vomiting, constipation or diarrhea, urine retention or frequency of urination, general or one-sided chilliness, pallor or flushing—the attack lasting one hour to several days, followed by fatigue or depression, although the patient may be lively or energetic.

Attempts from time to time have been made to classify this type of headache in broad general classifications such as typical migraine or atypical migraine depending on the author’s criteria, “red headache or white headache” depending on whether the patient showed pallor or flushing of the face at the time of the attack. Etiologic classifications have been proposed and are numerous, eg, allergy, endocrine, anatomical and psychic.

Mechanism and Etiology

The mechanism of migraine is believed to be first a vasoconstriction followed by a vasodilatation of the cerebral arteries. The former accounting for the preheadache aura, scotoma and other cortical sensory phenomena and the latter accounting for the headache by stretching pain fibers closely associated with these arteries. That this mechanism is mediated through the sympathetic nervous system, is generally accepted; however, there is disagreement on the trigger mechanism that initiates the initial vasoconstriction and the vasodilatation that follows. In histaminic cephalgia we see only the second part of the mechanism in effect, namely that of vasodilatation. If the vasoconstriction is present it is certainly transitory for in this type of cephalgia we lack the preheadache symptoms seen in typical migraine.

Although many theories have been proposed as to the etiology of migraine headache, none of them are wholly acceptable. The most widely accepted theory is that migraine is an allergic reaction comparable to asthma, urticaria, etc. The allergen believed to be the offender is an ingestant though inhalants have been incriminated. The allergic concept has much in its support. The age incidence is comparable, most allergies and migraine occurring in the second, third and fourth decades of life. In each there is a familial tendency. Migraine and other allergic manifestations are frequently seen in the same individual. Von Storch reported 76 percent of 862 cases of migraine significantly allergic. Tillman states, “The multifarious nature and distribution of migraine and allergy suggest a common physiologic morbidity.” In 1927, Vaughn proved that true migraine was allergic by (a) finding of positive skin tests, (b) relief of symptoms follow-
ing avoidance of foods reacting positively, and (c) reproduction of the headaches by feeding foods to which patients were sensitive. However, in 1939, Vaughn reported good results by management from the allergic standpoint of view in 51 percent of his patients, with complete relief in 40 percent. There remained approximately 50 percent of his series who received no benefit from allergic management, whether the offending allergen or allergens could not be discovered must of course be taken into consideration.

Rowe\textsuperscript{10} reported only 17 percent failure in 247 patients by use of elimination diets. Wolf and Unger\textsuperscript{11} reported a case of true migraine directly attributable to milk, which was discovered by simple feeding and elimination tests and could be produced by feeding the offending allergen.

Although the preponderance of evidence bears out the allergic theory of migraine headache there are other theories proposed.\textsuperscript{11}

**Reflex**—from refractive errors leading to eyestrain.

**Central**—from local or general pressure on dura mater with increase in cerebrospinal fluid. Goldman\textsuperscript{12} demonstrated edema of the brain was present at the height of an attack. The patient was operated on for supposed brain tumor. At the height of the migraine attack the scalp over the burr hole bulged, between attacks this same area was depressed. Pool\textsuperscript{13} and his associates did not find the cerebrospinal fluid pressure greater in patients during the migrainous attack than in a group of normals.

**Sella Turcica Abnormalities**—Timmie\textsuperscript{4} subscribes to the theory that the headache, in certain instances at any rate, is due to swelling of the pituitary body within an abnormally small pituitary recess. Other observers have been unable to demonstrate by roentgenography any significant difference in the pituitary recess of migrainous individuals than in individuals who have never had an attack of migraine headache.

**Hypoglycemic theory**—Some point out that a low blood sugar may be a factor in causing migraine headache, citing in support of their belief, the headache of fasting and hyperinsulinism and the relief which follows the administration of glucose or of adrenaline; however, Tillman\textsuperscript{14} reported two cases of headache, one of which was true or typical migraine, that were treated by hypoglycemic reactions using intravenous insulin. Both cases received marked relief from attacks of migraine in thirty to forty minutes.

**Endocrine theory**—Riley, Bricker and Kurzork\textsuperscript{15} [sic] reported that in 20 out of a series of 39 female subjects of migraine, the gonadotropic principle appeared in the urine preceding an attack. At the same time the female sex hormone, estrin, was either absent from the urine or present in very reduced amounts. In support of this view, that disturbance in the gonad-hypophyseal mechanism plays an important role in the production of migraine, they point out the following: 1) “The first attack of migraine frequently coincides with puberty, 2) attacks commonly just precede menstruation, when the excretion of estrin is reduced and the gonadotropic principle may appear in the urine, 3) the subject is usually free from attacks during pregnancy when the excretion of estrogenic hormone is increased whereas the gonadotropic principle of the pituitary is reduced, 4) relief from the condition commonly follows the conclusion of the menopause.”

**Emotional Immaturity**—”In a study by Touraine and Draper of 50 patients with migraine headache they suggested that there exists a constitutional type in which the skull shows acromegaloid trends, patients show outstanding intelligence, but with a retarded emotional make-up. They observed that the headache was characteristically repeated in the same pattern for each patient and recurred in similar circumstances. Situations necessitating the individual to stand alone, such as loss of home protection, or the assumption of adult responsibilities, marked the beginning of the headaches. Headaches were observed to come through the maternal line with the factor of unconscious imitation of the mother important in the causation. They found that there was an emotional attachment to the mother which could not be resolved. This retarded the process of emotional maturity so that an arrest occurred at some point short of mature psychosexual adjustment. They concluded that the migraine attack was a syndrome comparable to any neurosis and the fact that migraine responded to such a variety of treatments spoke in favor of psychic etiology. They felt that the psychological approach offered the most in research and therapy.” Wolff\textsuperscript{16} believes the psychotherapy is an essential part of the treatment of migrainous patients and that all patients receive benefit from psychotherapy. Alvarez\textsuperscript{25} finds that sympathetic interviews and understanding are preferable to elaborate and expensive examination. Lennox\textsuperscript{21} states that, “Main reliance must be placed on the gradual education of the patient so that he will adjust his work and his methods of living to the personality and the nervous system which he has inherited.”
Treatment

The most important single concept of migraine is the realization that it is not a clinical entity and in handling this condition it must not be treated as such. It is essential to rule out any organic abnormality which might be causing the headache. If we can elicit the five cardinal points the diagnosis is true or typical migraine. If some of the various signs and symptoms of a periodic headache with complete freedom from pain in the interim are present the diagnosis of atypical migraine may be made. As will be pointed out later, histaminic cephalgia need not be confused with this group as to diagnosis.

Since the most important point of making a diagnosis is a guide to therapy and since the therapy of migraine is not specific, the diagnosis of the type of migraine in view of our present available knowledge is not too important.

The nature of the migrainous attack should be explained to the patient. Mild sedation, reeducation, encouragement and reassurance should be the initial step. This need not be time consuming and can be done at regular visits, say once a week. Interest in the patient is of importance; they have usually been seen by many other physicians and their lack of confidence is as general as their need of relief is desperate.

Because of the “multifarious nature and distribution of migraine,” the simplest, least expensive and time consuming measures should be tried first. The belief that the actual migrainous attack is due to anaphylaxis is widely held. That is, the offending allergen may be ingested with impurity between attacks, but the individual eventually becomes sensitized so that when the allergen is ingested an anaphylactoid reaction occurs. This reaction desensitizes the patient until desensitization occurs, then another headache results. Skin testing for foods is considered in many recent articles to be unreliable. Laboratory studies have proven of little value either in diagnosis or treatment.

Food elimination diets should then be tried, such as those of Rowe. The most common food offenders are milk, wheat, egg, onion, legumes, nuts, beans, chocolate, fish, beef, pork, sea foods. The most important point in the use of these diets is absolute elimination of foods to be eliminated.

If by adequate use of elimination diets no relief is obtained, histamine desensitization or hyposentization should be tried. Aside from histaminic cephalgia, in which almost 100 percent get complete relief, Horton reports significant improvement even in those headaches not of the migrainous group.

The use of chondroitin in treatment of idiopathic headaches, including true migraine and those of the migraine group, was reported by Crandal, et al. They reported 50 percent of 151 cases received marked relief from chondroitin therapy. Chondroitin is a mixture of chondroitin and chondroitin-sulfuric acid, containing not less than 70 percent of the mixture calculated as chondroitin-sulfuric acid.

Amniotin orally has been reported as beneficial in women with simple (typical) migraine. Matier, et al, reported 75 percent of patients with headache, associated with chronic constipation or colon distress, were relieved completely by colon bacillus vaccine therapy.

In women who suffer with migraine preceding or at time of menstruation, dehydration has proved to be of value. Patients are placed on low fluid intake, salt is limited and diuretics are used such as ammonium chloride orally or mercupurin intravenously. This regime is begun one week preceding onset of menstrual period and carried through until termination of menstrual period.

Other more radical measures in the treatment of this type of headache have been employed; ligation of the middle meningeal artery, stripping the common carotid artery, or induction of artificial menopause by surgery or irradiation. None of these measures have been widely accepted or employed.

The management of the acute attack of migraine is amenable to many therapeutic measures. The most widely used and the most acceptable being ergotamine tartrate. Lennox and Storch treated 120 carefully chosen, true migrainous patients with intravenous or subcutaneous injections from 0.5 to 1.0 milligrams of ergotamine tartrate. Ninety percent experienced prompt relief as the result of the first administration, four percent obtained slight or only temporary relief, and the headache was made worse in two percent. The dosage of ergotamine tartrate must be determined empirically. It should be great enough to produce relief from headache, but not enough to produce toxic effects such as nausea and vomiting, cortical sensory disturbances, etc. It should not exceed 1.0 milligram as initial dose. Oral ergotamine tartrate has not proved to be of value once the headache has started but may be of value in aborting the headache before it has begun. One to two milligrams placed under the

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Because of the “multifarious nature and distribution of migraine,” the simplest, least expensive and time consuming measures should be tried first.
tongue or taken by mouth may abort an attack. The use of oral ergotamine tartrate as a prophylactic measure, one to three milligrams daily, has not proven of value in two cases that we have seen.

Other measures which have been employed include 100 percent oxygen inhalation (Alvarez), and hypoglycemic reactions by insulin (Tillman). Dihydroergotamine tartrate has been used; its value has not yet been established.

Horton, et al, used this new preparation in the treatment of migraine headaches and reported results comparable to the use of ergotamine tartrate. Nausea and vomiting was four times more frequent with ergotamine tartrate than with dihydroergotamine tartrate. They report the drug equally as effective in treatment of the acute attack. Dosage of 1-3 cc subcutaneously was employed. We have used dihydroergotamine tartrate* on several patients with varying results: we have not found it to be as valuable a drug as ergotamine tartrate, once the headache is firmly established; the best results have been with its use early in the migraine attack.

The use of cutaneous anesthesia for relief of pleuritic pain associated with pneumonia has been reported by Dybdahl. Similar application of ethyl chloride spray over the back of the neck and the carotid artery on the side of the headache may prove of value in the treatment of migraine. This procedure has been used on five cases here, two of which received dramatic relief and were able to leave the clinic in thirty minutes. In previous attacks, with use of ergotamine tartrate, oxygen inhalations, morphine, and codeine, these patients remained in the clinic two to four hours. The other patients on which ethyl chloride was similarly employed, experienced no relief whatsoever. In the patients who were relieved the attack had just begun; in the latter group the headache was of one to two days duration and associated with marked nausea and vomiting.

The patient in a migrainous attack should be kept in a quiet, cool, dark room and the treatment initiated early. Once the attack is well established with nausea and vomiting, the efficacy of any measure is markedly decreased.

Histaminic Cephalgia

Horton, et al, noticed in the group of patients with the chief complaint of headache, that certain definite signs and symptoms tended to predominate. To this group they applied the descriptive term erythromelalgia of the head, later histaminic cephalgia because the same syndrome could be reproduced by injections of histamine. This type of headache has the following characteristics:

1. It is unilateral and always on the same side.
2. There is a lack of familial history of migraine or allergy.
3. Onset is common in the fourth and fifth decades of life.
4. It is of sudden onset and short duration, frequently less than one hour.
5. It usually occurs at night, one to two hours after the patient has gone to sleep.
6. Pain is of suicidal intensity, constant, excruciating, burning and boring; it involves the eye, temple, neck and often the face.
7. The pain is not confined to the distribution of any cranial nerve but has a tendency to conform to the ramifications of the external carotid artery.
8. Pain is eased by sitting up or standing erect.
9. Compression of the common carotid and sometimes the temporal artery, early in an attack, sometimes gives prompt relief.
10. There is occasional nausea, but no vomiting.
11. There is no preceding aura or other cortical sensory phenomena.
12. There is no relationship to menstrual period.
13. Alcoholic beverages frequently precipitate an attack.
14. Histamine 1.0 to 1.2 milligrams subcutaneously, precipitates an attack identical with that of spontaneous origin.
15. Hyposensitization to histamine usually cures the patient.

Seventy-two (40%) of 184 patients in Horton’s series with a primary complaint of headache were of this type. Sixty-three were desensitized with histamine. Of 51 of these whose symptoms were typical, 48 had complete relief for varying periods of time after desensitization. In Lieder’s group of 71 patients, four of whom had histaminic cephalgia, all four got complete relief from histamine hyposensitization.

The method of hyposensitization used by both Horton and Lieder was an initial dose of 0.05 centimeter of a solution containing 0.1 milligram per cubic centimeter of the histamine base. The dose was increased 0.05 cubic centimeters at each injection until 1.0 cubic centimeter of 0.1 milligram of the base was reached. Two injections subcutaneously were given daily for a period of from 20 to 30 days. Some patients required a maintenance dose one to three times.
weekly for varying periods of time. The frequency of incidence in Lieder's group was six percent and in Horton's group was 40 percent. It is generally believed that this type of cephalgia is quite infrequent as compared to other types of cephalgia.

Summary
A review of migraine headache has been presented, with a discussion of the types which may be seen, the mechanism and various etiological factors involved, the criteria for diagnosis, and the numerous modes of therapy.

Special attention has been paid to the allergic aspects of migraine, and to histaminic cephalgia. Dihydroergotamine tartrate was supplied by Sandoz Chemical Works, Inc.

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Commentary
(continued from page 33)
For many years, a vascular hypothesis held that migraine was primarily a disease of the cranial vasculature. This theory proposed that headache pain occurred as a result of sensory nerve activation by inappropriate vasodilation or opening of arterial venous anastomosis in the cranial circulation. Subsequently, a neurogenic hypothesis proposed that neurogenic inflammation (vasodilation and plasma protein extravasation) in the meninges may be responsible for trigeminal sensory nerve activation and generation of headache pain. More recently, brain-imaging studies conducted during spontaneous migraine episodes have shown activation of brain stem regions that participate in central modulation of head pain and craniovascular functions. This observation has given rise to an integrated hypothesis, ie, that migraine has a central neural basis that leads to dysfunction in various sensory, nociceptive, and vascular control pathways. The first observation to support the integrated hypothesis was that patients with no history of migraine developed migrainelike episodes after having surgery to implant electrodes leading to the periaqueductal gray matter and raphae nuclei within the brain stem. This finding suggested that these regions of the brain may be the loci of an endogenous “migraine generator.” Participation of brain stem regions in migraine pathogenesis is now further supported by positron-emission tomography (PET) studies showing regionally specific increases in cerebral blood flow and an index of neuronal activity within the reticular formation during spontaneous migraine attacks. The nuclei thought to be activated most were the raphae nuclei (which have a high density of serotonergic neurons) and locus ceruleus (which has a high density of catecholaminergic neurons).
[eg, norepinephrine-activated] neurons). Continued activation observed in this brain stem region after successful drug therapy suggests that ongoing activity within such a “migraine generator” could be responsible for recurrence of migraine headache. This hypothesis, however, requires further investigation.

For many years, pharmacologic interest in the mechanisms of migraine focused on serotonin (5-hydroxytryptamine, or 5-HT). Current theories suggest that parasympathetic projections (containing acetylcholine and vasoactive intestinal peptide) from brain stem regions innervate intracranial meningeal blood vessels. Activation of these pathways could trigger a headache by releasing nitric oxide, which is a potent vasodilator and activator of perivascular sensory nerves. Indeed, serotonin-antagonist agents used prophylactically against migraine but which are ineffective after a migraine attack has started may act by preventing this initial vasodilator stimulus. These hypotheses reflect current thinking and may provide an integrating link between the vascular and neural theories of migraine.

Dr Dannenberg’s comments on histaminic cephalgia (or “cluster headache,” as we would say today) bring to mind an interesting chapter in my life as a medical resident on the private service at Johns Hopkins in the late 1960s. A well-known and highly self-aggrandizing Baltimore internist continued to flood us with patients whom the internist deemed suitable for histamine desensitization. The hospitalizations were lengthy and, I'm sure, very expensive for the patients. The results were variable at best, and it was not unusual to see the same patients return for repeat treatments. One hundred percent oxygen inhalation (mentioned in Dr Dannenberg’s review) is often highly effective for treating cluster headache and is still very widely used.

The sheer complexity of migraine, the variety of its forms, its prevalence in our species, and the suffering it causes all continue to tantalize and challenge clinicians and researchers all over the world, and migraine research has never been as active as it is today. In contrast to the “dirty” drugs of the past, we are beginning to develop highly specific and often highly effective serotonin agonists, which seem to act both centrally (in the brain stem) and directly (in the meningeal vessels); these agents are the triptans. But we still have pieced together only fragments of the complete puzzle—we continue to seek a synthesis which brings all the pieces together.

References


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Clinician Champions and Leaders for Electronic Medical Record Innovations

Electronic medical records (EMRs) typically require substantial change in the way clinicians work and may contribute to transformation of health care organizations. Effective leadership can mitigate the associated instability and resistance. Aspects of clinician champions of new technology are examined, including their importance and how to identify, develop, and support them.

Introduction

Installing an electronic medical record (EMR) in a large organization is a complex and difficult undertaking. Achieving acceptance by clinicians is among the greatest challenges. EMRs typically require substantial change in the way clinicians work; indeed, introduction of EMRs may transform health care organizations. Nearly any change is associated with instability and resistance, and this is well documented among physician users of EMRs. Fortunately, however, effective leadership may help mitigate and overcome this resistance.

How important are clinician champions in achieving clinician acceptance? How can they be identified? What can be done to develop their knowledge, skills, and attitudes so that they are optimally prepared? What support will increase their ongoing effectiveness? Answers to these questions draw from literature review and from the author’s own experience implementing EMR systems in a health maintenance organization.

Adoption of Innovation and Change in Health Care

Some published work relates to adoption of innovations in health care settings. In 1985, Freiman surveyed 484 physicians to determine the number of new procedures adopted during one year. The author identified differences by clinician specialty, age, board certification, and practice type but did not report on the impact of attitudes or behaviors of colleagues, leaders, or champions. That same year, Frost described use of a microeconomic model of physician behavior (in Great Britain) to generate testable hypotheses regarding physicians’ adoption of innovations in processes as well as products. Even using this technical economic analysis, the author considered “peer pressure” among the leadership factors which “might encourage the adoption of a socially valuable diagnostic innovation.” (Peer pressure implies a type of peer leadership with a somewhat more negative connotation.)

Scott and Rantz described a nursing task force team approach to planning and implementing a re-structuring project in an inpatient medical unit. This team approach focused on creating an environment for change. Designating a team as “change champions” is appealing because teams are often an effective unit for process improvement; however, applicability of this method may be greater among nursing staff than among physicians, who tend to practice more independently. Indeed, even when organized into groups, doctors often “practice alone together.”

Massaro described the 1988 implementation of a medical information system (MIS) in an academic medical center. The MIS included mandatory physician order entry. The implementation process was far more difficult than expected, and cultural and behavioral problems were the most troublesome. In response, a senior management committee was created and met weekly beginning some time into the project. This committee included chairs of three major clinical departments and played an important role in integration of the MIS into the operational culture of the medical center. A chief resident’s coordinating council was also formed to further facilitate the MIS implementation by exchanging information across resident teams. Although Massaro did not specifically address the role of physician champions, the author did indicate that leadership was important to eventual acceptance of the MIS. The author asserted that “initiatives of this magnitude cannot be managed on a part-time basis using personnel who volunteer time from an already busy schedule” and that “the institution must be prepared to invest resources … that are appropriate to the magnitude of the task and must be prepared to support those individuals it chooses for this management role.”

In 1997, Ash described organizational factors that influence diffusion of information technology in academic health centers. The author’s goal was to determine the extent to which this diffusion is affected by several variables: communication, participative decision-making, top-management support, planning, reward systems, and existence of champions. The author surveyed more than 600 informatics profes-

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MICHAEL A KRALL, MD, is a Family Practice Physician who has worked for Northwest Permanente, PC since 1983. He is a former Chief of Primary Care of the Salem, Oregon Medical Offices and has worked on clinical information projects in the Northwest Division since 1991. E-mail: kralmi@kpnw.org
tionals and more than 700 library staff members from 67 academic health centers about their use of three innovations: end-user online literature searching, the computer-based patient record, and electronic mail. Respondents were asked to indicate on a five-point Likert scale the extent to which faculty members, information professionals, and campus administrators “really encouraged” users, their colleagues, or departments to use each innovation. The author found that the variables did not have the same effect on each innovation. Communication, decision-making, and planning all appeared to affect diffusion of the computer-based patient record, whereas rewards appeared to be the least important variable in this regard. Presence of champions did not appear to affect use of the computer-based patient record, but champions were apparently important in encouraging the use of electronic mail. The champions’ apparent lack of influence on use of the computer-based patient record may be attributable to the specific questions asked, the type of individuals and groups queried, or other factors.

The Case for Leadership in Innovation

“Leadership is the ability to influence a group toward achievement of goals.”15-16 Physicians are influenced by what they are taught in medical school, by what they read, by what they learn in continuing medical education courses, and by what they hear and observe from their peers. Historically, medical education has relied heavily on an apprenticeship model; even today, physicians generally train in teams with a formal hierarchy of mentoring and instruction. They usually develop a habit of consulting with their colleagues on clinical and practice questions. After formal medical education is completed, influence of peers remains powerful; indeed, as practicing physicians spend less time in formal training, they may rely even more on these contacts for information and guidance—and the more credible the role model, the greater the impact of the modeled behavior. Such credibility is achieved through formal credentials and training or from practice experience and exemplary ongoing performance in clinical, academic or administrative pursuits such as presenting clinical material at meetings or conferences, leading department meetings, publishing papers, or otherwise developing a reputation for expertise in specific areas. Clinicians tend to value highly such expertise as well as other traits such as “being a team player,” willingness to “pull one’s weight” or to “pitch in,” honesty, reliability, and engaging personality; these characteristics increase the ability to influence others. Particularly in times of great difficulty, uncertainty, stress, or transition, clinicians look to their colleagues for advice and guidance. The result may have great impact on clinician behavior.

The importance of “physicians as leaders in improving health care” recently prompted a new series of articles in the Annals of Internal Medicine based on a three-part premise: that an existing body of knowledge can inform the goal of physician-leaders to improve health care, that this goal is typically not addressed in medical school, and that many physicians will want to study such a curriculum and will benefit from it.

Types of Leaders

Leaders can be described as formal or informal types. Formal or “officially sanctioned” leaders hold a specific managerial rank or other position of authority, whereas informal leaders emerge and influence others by their moral authority, charisma, energy, strength of character, or other attractive attribute. Possessing and demonstrating such attributes makes official leaders more effective as agents of change—and strong, visible endorsement by formal leadership is typically necessary for successful introduction of innovations. Nonetheless, some people inherently mistrust or have an aversion to authority and thus are unlikely to respond well to formal leaders but may be comfortable seeking advice or receiving suggestions from peers. Both types of leaders are therefore important.

Levels of Leaders

Most organizations have levels of formal authority. Although size and structure of health care organizations varies tremendously and impact and scope of leadership may vary by setting, leadership is nonetheless likely to affect most health care settings. Larger organizations often have at least three levels of hierarchy—upper management, middle management, and the work team or individual worker—each of which may have formal and informal leaders. Some people may operate at more than one level within the organization, holding an administrative position while serving as a member of a clinical team, for example. When this duality occurs, roles may become confused. This circumstance is common among physician-leaders and can be complex. Each role inherits different levels of authority and responsibility and
thus creates ambiguity for both the leader and for those within his or her sphere of influence. An upper-management position may confer advantage due to access to special knowledge and authority—but formal authority and special status can also interfere with credibility (and therefore, effectiveness) among some persons lower in the hierarchy. Leaders with the most formal authority may not always be those with the most influence on other people. Leaders at each level rely on different strengths to effect their influence. Moreover, requirements differ for leaders at each level: Generally, upper-management leaders are expected to develop and articulate the overall “vision” and strategic importance or rationale for an innovation, whereas a middle manager (eg, a department head or chief of service) must communicate this same vision to specific department members while interpreting the vision and its consequences. This middle manager may be in the difficult position of advocating a position which he or she neither developed nor fully agrees with. As an effective leader, however, the middle manager must present the innovation in as positive a light as possible. This task may create in the middle manager an internal conflict which, in extreme cases, he or she may not be able to resolve.

The leader of a work team or module takes the message one step further because this person and his or her colleagues must live with the consequences of the innovation on an immediate and personal level. If the decision to adopt the innovation has been made and is inevitable, the team leader must find ways to adapt to the innovation on a daily, real basis. Verbal and nonverbal responses of these leaders to the innovation will have a major “ripple effect” throughout the work team. Individuals who work most closely together are likely to have the greatest impact on each other. For this reason and because of the crucial role of work teams in improving clinical processes, it is especially important to support and develop resources at this level.

Leaders, Managers, Champions, Sponsors, and Change Agents

Leaders are not necessarily “change agents.” Moreover, by having a very conservative (or even regressive) outlook and behavior, leaders are sometimes agents of resistance to change. Of course, such conservatism may well be appropriate at times; change is not always either desirable or inevitable. In today’s rapidly changing health care environment, however, effective leaders must anticipate and manage change with alacrity. Reinertsen stated “leadership is focused on producing needed change. Management … [is] working with people and processes to produce predictable results.”

Leaders and managers have different attributes (Table 1) and various categories can be defined. “Champion” and “sponsor” are two such subgroups which have been defined by other authors. “Champions are the individuals who emerge to take creative ideas (which they may or may not have generated) and bring them to life. They make a decisive contribution to the innovation process by actively and enthusiastically promoting the innovation, building support, overcoming resistance, and ensuring that the innovation is implemented.”

By one definition, champions “attempt to obtain commitment and resources but lack sponsorship.” “Sponsor” is the term often applied to leaders (usually, senior managers) who “authorize, legitimize, and demonstrate ownership” for a specific change project or team. Sponsors have the organizational authority to provide resources, local support, or both for the change. They help eliminate organizational barriers to the innovation. The change agent plans and actually brings about the implementation.

Table 1. Characteristics of managers and leaders

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<tr>
<th>Manager</th>
<th>Leader</th>
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<tr>
<td>Has impersonal/passive attitudes toward goals</td>
<td>Has personal/active attitudes toward goals</td>
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<tr>
<td>Views work as an enabling process involving combination of people and ideas interacting to establish strategy and make decisions</td>
<td>Works from high-risk position</td>
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<td>Prefers to work with people and to avoid solitary activity</td>
<td>Concerned with ideas</td>
</tr>
<tr>
<td>Relates to people according to the role they play in sequence of events and decision-making process</td>
<td>Relates to people in intuitive and empathetic ways</td>
</tr>
<tr>
<td>Able to cope with complexity</td>
<td>Establishes direction by developing a vision</td>
</tr>
<tr>
<td>Brings about order and consistency, formal plans, rigid structures, and monitoring results</td>
<td>Aligns people by communicating the vision</td>
</tr>
<tr>
<td>Able to cope with change</td>
<td>Able to cope with change</td>
</tr>
<tr>
<td>Inspires people to overcome hurdles</td>
<td>Inspires people to overcome hurdles</td>
</tr>
</tbody>
</table>

Characteristics of Effective Change Agents

Howell and Higgins\(^\text{18}\) have written an excellent discussion on "champions of change." After interviewing more than 150 leaders involved with 28 successful information technology innovations in 25 large Canadian organizations (though not health care organizations), the authors conducted in-depth studies of 25 of these leaders. Table 2 lists patterns of personality, behavior, and experience characteristics of these leaders\(^\text{18}\) and includes input from other authors.\(^\text{6,15,17,19,20}\)

### Identifying Champions

A reliable mechanism to identify people with leadership potential would be helpful—and should be possible if, in fact, they have behavioral and personality traits, organizational experience, and personal history in common with one another. Instruments such as Myers-Briggs Type Indicators\(^\text{21}\) are used to identify people with personality traits consistent with leadership potential. This instrument is used today by many prominent organizations, including some

<table>
<thead>
<tr>
<th>Table 2. Characteristics of effective change agents</th>
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<tbody>
<tr>
<td><strong>Personality Traits:</strong></td>
</tr>
<tr>
<td>High self-confidence(^\text{6,17,19,20})</td>
</tr>
<tr>
<td>Desire to lead and influence others(^\text{19})</td>
</tr>
<tr>
<td>Persistence(^\text{18,19})</td>
</tr>
<tr>
<td>Honesty and integrity(^\text{17,19})</td>
</tr>
<tr>
<td>Energy(^\text{18})</td>
</tr>
<tr>
<td>Environmental sensitivity(^\text{20})</td>
</tr>
<tr>
<td>Risk-taking/courage(^\text{17,18})</td>
</tr>
<tr>
<td>Awareness of culture(^\text{6,20})</td>
</tr>
<tr>
<td>Drive and ambition(^\text{19})</td>
</tr>
<tr>
<td>Vision(^\text{20})</td>
</tr>
<tr>
<td>Intelligence(^\text{19})</td>
</tr>
<tr>
<td>Empathy(^\text{17})</td>
</tr>
</tbody>
</table>

| **Behavioral Characteristics:**                  |
| Expresses compelling vision\(^\text{17,18,20}\) |
| Gains commitment of others\(^\text{18}\)         |
| Often supports their views with data\(^\text{17}\) |
| Active innovator\(^\text{17,18}\)               |
| Pursues unconventional action plans\(^\text{16,20}\) |
| Perceived as agents of change\(^\text{20}\)      |
| Develops potential of others\(^\text{18}\)       |
| Develops and tests changes\(^\text{17}\)          |
| Gives recognition to others\(^\text{18}\)        |
| Develops teamwork among sponsors, agents, and targets\(^\text{6}\) |
| Strong personal conviction\(^\text{16,19}\)      |
| Ability to demonstrate balance\(^\text{17}\)      |

| **Career Experiences:**                          |
| Long tenure with the organization\(^\text{15}\) |
| Wide organizational experience\(^\text{18}\)     |
| Middle management position\(^\text{15}\)        |
| Successful personal and organizational history\(^\text{6}\) |
| Decision-making authority\(^\text{15}\)         |
| Credibility with key sponsors\(^\text{6,17}\)   |
| In-depth knowledge of the industry\(^\text{16,19}\) |
| Trust with key targets\(^\text{6}\)              |

Adapted from Howell and Higgins,\(^\text{18}\) Kirkpatrick and Locke,\(^\text{19}\) Conger and Kunungo,\(^\text{6}\) Harrison,\(^\text{17}\) and Reinertsen.\(^\text{17}\)
in health care. Other instruments, such as the “Change Agent Assessment,” exist and may become available commercially. This tool is used to select change agent candidates and to assess the capability and performance of current change agents. The tool also enables supervisors, chiefs of service, and department heads to recognize people with leadership interest and aptitude. Formally, “…individuals who have champion potential can be identified through validated personality and leadership measures or by observing behavior in interviews or assessment centers.” Informally, people with energy, vision, desire to lead, and other characteristics typical of leaders tend to surface and make themselves evident.

A mistake that an organization should avoid is to choose “champions” primarily on the basis of their availability, expressed interest, or some political consideration independent of the other characteristics predictive of success. “[The] early appropriate identification of potential champions gives managers the opportunity to provide an appropriate environment and career experiences that will encourage potential champions to emerge in a championing role.” Sponsors may have to be convinced by others that the quality of change agents will have an important impact on implementation success and that the resources needed to develop and support these change agents are well invested.

Developing Champions

Leaders may be born, but they certainly are also developed. Change agents unaware of the skills required to be effective are at a disadvantage. Skills and techniques such as self-awareness training, leading effective meetings, time management, active listening, and effective oral and written communication can be taught. Instruments and seminars also are available to assist with this training. Other important interpersonal skills include consulting skills, conflict management skills, and facilitation training. Operating effectively in multidisciplinary teams is another learned skill; such effectiveness requires appreciating and understanding the differing frames of reference, values, and learning and working styles of various types of professionals (doctors, midlevel clinicians, nurses, medical assistants, pharmacists, and others). Many organizations—including those in the health care industry—provide or participate in programs to develop leadership skills in senior managers and in middle managers.

Supporting Champions

For champions to be effective, they must feel empowered and supported. Among their needs is current, accurate information, which includes data about the overall plan, project status, near-term developments, and active problem areas. To maintain credibility with their colleagues, change agents must have answers—or, at least, a facilitated conduit to these answers. Colleagues should see change agents as a reliable source of information. The champions require regularly scheduled and ad hoc updates and clarification and must sense that they are involved, included, and important. For their own development, change agents need time for continuing education and for “hands-on” experience. They also need opportunities to demonstrate and model for their colleagues the knowledge, skills, and especially the attitudes required for adoption of innovations. Change agents also need to feel appreciated and adequately compensated for taking both the lead and the risk. Such compensation might include paid administrative time and other perquisites such as sponsored travel or meeting attendance, books, journals, software, or electronic equipment. Opportunities to relate formally and informally with sponsors and with other project leaders may also be rewarding.

Call for Further Research

Many questions remain about use of clinician champions for introducing electronic medical records and similar innovations. Although some answers can be gleaned from work in related areas, very little research has focused specifically on this topic. Knowing more about clinician “change agents” and about the people they influence might allow more timely and successful diffusion of these technologic innovations. Additional research is thus warranted.

Acknowledgments: The author acknowledges Joan Ash, PhD, for her review of an early draft of this paper and for her leadership in the exploration of organizational behavior and diffusion of information technology. He also wishes to thank the clinicians and staff of Kaiser Permanente for being such rich role models and teachers.

References

Complexity Theory: Minimum Specifications

“The principle of minimum specifications suggests that managers should define no more than is absolutely necessary to launch a particular initiative or activity on its way.

They have to avoid the role of ‘grand designer’ in favor of one that focuses on facilitation, orchestration and boundary management, creating ‘enabling conditions’ that allow a system to find its own form.”

Permanente Physicians Determine Use of New Technology: Kaiser Permanente’s Interregional New Technologies Committee

Background

Increasingly, as advances in medical technology lead to new clinical applications, difficult issues arise—social, legal, ethical, economic—to challenge individual health care practitioners and the health care industry alike. To respond to these issues and challenges, new structures of decision making are needed. Ideally, available information allows these structures to be created preventively; in practice, they often develop in response to past events. An example of the latter sequence is the Kaiser Permanente (KP) Interregional New Technologies Committee (INTC), which was formed in the early 1980s as a result of two major court decisions.

One of these cases—a class action lawsuit in which $40 million in damages was assessed against the KP Northern California Region—ensued after the Region decided to delay coverage of in vitro fertilization (IVF) for about two years after reasonable scientific evidence had shown IVF to be safe and effective for treating certain types of infertility. The court found that the decision to designate IVF as “experimental”—thus delaying coverage for the procedure—was not based on sound scientific evidence and did not result from a well-documented process of evaluation.

In the other case (in the former KP Texas Region), the parents of twins with severe congenital liver disease requested liver transplantation for the infants. The request was denied on the grounds that the procedure was experimental in infants. At the time, liver transplantation in adults was still new and was widely considered experimental; liver transplantation in infants had not yet been done. Nonetheless, a media storm of bad publicity attended the Region’s denial, and a settlement of $5 million was awarded to the family of the twins. Both twins received liver transplantation, and both ultimately died.

The KP INTC today considers many topics in addition to infertility treatment and organ transplantation. Recent and upcoming clinical topics for INTC discussion include cervical cancer screening technologies, transmyocardial revascularization, photodynamic therapy (PDT) for treatment of esophageal cancer, PDT for age-related macular degeneration, percutaneous vertebroplasty, and melanoma vaccines.

Formation of KP Interregional Physician-Led Committee

The Executive Medical Directors of the KP Regions (which numbered 12 at the time) chartered the Committee to develop an explicit process for evaluating new medical technologies. The Committee’s purview included drugs, devices, procedures, and determining whether a particular new technology is experimental. The Committee’s goal was threefold: 1) to evaluate available scientific evidence, 2) to determine if a new technology is safe and effective, and 3) to recommend to the Regions whether a specified technology should receive Health Plan coverage. This threefold goal transcended Regional boundaries: A major premise of the Committee was that the “community standard” had become the national standard and that, for example, current expectations for practice in California should also be the current expectations for practice in other states.

Initially established by the late Paul Lairson, MD, who served as Physician Liaison (the predecessor position to the Executive Director of The Permanente Federation), the Committee began by examining issues such as heart transplantation, lung transplantation, gastric stapling, and radial keratotomy. Given this history, we may reasonably say that Kaiser Permanente has been practicing evidence-based medicine since long before this concept entered the medical vernacular.

The Committee is currently chaired by Dr Jed Weissberg, Associate Executive Director of The Permanente Federation, and is managed by Mitchell Sugarman, Director of Medical Technology Assessment in The Permanente Federation (Table 1). Through these members, the Committee gains access to Permanente specialists throughout the KP Program so that the evidence supporting use of a specific technology for a given medical condition can be evaluated by physicians who regularly treat that condition.

Committee Evaluative Process

The Committee meets quarterly to review all information pertaining to the safety, efficacy, and comparative utility of medical technologies presented to the Committee for determination. If the status of a particular technology requires more extensive evalu-
The Committee refers the technology to an ad hoc or standing Regional committee for further review. Examples of standing Regional committees within KP include the Northern California Regional Bone Marrow Transplant Advisory Board, the Southern California Regional Biotechnology Committee, and the Northwest Regional Cytokine Advisory Board.

When sufficient information is available, the Committee compares the safety, efficacy, and relative utility of the new medical technology with current medical practice. In some instances, a new medical technology stands alone as a completely new innovation, making comparison difficult. In this situation, the safety, efficacy, and utility of the technology must be evaluated without any comparison.

Agenda items for the INTC come from a variety of sources. An individual Permanente physician may inquire if the INTC has data or a report on the technology that the physician can use to make a decision about a patient. A Health Plan benefits manager at KP may simply want to know if the technology is included in Health Plan coverage. These inquiries may not require extensive review by the INTC, because relevant data may already exist. Through the INTC’s contacts, physicians in one KP Region can easily be connected with physicians in another KP Region who may have the experience sought by the first physician. However, when a question does not have a simple answer or when the technology prompts divergent views, the topic is likely to be placed on the INTC’s agenda. After the INTC makes a recommendation, the recommendation is disseminated throughout the Program, primarily through the recorded minutes of the INTC meeting.

### KP Regional Committees

Each KP Region maintains a local committee composed of regional representatives who are responsible for direct communication with the INTC. This group raises issues and sends requests for technology assessments to the INTC and acts on recommendations made to the KP Regions by the INTC. Ultimately, the group is responsible for evaluating the impact and implications of INTC recommendations as these recommendations affect the Region’s benefit structure. The group is also responsible for communicating with appropriate practitioners in the Region to inform them of any changes in INTC recommendations. Table 2 shows activities managed by the KP Regional Committees.

### Decision making and Controversies

Over the years, the INTC has studied hundreds of issues arising from availability of new technology. Because development of medical technology is a dynamic process in which new data regularly become available, many of these issues have been reassessed many times, and recommendations have subsequently been updated when appropriate.

As might be expected from the nature of this developmental activity, the process has also been filled with controversy. Medicine is not an exact science, and evidence is sometimes not conclusive; therefore,

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**Table 1. Kaiser Permanente Interregional New Technologies Committee membership**

<table>
<thead>
<tr>
<th>Role</th>
<th>Members</th>
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</thead>
<tbody>
<tr>
<td>Physicians at the senior management level from six of the KP Regions</td>
<td></td>
</tr>
<tr>
<td>Legal counsel</td>
<td></td>
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<tr>
<td>Pharmacy operations representative</td>
<td></td>
</tr>
<tr>
<td>The Director of The Permanente Federation’s Care Management Institute</td>
<td></td>
</tr>
<tr>
<td>Two Health Plan benefits senior managers</td>
<td></td>
</tr>
<tr>
<td>Director of Medical Technology Assessment in The Permanente Federation</td>
<td></td>
</tr>
<tr>
<td>The Director of Technology Assessment and Guidelines in Southern California Region</td>
<td></td>
</tr>
<tr>
<td>The Director of TPMG New Medical Technology in Northern California Region</td>
<td></td>
</tr>
<tr>
<td>A medical ethicist</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Activities managed by KP Regional Technology Assessment Committees**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional impact/implications of INTC recommendations</td>
<td></td>
</tr>
<tr>
<td>Dissemination of INTC minutes and other information from the INTC</td>
<td></td>
</tr>
<tr>
<td>Updating appropriate regional personnel on new technology issues</td>
<td></td>
</tr>
<tr>
<td>Regional interest in new technologies not addressed by the INTC</td>
<td></td>
</tr>
<tr>
<td>Benefit exceptions</td>
<td></td>
</tr>
<tr>
<td>Cases sent for outside, third-party ombudsman review</td>
<td></td>
</tr>
</tbody>
</table>
Health Systems

Table 3. Resources for evidence gathered by INTC in evaluating new technology

<table>
<thead>
<tr>
<th>Peer-reviewed medical literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governmental agencies</td>
</tr>
<tr>
<td>• US Food and Drug Administration (FDA)</td>
</tr>
<tr>
<td>• National Institutes of Health (NIH)</td>
</tr>
<tr>
<td>• National Cancer Institute (NCI)</td>
</tr>
<tr>
<td>• Centers for Disease Control and Prevention (CDC)</td>
</tr>
<tr>
<td>• Agency for Health Care Policy and Research (AHCPR)</td>
</tr>
<tr>
<td>Medical Associations</td>
</tr>
<tr>
<td>• Medical specialty societies</td>
</tr>
<tr>
<td>• American College of Physicians (ACP)</td>
</tr>
<tr>
<td>• American Medical Association (AMA)</td>
</tr>
<tr>
<td>• American Hospital Association (AHA)</td>
</tr>
<tr>
<td>Private Technology Assessment Organizations</td>
</tr>
<tr>
<td>• ECRI (formerly the Emergency Care Research Institute)</td>
</tr>
<tr>
<td>• Blue Cross/Blue Shield/Kaiser Permanente Technology Evaluation Center (TEC)</td>
</tr>
<tr>
<td>• Hayes, Inc</td>
</tr>
<tr>
<td>• Diagnostic and Therapeutic Technology Assessment (DATTA)</td>
</tr>
<tr>
<td>Medical Experts</td>
</tr>
<tr>
<td>• External to Kaiser Permanente</td>
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<tr>
<td>• Internal to Kaiser Permanente</td>
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</table>

A degree of judgment always accompanies the INTC’s recommendations. This situation is exemplified by bone marrow transplantation for breast cancer—a topic that has been placed on the INTC agenda 11 times since 1991. Most of the early Committee meetings resulted in recommendations that did not support bone marrow transplantation for breast cancer; later, in light of mounting pressure from advocacy groups, from news media, from legal challenges, and from legislative mandates, the INTC recommended bone marrow transplantation for breast cancer as a “medically appropriate alternative treatment in carefully selected patients.” In 1999, however, more definitive evidence was presented (at American Society for Clinical Oncology meetings in Atlanta, Georgia) to show that this approach to treating breast cancer is more dangerous and no more effective than conventional care. (Notwithstanding this evidence, however, a federal mandate still requires that federal employees receive coverage of bone marrow transplantation for breast cancer!)

Evidence-Based Decision Making

The previous example underscores the point that although evidence is the primary staple of the INTC’s deliberations, the Committee cannot escape the need to consider social, legal, ethical, emotional, and other factors when making its recommendations to the Regions. However, evidence is always the weightiest factor in the Committee’s deliberations. To obtain this evidence, the Committee uses staff resources in both The Permanente Federation and in individual KP Regions. Table 3 displays these resources for gathering evidence.

Obtaining Further Information About the INTC

The proceedings of the INTC meetings are available online through the Permanente Knowledge Connection (http://pkc.kp.org/), accessible by all who work at Kaiser Permanente. The Web site contains additional information about the INTC, its topic list, individual members, how the INTC interacts with local KP Regional technology assessment committees, and contact information. Another extremely useful resource is the Technology Assessment and Guidelines (TAG) Unit based in the Department of Clinical Analysis in the Southern California Region. The TAG Unit works closely with both the INTC and The Permanente Federation to provide technology assessment assistance and guidelines to Permanente physicians throughout the Program. The Technology Assessment Inquiry Line can be reached by calling 626-405-5138 or through the KP e-mail system at Med-Technology-AGU,Scal. The Southern California Regional Clinical Practice Guidelines Handbook can be obtained by calling 626-405-6615. In the Northern California Region, TPMG New Medical Technology provides this resource for TPMG physicians and KPNC Administration and can be reached by calling Agnes Cronin at 510-987-3507.

Summary

The Kaiser Permanente’s Interregional New Technologies Committee is an example of a Permanente-led, evidence-based activity at the forefront of making decisions to integrate new technology into Permanente Practice.

The Committee is a national model for evaluating potential solutions in an environment constantly challenged with new technology and rising health care costs.

Suggested Further Readings
“When it hurts to breathe”
Mixed media (acrylics, glass chips, engraved aluminum)
by Sharon Carter, MD

More of Dr Carter’s artwork can be seen on the cover and pages 68 and 80.
Kaiser Permanente is setting the national standard for clinical information systems and the electronic medical record, says Dr Andy Wiesenthal in the following conversation with Associate Editor Jon Stewart. He notes that a small but very experienced core of CIS experts in Oakland is assisting the Regions in a deployment process that is very much driven by regional planning. Dr Wiesenthal is the Associate Executive Director of the Permanente Federation for Clinical Information Support and is the lead physician on the national CIS implementation team. He helped implement Colorado’s IBM clinical information system, on which KP’s national system is based.

**TPJ:** What is CIS? Is it a medical record, or is it something more?

**Dr Andy Wiesenthal:** “If you ask the doctors and nurses in KP Colorado and Northwest who use CIS, they will tell you it is a superior medical record in terms of its content, clarity, organization, and availability. But CIS is much more than that; it’s a way of organizing your work so you can do more. At a minimum, it is a way of managing the flow of information into clinical practice, to doctors and to nurses, such as results from laboratory and imaging studies or messages from members, other physicians, staff. CIS also manages the flow of information going out from the doctor and nurse. And it organizes it all in a way that can be customized, that allows you to work with the data and to engage other members of your team in helping you manage and communicate that information.”

**TPJ:** Where is this going to position Kaiser Permanente in terms of competitor organizations that are moving in this direction?

**AW:** “Nobody has anything like this. There was a national conference on health informatics in San Francisco this past year and the keynote speaker, who was not from KP, said, ‘If you want to see the state of the art for electronic health record keeping, you have got to go to Kaiser Permanente in Colorado.’ And what we’re about to implement nationally is actually an enhanced version of the KP Colorado system.”

**TPJ:** This system promises a lot in terms of greater efficiency and quality. Have we had enough experience with this or similar systems in KP Colorado and Northwest to be confident that the promised benefits are really there?

**AW:** “They really are. Now having said that, I think if you look at the amount of time doctors and nurses spend at work, for most of them using CIS probably hasn’t changed very much. But they are doing things differently, and what they are doing is more directed toward the care of the patients than it used to be. This is especially true for nurses, who will tell you that they spend 10 to 20 percent of their day in the old paper world, getting information—charts, test results, etc—together to put in front of the doctor. In the new world, they find better ways to use their time to take care of patients and to assist each other. They are still working a full day, and they work very hard, but the work they are doing feels more like nursing than it did before. The same thing is true for physicians; they are not searching for things. They have what they need, and they can spend more time using that information to take care of patients.”

**TPJ:** What you say is a reminder that this system is not just for physicians. Virtually all clinical staff will be affected, won’t they?

**AW:** “Most users are not physicians. And it will affect almost everybody in the whole organization. Think about it: People in a variety of business functions use medical records a lot; their access is now dramatically enhanced. Furthermore, they are now shared contemporaneously: doctors, nurses, and whoever else needs access can all have it at the same time. In the electronic world, the record is available all the time and in multiple places at once. If somebody is entering something into a record in one location, that fact is clearly indicated to the person who may be looking at it simultaneously in another place. By hitting a refresh button, the information one person has just entered becomes available to anyone else accessing that record. In fact, it’s very common for two people to be looking at the same information about a patient at the same time and discussing it over the telephone.”

**TPJ:** When you implemented the IBM system in KP Colorado, did you get much resistance from the users?

**AW:** “Sure, but I think we ran into very justifiable concerns. The concerns fell into several categories: First, many people were concerned about their ability to use computers at all. They didn’t feel their computer skills were up to the task. So there are lots of things that must be done in the way of training as we implement CIS to help people address those concerns. The second thing people were worried about was that it was going to decrease their efficiency. We recognized at the beginning that there is a learning curve and it absolutely will decrease efficiency initially. When you first start using the computerized record, you are not going to be as fast as you were with the old paper record system. So a lot of backfilling is necessary, which is expensive but a very important investment in our people. It takes six to eight weeks for the average person to get up to speed, but we do everything we can to help. And there is a lot of support. In the beginning, there is hand holding, quite literally. Somebody just like you, a nurse or a doctor, who is also an expert in the system, is available right there to help you work through what you need to do, right then.”

**TPJ:** You’ve said that this is the first time that our organization has ever installed a software program across the entire...
organization, affecting virtually everyone. And this is an incredibly complex clinical information system, not just some word processor. With such a massive undertaking, it must require a large national infrastructure to carry off the deployment.

AW: “Yes, we are hiring thousands of psychologists for major group therapy (laughter).

“In fact, the core Implementation Team in the national office, which is the major interface that the users will notice in any KP region, is only about 10 or 12 people. It’s their job to help regions develop rollout plans and structures, to identify the talent and the folks in a region who are necessary to carry this forward. Then we will work collaboratively with them and give them whatever support they need and the wherewithal to get the job done. We can’t implement this nationally. This is an operational issue, and all operations are local.

“Consequently, all implementation plans are being made at the regional level. We have models, and we have suggested ways to do things, based on our accumulated experience from KP Colorado and Northwest. We will be learning more from Hawaii and Southern California. So we will propose models that have been successful. The Regions don’t have to reinvent the wheel. This is a collaborative effort.”

TPJ: Is the CIS content being developed on the same kind of national/regional partnership level that characterizes the implementation?

AW: “Yes, it is, and the word content means many things to many people. It falls into several categories as far as CIS is concerned:

“First, there’s the guts of the system—the content that is largely going to be invisible to doctors and nurses but is very important. This is something called the ‘convergent medical terminology.’ This is a big library catalogue of coded terms, about 400,000, that we hope will be an emerging national standard. For example, as doctors or nurses create a diagnosis, it will have an underlying code and logic. We can then use that for all of the obvious purposes, including fulfilling our obligations to HCFA; for producing coded material for learning about what we do; for mining our data; and for understanding what outcomes relate to what interventions and so on.”

“Second, the parts users will see are what the software calls ‘baselets.’ These are templates that are used in creating clinical progress notes. They can be everything from a big template that includes every part of a progress note, including all the historical data, to a kind of fragmentary baselet, something that just covers a physical examination for a person with a particular kind of problem. This is also the way in which we will embody national practice guidelines from the Care Management Institute, for example, or regional guidelines.

“Another kind of content is ‘formularies.’ These are inventories of various courses of action doctors can take. They include not only drugs but laboratory tests, disposition of patients, diagnoses—a wide variety of possibilities. Again, we will provide starter sets of these formularies, so clinicians do not have to start from scratch. We will have sets for pediatricians, sets for internists, sets for specialists, and so on. However, there is a lot of flexibility for individuals because they create their own custom formularies.

“Another area of content is ‘flowsheets.’ These let doctors review the progress that patients with chronic conditions make over a series of visits. A great asset is that the data you enter into the notes automatically populates the flowsheet, so you don’t have to do double entry.

“Finally, there will be medical drawings. This will be a library of medical drawings you can call out and put on your screen to illustrate, for example, where a rash is or where something is on somebody’s eye.”

TPJ: What’s the timetable for deployment?

AW: “There are currently two releases of CIS being developed and managed by the National CIS team. The first version (Release 1.0) will be implemented in KP Hawaii in 2001. Then we’ll focus on rolling out Release 1.5 (R 1.5) in KP Southern and Northern California, Hawaii, and Colorado. In Hawaii, R 1.5 will be an upgrade from R 1.0, and deployment in KP Colorado will actually be a conversion from their current CIS product. The other Regions will follow soon after.”

Thank you, Dr Wiesenthal.”

Most users are not physicians. And it will affect almost everybody in the whole organization.
Clinician-Patient Communication:
The Electronic Medical Record—Barrier or Bridge to Effective Clinician-Patient Communication?

Common Questions
The Kaiser Permanente Computerized Information System, KP CIS, is coming to an examination room near you. Will it help or harm your patient relationships? We’d like to share some of the learnings from the KP Colorado Region.

In 1997, when CIS was being launched, a few questions were posed by clinicians in the Colorado Region:
- “What do patients think of having a computer in the exam room?”
- “Doesn’t the computer distract you from taking care of the patient?”
- “What if it goes down?”

We know that communication behaviors in the examination room affect health outcomes and patient satisfaction.

The Crucial Role of Clinician-Patient Communication in KP’s Future: Summary
Evidence from our own research and from the medical literature shows that the quality of communication between clinician and patient matters a great deal. Outcomes such as adherence to treatment, resolution of symptoms, and functional status of patients are directly attributable to elements within the medical interview. Patients’ assessments of quality and the appeal of membership in KP depend highly on patients’ views of their interactions with clinicians. Communication mishaps are extremely costly to the organization.

Although KP consists of dedicated, competent, motivated health professionals, many of our clinicians simply did not receive training in communication skills as part of their formal education. During the past decade, nearly all of our medical groups have initiated programs in communication skills to address this lack. The challenge now is to strengthen and broaden that effort by supporting training in communication, by linking training with performance feedback and incentives, and by recruiting clinicians who have strong interpersonal skills.

We have an opportunity to distinguish ourselves in the marketplace. Our members deserve to be listened to, heard, cared about, and involved in decisions about their own health care—not only to have satisfying care experiences but also to achieve optimum health. This goal is crucial to the success of KP. The time is right for Kaiser Permanente as a national organization to make a strong commitment to strive for excellence in clinician-patient communication.

Desired Outcomes at KP Colorado
Many “hoped for” outcomes associated with use of an electronic medical record effort are compatible with the goals of superb clinician-patient communication. These outcomes include excellent quality of care, improved patient outcomes, enhanced careers, patient satisfaction, and increased rates of patient/member retention.

Communication in the Examination Room
As a result of work spearheaded in our organization by Drs Terry Stein and Jill Steinbreugge (personal e-mail communication, May 2000), we know that communication behaviors in the examination room affect health outcomes and patient satisfaction. Communication that is dissatisfying to members can lead to complaints, legal claims, and disenrollment, all of which are costly financially and costly for clinician careers. A superb electronic medical record supports communication and outcomes with patients and has an important impact in all these arenas.

Our experience at KP Colorado showed that KP has the responsibility to take the lead in creating excellence in “exam room communication” as supported by an electronic medical record. The path to achieving KP CIS proficiency can be rocky—personally as well as organizationally—and requires substantial sponsorship and an array of resources. In Colorado, when we started using KP CIS, 40% of our workforce had no previous computer experience. (One novice placed the computer mouse on the floor like a footpedal; another held it up at the screen like a remote control device.)

Table 1. Kaiser Permanente Colorado Clinical Information System (CIS) Implementation Support Team

Contact person: Andrew M (Andy) Lum, MD
Team: Michael D Chase, MD; Marianne P Gapinski, PhD; Noni Wiencrot, MD; Cheryl Rogers, RN; Alice Alexander, MPA; Dee Lawer, RN

ANDREW M LUM, MD (left), an Internist, was a partner physician with SCPMG and served as the PIC of the Santa Clarita Medical Offices until 1994. In 1994, Andy moved his beautiful wife and four children to Colorado. He currently serves as the Assistant Medical Director of Service Quality and Informatics and is on the Board of Directors for CPMG.

MARK D ZUIDERVEEN (right), has been with Kaiser Permanente for 18 years; he serves as Senior Director for Service Quality in the Colorado region.
Five Steps to Adopting the Electronic Medical Record

In reviewing the KP Colorado implementation, Dr. Steinbruegge (personal e-mail communication, May 2000) and others have identified five steps required to support adoption of an electronic medical record (see sidebar “The Five Steps”). Clinician Patient Communication is addressed in the fourth step. Several efforts were specifically addressed at facilitating this skill at the time of implementation:

1. one-on-one tutorials,
2. early-morning departmental practice sessions,
3. written tip sheets and newsletters with anecdotal stories, and
4. sessions using a humorous but instructional video, “CIS: Improving the Art of Medicine.”

The Five Steps to Successful CIS

Five steps to be successful using CIS as outlined by Dr. Jill Steinbruegge, MD (personal e-mail communication, May 2000):

1. Basic PC skills. Ensuring that all users have acquired basic PC skills is important because all other CIS-related learning is slowed if these skills are not in place. At KP Colorado, approximately 40 percent of the workforce had no computer experience before implementation of CIS.

2. CIS functions and features. Users must learn to navigate the screen and to perform all the functions relevant to their role. The training document outlines many options for this.

3. How to integrate CIS into personal workflow. Physicians must learn how to integrate the CIS tool into the way they do their work—the way they gather and record information, the steps they take in performing a task, and the order of these steps—so that they may return to their baseline efficiency level. Workflow efficiency before implementation of KP CIS predicted efficiency after implementation of KP CIS as well as the rate at which baseline efficiency was achieved. Stated differently, the efficient physicians were efficient when using either paper or KP CIS, and they learned to become efficient more rapidly than colleagues who were not efficient before KP CIS and who slowly returned to their relatively inefficient baseline efficiency levels.

4. How to integrate CIS into the clinician-patient interaction. How to have CIS enhance (and not interfere with) the clinician’s interaction with the patient is a fourth area of learning necessary for using the KP CIS effectively. Without additional training, physicians ended where they started: physicians with strong interpersonal skills engaged their patients during the learning process (“bear with me while I do this on the computer”), whereas physicians with poorer interpersonal skills were unable to mitigate interference of the KP CIS in patient interactions. As did physicians’ efficiency with patients, the “Art of Medicine” scores of physicians with poorer interpersonal skills returned to pre-CIS baseline levels.

5. How to integrate CIS into work unit (team) workflow. The final aspect of learning to use the KP CIS effectively is learning how to integrate CIS into the workflow of the work unit or team. How do individuals in the work unit change their workflow and work processes after they have implemented a CIS? In what order are steps taken? How does communication occur (eg, without a paper chart, how to know when a patient has checked in)? These are areas that affect the ability of the work unit to process patients efficiently.

Reproduced by permission of the artist, Patricia K Fahy, MD.
Ongoing Efforts

Ongoing efforts include:
1. Clinician Patient Communication skills teaching sessions (see sidebar),
2. Informatics teaching sessions for team members, and
3. Disseminating information (tip sheets and voicemail) to highlight ways in which quality of outcomes can be enhanced.

Summary

KP CIS can be a bridge to excellent clinician-patient communication and can be a real opportunity for our organization to distinguish itself on this front. We must build on the learnings from each KP Region to help other Regions navigate the steps of implementation. In addition, to fully exploit KP CIS as a tool, we must continue to focus on our core product: interaction between clinician and patient in the examination room. The extent to which KP CIS can support and enhance quality of health care, patients' confidence in clinicians, clinicians' confidence in themselves, level of patient service, treatment outcomes, and member retention is the extent to which we have appropriately exploited this exciting new tool.

Acknowledgments: Patricia K Fahy, MD, reviewed and edited the manuscript. Many thanks to Terry Stein, MD; Bob Tull, PhD; and the Bayer Institute for Health Care Communications, Inc (Fred Platt, MD), who helped us design our Clinician Patient Communication courses. The Medical Editing Department, Kaiser Foundation Research Institute, provided editorial assistance.

Clinician Patient Communication Skills for the Clinician

"Communication Skills for Clinicians," designed by Peter LaFleur, MD, is an interactive tool suitable for 90-minute facilitated sessions within clinical departments. Optimal group size for these sessions is 5 to 15 people. Sessions are designed to stimulate discussions about communicating with patients who are considered challenging. Each of six video vignettes presents a patient with a common but fairly problematic, challenging communication issue (e.g., angry patient). The doctors demonstrate some desirable communication skills and omit others. The focus is on communication—not on clinical diagnosis.

We conducted approximately 30 classes with half of our 16 medical offices. Sessions have been very popular. Our Executive Medical Director (Jack Cochran, MD) is one of our stars in the video series!

References

The Problem with Variation

“What lies behind us and what lies before us are tiny matters compared to what lies within us.”

often attributed to Ralph Waldo Emerson

A common expression likens the challenge of organizing physicians to that of herding cats. This metaphor is based on the recognition that their training and development makes physicians very independent and autonomy-oriented. The virtues of independent practice may have served us well in the competitive atmosphere of pre-med studies and medical school training, but this benefit is not clearly true in today’s health care arena. The problem with variation in medical practice is that this variation is a double-edged sword: It can form the basis for creativity and innovation or it can be a cause of poor outcomes, defective processes, and ineffective stewardship of resources.

Given today’s need for health care delivery systems that function in a highly integrative fashion, collaboration has become a highly valued behavior in medical practice. An ongoing assumption among many experts has held that group-model medical practices deliver population-based care more effectively than large network models or more loosely associated models. The theory underlying this assumption is that group models can 1) leverage their self-governance and integrated relationships to achieve a higher degree of alignment, 2) define strategic goals more clearly, and 3) promote greater compliance with care guidelines that are based on evidence-based medical research. The debate continues as to whether these higher levels of performance as measured by clinical outcomes and cost-effectiveness in group models offer greater competitive advantage than large network models that may sometimes offer greater choice and achieve greater patient satisfaction.

The challenge for Permanente Medicine is to combine the best of both worlds. With few exceptions, we have been able to greatly leverage our group-model, integrated-delivery approach to consistently outperform the marketplace in clinical quality outcomes as measured by NCQA, HEDIS, and others—but we have not enjoyed similar success in the service/satisfaction category. I believe that our success in the clinical arena has been fueled by our ability to define and establish evidence-based best practices and to effectively decrease inappropriate variation in clinical practices. We have, in fact, found successful means to “herd the cats!” If we are to enjoy similar results in service improvement, we will need to apply the same principle of defining appropriate service-related standards of behavior and performance, eliminating inappropriate variation from those standards wherever possible.

Now that we have begun to apply an “evidence-based” approach to service improvements, the Care Experience Council has confirmed, through exhaustive research and analysis of the service literature, that the elements of the “Care Index” do correlate highly with patient and member satisfaction (Figure 1). Therefore, as we build practices and guidelines

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**Five Key Drivers of Satisfaction:**

**Care Index**

- Interest and attention of physician
- Have a regular physician
- Ability to see own physician
- Days waiting for an appointment
- Time on the phone to make an appointment

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**Figure 1.** Five elements that correlate with health plan member satisfaction.

**Figure 2.** Defining appropriate norms for service performance has a “ripple effect” that leads to customer loyalty.
around these critical elements, our challenge will be to maximize compliance. The scheme shown in Figure 2 demonstrates what I believe is the positive ripple effect of two specific activities: 1) defining appropriate standards for achieving high levels of service performance and 2) preventing what health plan members perceive to be deviation from these norms and variation in clinical practices.

In summary, if our goal is to produce a value proposition based on high quality, outstanding service, and competitive pricing, then our approach to service must be the same as the approach we have taken to ensuring HEDIS or CMI compliance. To grow our membership, we must retain current members and attract new members. And as described in Figure 1, loyalty of our members is a function of both the extent to which we meet their needs and the competitive value proposition that we offer reliably and consistently. The KP Promise contemplates our ability to offer and consistently deliver on this commitment across the entire KP Program. Although this value proposition has traditionally been directed toward employers, a focus on individual consumers is becoming increasingly necessary.

As is true for all change agendas, success requires courageous leadership, sustained focus, continually reinforced training, timely completion of performance metrics, and recapturing the hearts and minds of our physicians and employees. Ours is the business of caring—and most of us chose the health care profession because we believe in this mission. Ultimately, it is this shared belief and the manner in which we use our group model that positions us to “herd the cats” and to actualize, for ourselves and our patients, the belief that we provide the best health care delivery model in the world. ❖

A Practical Path

“Relax, hit it easily, smoothly; keep your head down and your eye on the ball; follow through toward the pin.”

Homer Carey is “The Prince of Slides” in the Northern California Multimedia Department where his responsibilities include producing computer-generated slides and other graphic art projects. He has a background in architecture, stained glass, photography, miniatures, and cardboard sculpture—a medium he has been working in for over 20 years. When he began working with cardboard in the late 1970s, it was an inexpensive and little-used medium. Its appeal is that the final product is lightweight, yet strong. Most of the work Mr Carey produces is based upon a cubical or cylindrical shape, which adds to the strength. His work has been engineer-tested and can hold over 1000 pounds.

“Tongue Table,” named that because it abstractly resembles a tongue, is approximately 18” high, 24” wide and 28” long. It is in Mr Carey’s preferred “natural” state (unpainted). Mr Carey says, “You have to be somewhat ‘Zen’ around cardboard furniture as it doesn’t like moisture and can be easily dented.”
Videoconferencing and CME: “Pearls of Wisdom” Learned From Ten Years of Experience

This article describes the KP Northern California Region’s decade of experience providing videoconference programs for continuing medical education (CME). Suggestions for planning and delivering an effective CME videoconference are also presented.

The Northern California Region of Kaiser Permanente (KP) extends northward from well below San Francisco up to Sacramento. About 3800 physicians care for almost three million Health Plan members in the KP Northern California Region’s 17 hospitals and 31 medical office buildings. KP Corporate Offices and MultiMedia Communications Department are both located in Oakland, California.

During our half century of providing health care services in Northern California, KP has for the past decade been producing continuing medical education (CME) videoconferences. Our original CME videoconference programs were designed to educate our physicians about HIV disease, which was then becoming a frequent diagnosis in Northern California. Information was changing frequently, and few of our physicians were as yet caring for HIV patients. Our first videoconference program, a one-hour noon-time series titled “Sharing the Care,” was given every two months. In the next two years, we increased the number of topics covered, increased frequency of presentations to monthly, and changed the name of the series to “Medicine in the Nineties,” and now to “Permanente Medicine Today” (Figure 1). As sources of information about HIV increased, we gradually decreased the number of programs dedicated to HIV and increased the number of general interest topics.

As our experience with videoconferencing and its acceptance by our physicians grew, we added to the videoconferences special topics, such as abuse and end-of-life issues. We then added Grand Rounds videoconferences on pediatrics, musculoskeletal medicine, medical ethics, geriatrics, use of computers in medicine, research, podiatry, echocardiography, risk management, alternative medicine, spine care, and neurology. These videoconferences are currently given at intervals ranging from semiquarterly to quarterly. We also give single presentations (e.g., “Healing the Healer”) on topics whose adequate coverage does not require the series format.

Most of the videoconferences originate from our regional MultiMedia Communications Department in Oakland, although programs occasionally originate from local hospitals. We present videoconferences to more than 100 sites in California and to an additional 100 sites throughout the rest of the United States, enabling us to reach a prospective audience of several thousand physicians simultaneously. We have produced live CME programs linking facilities from Hawaii to New York for as long as four hours. Most of our conferences are viewed in broadcast mode with live call-in capability (i.e., one-way video and two-way audio transmission), but some of our smaller conferences permit two-way audio as well as two-way video transmission.

Among other uses, our videoconferencing system is used for CME, nursing education (for either a Bachelor's or Master's degree), continuing education for non-KP physicians, and conferences for employees.

Table 1. Permanente Medicine Today; 2000 Videoconferencing Schedule

<table>
<thead>
<tr>
<th>Series</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td>Fibromyalgia</td>
<td>March 9</td>
</tr>
<tr>
<td>Unstable Angina</td>
<td>April 13</td>
</tr>
<tr>
<td>Evidence into Practice</td>
<td>May 11</td>
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<tr>
<td>Palliative Care</td>
<td>June 8</td>
</tr>
<tr>
<td>Prostate Cancer: Controversies in Screening and Treatment</td>
<td>July 13</td>
</tr>
<tr>
<td>The Exercise Prescription: Giving Good Advice</td>
<td>August 10</td>
</tr>
<tr>
<td>Physicians and the Pharmaceutical Industry: Friends or Foes?</td>
<td>September 14</td>
</tr>
<tr>
<td>Gastroesophageal Reflux Disease (GERD)</td>
<td>October 12</td>
</tr>
<tr>
<td>Antibiotic Resistance</td>
<td>November 9</td>
</tr>
<tr>
<td>Fad Diets</td>
<td>December 14</td>
</tr>
</tbody>
</table>

By Carol Havens, MD
elor of Science [BS] or Master of Science [MS] degree in nursing), long-distance consultation, business meetings, and classes leading to certification in medical translating and engineering. Our current videoconferencing curriculum includes a mean of 150 conferences per month with about six of these conferences given regionally for CME credit. Depending on content, most of our videoconferences attract 200 to 800 physicians (Table 1).

CME credit for videoconferences is obtained through a combination of regional and local responsibility. The regional planning group for *Permanente Medicine Today* is composed of representatives from the Physician Education and Development Department, representatives from the MultiMedia Communications Department, and several physicians from various KP medical facilities. This group is responsible for documenting the needs assessment, developing objectives, planning the programs, and collecting and collating the evaluations. These activities are done in collaboration with the appropriate KP chiefs group, Regional department, or national effort. CME committees at KP medical facilities review the documentation and decide whether to offer the program at their respective facilities and whether to provide CME credit. Each facility is responsible for maintaining attendance records for the programs given at that facility; all other documentation is maintained in the Physician Education and Development Department. Publicity is developed in that department and is distributed to CME coordinators and chiefs at each facility for distribution at that facility. We are fortunate to have substantial production facilities, an outstanding MultiMedia Communications Department (Figure 2), and one of the largest videoconferencing networks in the country. Other producers of videoconferences may not be as fortunate, but we hope sharing our experience may still be valuable.

After ten years of experience, we have learned ten main things, all of which refer specifically to use of broadcast mode with telephone call-in:

1. **The only thing less effective than an in-person “talking head” lecture is a “talking head” lecture delivered via videoconference.** Holding the attention of a physician-filled audience is difficult enough when the speaker is present in the room, and this task is even more difficult when the speaker is remote. We have found that using a panel instead of a single speaker is more interesting and engaging—both aurally as well as visually—and encourages more questions from the audience. We therefore present all our programs as panel discussions with a moderator (Figure 3). We usually include two panelists, each with a different perspective. Instead of presenting prepared lectures, we plan our videoconference programs as a “conversation between colleagues,” with the moderator asking questions.1

2. **The most effective videoconferences are produced jointly by CME professionals and video production experts.** CME professionals can determine needs and objectives, help develop case presentations, ensure that all CME requirements are met, and contribute educational design expertise.
Video experts can contribute technical expertise in such areas as staging for the program, design of graphics for clearest visibility when projected, and how to most effectively produce and use pre-taped segments (e.g., interviews). Video experts can also contribute advice on mundane but important matters such as what to wear and how to interact (or not interact) with the camera. During the videoconference, a video expert can keep the moderator informed about timing and provide invaluable feedback about the presentation.²

3. Moderating a panel discussion is a new and different skill which can and must be learned by people who assume the role of moderator. The role of the moderator is to ensure that the panelists remain focused on the given topic and address all key points; maintain the pace and continuity of the program; ensure that all panelists participate in the discussion; manage incoming telephone calls to the conference; and ensure that the program stays on time. Sometimes these tasks are accomplished easily, sometimes not; but failure to manage them can make the program a disaster for the audience, the panelists, or both.³

4. Being a panelist requires different skills than being a lecturer. Being a panelist requires mental agility and ability to be a “team player,” and not all great lecturers have these skills. For this reason, preconference planning meetings are particularly important. We have had to remove from programs panelists who were unable or unwilling to abandon their “canned” talk and text-filled slides, but most panelists do adjust after receiving some explanation of why their presentation must be changed.²

5. Videoconferencing programs require intense planning to look spontaneous. Because the best videoconferences are not presented as prepared lectures, the planners (especially the moderator) must work with panelists on several objectives: development of realistic objectives for the presentation, design of the information “flow,” appropriate selection of panelists for presentation of specific information, development of a conference outline for everyone to follow. Planning for the program must also include some rehearsal.⁵

The best programs look completely spontaneous but have included many hours of preparation necessitating that we plan our videoconferences several months in advance. As part of the preparation process, the moderator usually participates in two or three conference calls with all panelists simultaneously to plan objectives, key points, flow, graphics, and handouts. On the morning of the program, we rehearse in the studio so that panelists can become accustomed to the set, timing and manner of presenting graphics, transition points, and other issues of timing. The technical crew gives panelists feedback on how to act while on camera (Figure 4). Because we want it to appear spontaneous, we do not rehearse the entire program.

6. Developing an audience takes time. People always enjoy live performance best, and physicians are no different. Developing a dedicated audience for our videoconferencing program required several years, during which we offered raffle prizes, made telephone reminders to audience members before each program, and “planted” questions in our attempt to gain the audience’s acceptance of videoconferences. We now cannot keep up with the demand for our videoconferences. In addition, videoconferencing gives all our physicians access to “expensive” speakers and gives physicians at distant or smaller facilities an opportunity they would not otherwise have to hear various speakers.⁴

7. The reason videoconferencing seems “just like television” is that it is just like television. Videoconference presentations must be visually interesting and include appropriate content. Because we do not use presentations prepared in advance, speakers must learn to present important information succinctly—or else they risk losing their audience. Graphics must be used judiciously (i.e., only when they add to the presentation). Adding appropriate visual images increases the audience attention, but merely creating slides of text—as is done in many live confer-

Figure 4. Studio 4a—MultiMedia Production Control Center.
ences—tends to lose the attention of the audience. As experienced television viewers, we all are easily bored; as videoconference producers, therefore, we must maintain a lively pace for the program by providing visual interest and diversity whenever possible.1,3,5

8. Consistency builds loyalty and identity. Consistent use of introductory music and graphics helps the audience to identify with the ongoing program of videoconferences; as in the television industry, use of identifiable characteristics develops brand loyalty. This effect can be accomplished alternatively by using the same set, moderator, and overall “look.” Using different introductions for different series gives to the audience a signal that the program is a different one. Changing the set prepares the audience for a change in topic, perspective, and objectives. For instance, our series “Medicine in the Nineties,” uses different music and graphics than were used in the Grand Rounds series. Single videoconferences also use this device to differentiate themselves from one another. For example, for a series on business aspects of practicing medicine, we used a different set, introduction, and moderator than used in previous series.

All these techniques help to “cue” the audience and to connect the programs in a series.

9. When included in moderation, controversy can be good. A lively debate encompassing differing viewpoints between panelists can increase the audience’s involvement in the program. However, too vigorous or lengthy a disagreement is likely to cause the audience to become so involved in the argument that they lose sight of the presentation’s objectives.

10. Graphics which are effective for a live presentation are often inappropriate for videoconferences. In planning a videoconference, producers should remember the adage that “Less is more.” At a live conference, graphics are projected onto a large screen which can usually be seen at the back of the room, whereas videoconferences are usually viewed on a television screen which is much smaller than a projection screen. Use of text-only slides should therefore be minimized, and charts or graphs should be simple.2

In summary, some activities essential for planning effective and interesting videoconferences are the same as for any other CME program.8 These activities include completion of a thorough, accurate needs assessment; development of realistic objectives; identification of the target audience; and conducting postconference evaluations. However, factors unique to videoconferences include the skills needed by moderator and panelists; use of graphics that project well in the televised format; developing and maintaining a pace and continuity (“flow”) throughout the program to hold the audience’s interest in watching the screen; ensuring a balanced view is projected; and ensuring the participation of CME experts as well as video experts in both the planning and production phases.

We believe that well-planned, well-produced videoconferences are a valuable and effective part of a CME program.9 In our decade of experience, we have learned much—partly by making mistakes. We are very proud of our videoconference program and look forward to its next decade.

Acknowledgment: Scott Waters, MA, Piper Cafferata, and Helen Hammer, MD, of the videoconferencing production team, reviewed the manuscript.

References
A Doctor’s Dream

I suddenly long
to be the ennui
musician playing
piano for the
elevator bit
parade in my
left ear as
I wait on
bold to answer
a page while
on call for
another tragic
case of human
misery and despair.

Will my dream
snowball or
fall like a
dried leaf eaten
by a tethered
old goat in
a dank field of
briars and thistle?
Or will it
vanish like the
failed aspirations
of that benumbed
music wizard’s
lost youth
spent rehearsing
for my tiny
otic concert hall?

By Robert Hippen, MD
The Future of Continuing Medical Education (CME) Technology

Introduction
In the first quarter of 2000 alone, an estimated 41 million Americans accessed the Internet for health care information and services; and this number is projected to reach 88 million by 2005. If nothing else, this phenomenon could bring an onslaught of well-informed (or ill-informed) patients swarming into medical offices to seek solace and treatment. As medical resources and physicians themselves become increasingly stressed by this onslaught as well as by other changes in the health care delivery system, the need to prove the value of continuing medical education (CME) becomes crucial. The value of CME can be shown by directly linking it to three measurable events: clinical outcomes, positive changes in physician behavior, and improved quality of care.

Interactive CME
To be effective, CME must be practical, effective, efficient, easily accessible, and directly related to clinicians’ daily lives. CME must also be convenient, present current information, use actual cases, and demonstrate useful methods for solving problems. New theories of learning suggest that, unlike didactic sessions (which seldom change physician performance), interactive CME sessions that enhance participant activity and that provide an opportunity to practice skills can effect change. Given that the effectiveness of CME is both difficult to develop and difficult to prove, medical educators face a challenge: How can they help to introduce the burgeoning number of technologic advances, especially given increasing demand for accountability in medical outcomes and in cost-effectiveness? Holly Atkinson, MD—trained in internal medicine and now intimately involved with a “dot com” (ie, Internet-based) company—has noted that while physicians practice “laying-off” of hands as technology advances, patients are demanding “laying-on” of hands. Educators face an inherent challenge “to address the contradiction in training physicians in the latest, greatest, fastest technology while helping them keep sight of what is humanistic and spiritual” (Holly Atkinson, MD, personal communication, 2000).

As we move from the “teacher-centered” model of learning to the “learner-centered” model, we must make this model both relevant to the workplace and inherently motivating. Indeed, self-directed, lifelong learning becomes increasingly important as we struggle to keep pace with changes both in the health care industry and in health care itself. Developments in use of audiocassettes, videocassettes, CD-ROMs, teleconferencing, and e-mail are converging to make Internet-based CME more than just replication of a didactic session. Distance education has become more sophisticated as it becomes more interactive, more widely delivered as a “just-in-time” product, and highly relevant to actual problems faced by clinicians. Moreover, physicians have a new need to learn skills that have not been included in traditional medical curricula (skills such as cultural competency, alternative medicine, interpersonal communication, and shared decision making) in addition to the need for both professional competence and professional survival skills (eg, improved management skills and teamwork; familiarity with marketplace economics, clinical guidelines, and formularies; methods of delivering patient care by telephone; and computer literacy).

We describe several Internet-based CME initiatives being undertaken within the Kaiser Permanente (KP) system and that are establishing KP as a national leader in this type of CME activity.

Videoconferences
Kaiser Permanente has one of the largest privately owned videoconference networks in the country. In Northern California, KP has been producing interactive, live videoconferences for more than ten years; 53 regional videoconferences were produced in 1999 alone, and many more videoconferences are both developed and broadcast locally. Regional videoconferences are broadcast live to locations in Northern California and Southern California, and all KP Regions can receive these live programs. KP currently offers regular videoconference series in alterna-
tive health, geriatric medicine, medical ethics, musculoskeletal medicine, neurology, pediatrics, podiatry, medical research, and risk management as well as the monthly program, “Permanente Medicine Today.” In addition to special videoconferences, these regular series provide education specifically directed to primary care physicians, specialists, and nonphysician clinicians.

Evaluation of all KP videoconferences was completed in 1999 and resulted in some changes in the regular series. For example, all programs were renamed with an overall series title (“Permanente Medicine”) in addition to the specialty topic (eg, “Geriatrics,” “Alternative Medicine”); this renaming was designed to indicate more clearly integration of programs into KP’s CME program. Results of a survey conducted by KP showed that audiences preferred case presentations, interactivity, and practical information. Because KP physicians told evaluators that they liked demonstrations and role-playing activities, those elements are now incorporated whenever appropriate. Use of a panel of presenters instead of the typical format—a single lecturer—has enhanced viewers’ ability to “connect” with the program and provides a showcase for KP’s wealth of internal experts.

As part of KP’s integration of videoconferences into our CME curriculum, we have worked with the KP Northern California Region departments of Quality and Utilization, Pharmacy and Therapeutics, Medical-Legal, and with Physicians-in-Chief to plan programs. In many cases, videoconferences are part of implementing a larger effort, such as introduction of clinical guidelines. KP has also featured programs on organizational imperatives such as use of hospitalists, redesign of primary care, and use of group medical visits.

All KP Regional videoconferences are recorded, and all videotapes are available for later viewing. For many of these programs, CME credit is available. (For more information on videoconferencing, see article on page 58.)

**CD-ROM**

The KP Regional Multimedia Communications Department has produced two interactive, multimedia CD-ROMs: one on shoulder pain (Figure 1) and one on low back pain. For both these CD-ROMs, content was developed by KP physicians. The CD-ROM on low back pain is based on the popular clinical guidelines developed in the KP Northern California Region and made widely available throughout the KP organization. The CD-ROM includes sections on anatomy, patient medical history and physical examination, laboratory tests, diagnosis, case management, appropriateness of medical or surgical referral, and case studies of actual patients with typical symptoms. These KP CD-ROMs are unique among educational CD-ROMs because they are easy to navigate and because their use of multimedia effectively demonstrates examination and injection techniques. Moreover, because the user interface in these CD-ROMs is so easily navigated, they can be used for “just-in-time” reference. More than 1000 copies of the CD-ROM on shoulder pain have been distributed nationally, and the CD-ROM on low back pain is currently available for sale (through MultiMedia Communications, Kaiser Permanente California) for $5.00.

Jointly with an outside company, KP is developing a CD-ROM on dermatology for primary care physicians. This product uses a diagnostic algorithm developed by an academic dermatologist who has

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**Figure 1.** Sample of learner-centered physician education: Kaiser Permanente CD-ROM, Shoulder Program for diagnosis and treatment of shoulder problems.

used it for several years. The content is based on the clinical skill summaries developed in the KP Northern California Region by a group of dermatologists and primary care physicians and approved by departments in both those specialties. The CD-ROM also uses a multimedia format and actual cases. This product is scheduled to become available by February, 2001.

**Internet-Based Learning**

Use of Internet-based learning has rapidly spread to all industries and encompasses all types of content and professions. Recent proliferation of Internet-based CME programs has been sponsored by academic institutions, professional societies, pharmaceutical companies, and “dot com” health care companies.

A typical Internet-based CME program involves direct transfer of text or slide presentations onto a Web site. The content provider is usually a physician posting his or her latest lecture or article on the Internet. Physicians who view the Web site can simply read the text or slides, answer a few evaluation questions, and obtain CME credit.

In contrast to this unidirectional, single-format method of delivering CME programs, KP’s approach to high-quality, Internet-based CME is an anomaly in the CME industry. To address KP physicians’ demand for more flexibility in educational programs, KP has developed Internet-based CME programs available only on a password-protected Internet site, “Permanente Knowledge Connection” the URL for which is http://pkc.kp.org. This site is accessible day or night from either a home or office setting. Five programs are available on the Permanente Knowledge Connection: “Asthma,” “Congestive Heart Failure,” “Coronary Artery Disease,” “Depression” and “Diabetes” (Figure 2). Another six programs are being developed and are scheduled for release before the end of 2001.

KP’s Internet-based programs are based on KP guidelines (national and TPMG) that were developed using an evidence-based approach. Use of evidence-based content with intensive program review by a team of physicians, technical experts, and education consultants results in an Internet-based educational program of high quality. In addition, instead of using embedded links to reference citations, KP’s Internet-based CME programs provide direct links to the actual guidelines on which the CME programs are based. KP physicians have reported that this easy access to information has assisted them with both learning and retention.

To emphasize the educational content, KP has designed programs using principles of adult learning theory. Interactivity is maximized by using realistic patient cases to encourage application of concepts and recommendations in the guidelines. For auditory and visual learners, KP is beginning to use audiostreaming and hopes to use videostreaming when its underlying technology improves. However, believing that multimedia should enhance—and not distract

Figure 2. Additional sample of learner-centered physician education: Permanente Knowledge Connection Web site area, Diabetes Program. (Source: http://pkc.kp.org/)
The physician orders medication directly from her handheld computer, which calculates the correct dosage on the basis of the patient’s weight (already stored in the database). From—the learning process, KP is cautious in using multimedia enhancements to CME programs. A judicious amount of multimedia is used to support learning the guidelines; for example, multimedia can be effectively used to teach screening for diabetic retinopathy or diagnosis of diabetic neuropathy. We believe that KP’s Internet-based programs deliberately avoid the trap of overusing the available multimedia enhancements commonly used by other Internet-based education programs. KP’s Internet-based CME programs are unique because they offer a “clicks-and-bricks” approach—tangible resources are available in addition to those available on the Internet. Whereas many other Internet-based CME programs offer only medical content, KP provides an integrated approach to its education: Within KP, Internet-based education is supported by use of clinical practice tools such as speed-charting forms and quick-reference cards. System enhancements accessible at the facility level (eg, Internet-based formulary, clinical skill summaries, and clinical guidelines) allow KP physicians to use these Internet-based databases to reinforce and strengthen the content of KP’s Internet-based CME programs.

Future Applications

One possible future scenario: A physician using a computer to review her schedule sees that she will soon see a patient for skin rash and hyperlipidemia. She clicks on an option labeled “diagnosis” and is taken to the “Dermatology Step by Step” CD-ROM (maintained on her server), which guides her through a diagnostic algorithm. Having developed a clearer idea of how to approach the problem and knowing she can return to the CD-ROM for information on treatment after the diagnosis is made, the physician visits the Permanente Knowledge Connection Web site for the latest guideline for treating hyperlipidemia. Later, as she is working in her office, she connects to a discussion of dermatology issues on a live Web cast on the Internet as part of the Permanente Medicine Today videoconference series. After watching the program, the physician completes charting for her patients. As she records the diagnosis of hyperlipidemia, the computer automatically shows a list of medications. The physician clicks on her first choice and is taken to the pharmacy site, which describes dosages, interactions, contraindications, and formulary status for the drug selected. The physician’s computer logs the time and locations for all her Internet searches and provides her with a summary that she then sends electronically to her local CME office for credit.

Another possible scenario: A hospital-based physician is seeing a patient with renal failure. Instead of walking to the nursing station computer at the other end of the floor to check laboratory tests done in the past 24 hours, the physician takes her handheld computer from her pocket to check the patient’s latest laboratory results by wireless local area network (LAN) (Figure 3). The physician orders medication directly from her handheld computer, which calculates the correct dosage on the basis of the patient’s weight (already stored in the database). The order for medication is then transmitted directly to the pharmacy.

The physician then considers prescribing one other medication and enters its name into the handheld computer. Immediately, an icon flashes to warn of a clinically significant complication associated with this therapy. The physician clicks the “Guideline” icon on her entry screen and is shown an algorithm that helps her to determine her next steps. She also recalls that a discussion group by physicians about therapy for renal failure is on the Permanente Knowledge Connection Web site—which she can access from her handheld computer. She logs onto the site to find out what her colleagues are discussing. Curious about one physician’s comments,
she accesses his phone number from the discussion group database and calls him for a consultation. In addition, she does a quick MEDLINE search on renal failure and downloads several full-text articles that she has selected for future reading. Her handheld computer tracks the time spent conducting literature searches and viewing guidelines and pharmacy databases, so the physician clicks on the “CME” icon to automatically report to her facility’s CME office the amount of time spent on the research.

Conclusion

In an earlier report on the possibility of Internet-based CME, Chow and Tan postulated that several years might pass before a new type of technology penetrates an existing organizational culture sufficiently to become commonplace and perceived as useful. In only four years, Internet use by physicians—for CME or for other purposes—has skyrocketed from 3 percent (in 1995) to 80 percent (in 1999). The number of Web sites offering online CME has grown steadily from 18 (in late 1997) to more than 100 (in 2000), although quality and relevance of these sites vary. Most physicians are currently interested in computer-assisted CME, but they have been slow to accept this mode of education for several reasons: lack of accommodation to change, fear of the unknown, lack of time, reluctance to master a new modality, aversion to noninteractive education, and insufficient relevance of many Internet-based CME offerings. Fox and Bennett identified two models of practice-based physician’s learning: one model centers on self-directed learning which is developed and managed by the learner; the other model centers on a form of organizational learning, in which physicians can learn from patients, from peers, and from team colleagues. The authors conclude that CME providers of the future will facilitate self-directed learning by providing opportunities for self-assessment and acquisition of knowledge and skills; high-quality individual and group education based on expertise and evidence; and assistance to health care delivery systems in developing and practicing organizational learning.

Medical educators are thus presented with both an opportunity and a challenge as CME enters the newest high-technology era.

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References

“Wound”
Digital image
by Sharon Carter, MD

More of Dr Carter’s artwork can be seen on the cover and pages 49 and 80.
Is There a Role for the Physician in Technology Acquisition?

Do physicians decide distribution of equipment—both high technology as well as some low technology—within the national Kaiser Permanente (KP) system? The answer is an unequivocal yes, given certain limitations such as finite financial resources. We describe the experience of two such committees, both having operated for many years in the KP Northern California Region and now enveloped by a national organization, the KP National Purchasing Organization (NPO).

National Model

The NPO, which currently operates in over 40 commodity lines, aims not only to lower prices nationally but to improve standardization and utilization of products. This new approach to purchasing should result in substantially improving the level of quality and service nationally. Physicians have a key role to play in this realignment; however, unless they actively participate, they run the risk of abdicating their responsibilities in favor of nonphysicians. In today’s marketplace, smart procurement is key to successful outcomes.

Sometime in 1995, strategic sourcing was recognized by KP as an accomplishable opportunity. Given the size of this KP national organization—which has more than 400 strategic contracts in place, sometimes conflicting with one another—and with an annual budget of close to $4 billion, the opportunity to simplify and use our leverage to provide greater service at less cost was an opportunity not to be missed. Two major areas of purchasing were medical imaging equipment and equipment for anesthesia and for patient monitoring. Moving the supplier base to fewer suppliers with higher performance became substantially more important. We would like to distinguish technology acquisition from technology assessment, which is an entirely different process (see Mitchell Sugarman’s article, p 46, this issue); however, as with most things, substantial overlap prevails.

Northern California Example

During the past 30 years, the high-technology edge in diagnostic medicine has, without question, resided with medical imaging. This phenomenon is evidenced by the prices asked, both for equipment acquisition as well as for individual tests. Computed tomography (CT), magnetic resonance imaging (MRI), positron-emission tomography (PET), interventional radiology, marked advancement and enhancements in ultrasound, digital x-ray imaging, teleradiology, picture archiving communications systems (PACS), and filmless departments have all blossomed in the past decade—rendering the imaging department the center of any medical enterprise.

The Kaiser Permanente Medical Care Program in Northern California provides care to more than three million members, employs nearly 4000 physicians, and includes a network of 17 hospitals and multiple clinics. Equitable distribution of imaging equipment to these hospitals and clinics while using consistent criteria has always been difficult. The 1980 establishment of a small physician committee, ably supported by personnel in the bioengineering, purchasing, and construction departments, has resulted in equitable, rational distribution of finite resources. The process used by the Medical Imaging Equipment Committee has been accepted by most radiologists in the Region and has gained enthusiastic support from senior management.

Although technology acquisition committees have gained considerable ground among many of our competitors, the long process necessary to create a workable committee with a consistent philosophy while retaining credibility with the population served is innovative in many respects. All members of the committee were initially selected to represent various characteristics (ie, size and location of facilities as well as radiology subspecialties). Through the years, the committee has developed a cohesiveness that has played a large role in establishing the committee’s credibility—particularly because the physician-chiefs of the various radiology departments understand clearly that serving on the committee is not necessarily advantageous (ie, because their facility requests may then be scrutinized more comprehensively than others).

The committee’s philosophy centers on amply and appropriately justifying all requests by providing accompanying demographics and by clearly establishing need. Life-cycle costs are as important as the costs of acquiring equipment. In addition, productivity and...
efficiency of the potential acquisition are keys to success: Systematic analysis of accompanying patient data to assure that the potential equipment will be used efficiently and effectively are among the most prominent criteria considered. Quality and cost-effectiveness of the equipment are additional considerations. This process of rationally considering both clinical and economic returns on investment has resulted in multiyear sole source contracts for imaging equipment: Contracts are currently shared by General Electric (for CT and MRI equipment), Phillips (for angiographic equipment as well as general radiology and fluoroscopy rooms), and Acuson (for high-end ultrasound equipment).

Lessons Learned

What lessons have we learned from this experience? The strict policy of impartiality and freely distributed equipment allocation decisions has kept everyone from worrying about unfairness. We have found that early establishment of rational, easily understood criteria was critical, as was balancing that simplicity with the need for responsiveness through flexibility. We learned to listen attentively to the justifications provided and to render decisions in an easily understood, logical sequence—yet be flexible enough to amend decisions whenever arguments are persuasive enough to overcome set criteria.

Flexibility also means the ability to respond to concerns as they arise. As tenure of committee members increased (because of the need to retain both consistency and corporate memory), concern for the need to have “new blood” arose. New committee members were then introduced on a rotating basis, allowing experience to coexist with new involvement.

This system has served as a model for similar equipment assessment and acquisition committees for laboratory medicine equipment; patient monitoring equipment; anesthesia equipment; computers; and equipment for nuclear medicine, cardiology, and other specialties. The system served as an establishment point for the NPO. The KP National Imaging Committee has representatives from both the Northern and Southern California Regions as well as the Northwest, Hawaii, Colorado, Georgia, and the Mid-Atlantic Regions. KP Ohio has declined representation, after the original representative left. Criteria similar to that used in the KP Northern California Region model are used. The committee is assisted by several subcommittees that include representatives from several KP Regions.

MRI Acquisition

The rational distribution of MRI machines as a function of efficiency and access in the multihospital system of Kaiser Permanente in Northern California serves as a good case example. When MRI was first introduced in the early 1980s, we were well positioned to assess our potential needs. Our size and the corresponding potential volume of scans secured very competitive rates—more than 50 percent lower than prevailing community rates. As use increased, we installed machines at permanent sites in our neurosurgical service facility and in the four largest centers, having first secured an understanding from those facilities that they were to serve as subregional centers for MRI.

To increase access to the equipment among the remaining facilities and to maintain accountability and competence (especially among our younger radiologists), we explored alternatives to a fixed-site installation. Utilization of the equipment had increased to the point that an external mobile service would be both advantageous and appropriate. Our mobile contract, which persists to this day, allows for the current installed base of 12 permanent units and five mobile sites, incurs a very competitive price per scan, and allows us use of a wide-bore machine for obese and claustrophobic patients.

Its credibility and acceptance well established, the committee saw its role as arbiter enhanced with introduction of the mobile service. Assignment of days and times and effective utilization monitoring enabled us to derive the most from this mutually beneficial contract. This result enabled us to review the needs of the smaller facilities in a slower, more rational manner as we budgetted for eventual permanent installation of MRI machines in all facilities.

In summary, given the context of finite resources, a rational plan for distributing MRI units has resulted in permanent installation of MRI equipment in about two thirds of our hospitals and in MRI services provided by a contract mobile service in about a third of our hospitals. We are currently assessing the need for more than one machine at our larger facility. Our budgetary process has been enhanced by moderate diffusion of this technology throughout the KP Northern California Region.

Most importantly of all, our patients’ easy access to MRI services enhances the services and quality of care they receive.
Expansion to Other Technologies

A similar process has occurred with two other committees (ie, the KP Anesthesia and Patient Monitoring Committees), which were formed in 1989 after five years of standardization attempts by the Chiefs of Anesthesia in the KP Northern California Region. These committees arose out of the success of the Chiefs in achieving standardized cost reductions in the purchase of pulse oximeters, capnography equipment, anesthesia machines, and assorted disposables. As a direct result of these initial successes, the committees have been involved in developing and designing diverse types of equipment in conjunction with multiple vendors. The immediate payback has been substantial: decreased costs of acquiring equipment, establishment of an in-house parts inventory with no cost to us for servicing most of the installed equipment base, and national recognition for the knowledge and negotiating skills of several participants.

Since advent of the Anesthesia Committee, cost savings for anesthesia machines has been outstanding. We estimate that national deployment of the established standard has resulted in savings of at least 45 percent and has given us the option of exchanging the new installed equipment base for the next generation of equipment at minimal cost.

Similar processes are in place in the Patient Monitoring Committee and have resulted in major savings: The installed equipment base is upgraded only when appropriate on the basis of substantial technological advances.

Conclusion

We have described Kaiser Permanente’s intent to refashion itself into a smart, selective buyer of supplies and technology by taking a new approach to purchasing. This activity has resulted in substantial savings during the past four years and, we hope, has improved the level of quality and service and has markedly increased compliance with our product formulary.

We have found strength in numbers. We have also enhanced value for our members, more strongly affected acquisition decisions, and negotiated major discounts for many types of equipment. Standardizing our use of fewer and stronger suppliers has provided us with strong pricing and other value-added enhancements while our suppliers increase their market share and develop both a more stable environment and a better working relationship with KP. And our physicians have been in the front lines, leading the charge! ❖

Acknowledgment: Juliene Malécot, BA, provided editorial assistance.

Related publication:

Other People

“There was a man who believed all his endeavors to be the result of his self-determination and self-reliance. He had very little gratitude.”

Determining whether a patient should be treated using a new technology—be it a promising screening test, a new surgical device, or an organ transplant—can be hard work. In an era when clinicians increasingly feel daunted by expectations for accessibility and service, clinicians and members alike are further challenged—and vexed—by the need to interpret and understand new technology and its applicability to individual members’ needs. This endeavor requires understanding that the technology’s effectiveness must be integrated with four other factors:

- The clinician’s desire to help the patient,
- The patient’s desire to be helped,
- Mutual intent of clinician and patient to find the right treatment, and
- Efforts of vendors to position and establish their products.

Choosing to use effective new technology further requires clinicians and patients to understand and participate in a fully informed decision with which they may be inexperienced or uncomfortable. Moreover, this challenge is occurring in a context of discontent and suspicion about the delivery and cost of health care. In this context, economic considerations and resultant stewardship tradeoffs can affect decisions of individual clinicians and health plan members whose preferences are more compatible with a nonexistent health care system: health care without financial constraint.

Choosing new technology for use by clinicians, health plans, and health plan members can thus be summarized as a threefold challenge:

- Ascertaining medical appropriateness;
- Creating a shared decision between clinician, health plan member, and the health plan; and
- Working within constraints of the health plan member’s insurance coverage.

Part 1 of this article addresses the first of these challenges: technology assessment and its roots in evidence-based medicine. Many clinicians and health plan members may perceive decisions about technology appropriateness and benefit coverage to be an intrusive reality of medical practice. This endeavor requires understanding that the technology’s effectiveness must be integrated with four other factors:

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- Mutual intent of clinician and patient to find the right treatment, and
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Choosing to use effective new technology further requires clinicians and patients to understand and participate in a fully informed decision with which they may be inexperienced or uncomfortable. Moreover, this challenge is occurring in a context of discontent and suspicion about the delivery and cost of health care. In this context, economic considerations and resultant stewardship tradeoffs can affect decisions of individual clinicians and health plan members whose preferences are more compatible with a nonexistent health care system: health care without financial constraint.

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Part 1 of this article addresses the first of these challenges: technology assessment and its roots in evidence-based medicine. Many clinicians and health plan members may perceive decisions about technology appropriateness and benefit coverage to be an intrusive reality of medical practice; nonetheless, my intent here is to examine technology assessment as an increasingly valuable opportunity for improving members’ health. This commentary is intended to represent this Permanente physician’s personal opinions and perspective and is not a policy statement of the Interregional New Technologies Committee, the Care Management Institute, the Permanente Federation, or any other body within Kaiser Permanente (KP) or of the Technology Evaluation Center of the Blue Cross and Blue Shield (BCBS) Association.

Determining Medical Appropriateness

For most—if not all—clinical conditions, clinicians and health plan members find themselves increasingly buffeted by vast amounts of information from varied sources about what treatments potentially “work” and what treatments appear to add value. This trend is especially true for new (and often, promising) technology.

The relative roles of clinician, health plan member, and health plan in supplying and interpreting clinically relevant information are in flux. Information technology allows health plan members to access knowledge which previously was only rarely available to nonclinicians. Clinicians commonly encounter patients whose didactic knowledge of certain relevant clinical material rivals or exceeds that of the clinician.

Previously serving as suppliers of clinical content, clinicians are becoming decision-making partners with patients by helping them to refine clinical context from an ocean of content. The clinician’s memory increasingly must access, store, recall, and integrate an ever-growing, ever-evolving knowledge base. Information technology, such as the Internet and the electronic medical record, are beginning to address this challenge but as yet do not meet the full range of needs for timely and relevant information at times when decisions are made and care is delivered. In addition, increasingly broad access to information and to methods of data storage is creating an escalating demand for a credible, durable way to assign relevance and importance to competing knowledge resources.

The clinician’s role is thus migrating from the benevolent, wise, paternal “Marcus Welby” model to a more demanding and complex three-part role: 1) dissect and solve clinical problems, 2) explicitly identify and characterize options, and 3) participate in achieving a shared, well-informed decision with an empowered health plan member or patient. (Of course, the fictional Dr Welby practiced in a simpler time of less medical knowledge and fewer treatment...
options. He also treated fewer patients in a year and was more likely to have sufficient time to be “all things” to those in his care. More patients with more complex medical histories and dilemmas transit through one episode of “ER”—the current television hospital drama—than Marcus Welby, MD saw in his entire fictional medical career.) The requirements of clinical judgment and experience are enduring; however, the currently evolving clinical paradigm also requires greater competence in knowledge management as well as the ability to explicitly define clinical context.

Evidence vs Eminence

Clinicians have always based their decisions on the evidence available and known to them. This evidence was acquired through personal experience in clinical practice, by reading the medical literature, in formal discussions and informal interactions with peers. Historically, this evidence guided clinical practice; and in educating practitioners, this evidence was given further context by the “eminence” of its source. From chief resident to department chairperson to national expert, personal eminence conveyed credibility, was appropriate, was earned, and got us to where we are now. The dilemma is whether this experiential and implicit approach to knowledge acquisition and analysis is adequate for the task ahead.

Can an unaided individual or group consistently and comprehensively analyze the growing body of medical knowledge in an experience-based, implicit manner? Will this analysis be reproducible across settings and across time? In part, the current variability (and resultant expense) of medical care delivery has been attributed to this historical reliance on implicit medical decisions. The theory now being tested is that sharing knowledge explicitly, agreeing to a definition of evidence, and then basing practice decisions on that definition will result in delivery of higher quality, less variable medical care.

Several examples of new technology being implemented before adequate research had clearly shown effectiveness have supported this concern about using implicit evidence for analyzing the suitability of new technology. A prominent example is the ongoing controversy over the benefit of high-dose chemotherapy with autologous bone marrow infusion for treating metastatic breast cancer. A decade of advocacy for this seemingly intuitive and logical clinical intervention included medical-legal pressure and legislative mandates for insurance coverage. The appropriateness of the intervention was ultimately called into question by results of randomized controlled trials that failed to confirm a consistent benefit justifying the considerable risk.1,2 This question has important implications for overall health care costs and for future health plan decisions. Of even greater concern to clinicians who care for these patients is the failure of members to make a fully informed decision: Because the projected benefits of the intervention were substantially overstated—they were based on implicit observation of initial trials only—some patients referred for the intervention were not adequately informed about the balance of its risks and benefits. This and other examples have stimulated the quest for shared standards (and processes) of evidence analysis to better substantiate expected benefit more explicitly and reproducibly. Stated otherwise, the desire is to better communicate what is known and what is as yet unconfirmed—and thus what is potentially both promising and harmful.

The KP Interregional New Technologies Committee (described on page 46 in this issue of The Permanente Journal) is charged with helping clinicians and health plan members to make decisions about the general medical appropriateness of new medical technology on the basis of what is known about this technology.

An enduring key principle of Permanente Medicine that should be emphasized is that the ultimate decision about the medical appropriateness of using a particular technology for any given KP Health Plan member is made by the clinicians responsible for the care of that member. In certain complex situations, such as organ transplantation, KP clinicians seek a decision on medical appropriateness from committees of informed and involved clinicians.

The KP Interregional New Technologies Committee uses an explicit process to analyze and summarize the evidence supporting use of new technology. This approach is modeled after criteria articulated by an ongoing collaborative venture between KP and the BC-BS Technology and Evaluation Center:

1. Is the technology subject to licensing by an oversight body such as the US Food and Drug Administration (FDA)? If so, has the technology been approved by that body?

Of importance is that the “evidence standard” and threshold used by the FDA for licensing a technology as “safe and effective” is often insufficient to fully support the medical appropriateness of applying the technology to a specific clinical situation. FDA
approval is thus necessary—but is itself insufficient—to justify use of new medical technology.

2. **Does adequate evidence support the appropriateness of using the technology?**

   Meeting this criterion enables determination of whether the data support conclusions “beyond any reasonable bias,” and this evidence generally requires gathering well-conceived, well-conducted clinical trials; for most technology, controlled, peer-reviewed, randomized trials are the necessary standard of evidence.

3. **If the second criterion is met, is it effective?**

   Does the technology improve the relevant health outcome?

4. **Is the effect of the technology at least as great as other interventions for the relevant medical condition?**

5. **Can the observed benefit be achieved outside the investigational setting?**

   Technology that meets the above criteria will generally be medically appropriate for use in applicable clinical settings.

   The converse, however—ie, when technology fails to meet one or more of these criteria—presents a more complicated situation. Within KP and the INTC, the overall evidence is weighed before clinicians are given a recommendation about the general appropriateness of using the technology. Technology that fails to meet the BC-BS Technology Evaluation Center criteria may be characterized as not medically appropriate for general use by KP members. When technology produces conclusive evidence of no effect (ie, no benefit) or evidence of net harm, the technology is characterized as generally inappropriate for use by KP members. This circumstance may also be reflected in health plan coverage as communicated to members and purchasers: ineffective therapies may be excluded from benefit coverage.

   However, “insufficient evidence” (eg, failure to meet the second criterion) does not mean that intervention using the technology is never medically appropriate for any KP member; instead, each clinician and member must reevaluate the balance of risks and benefits for the member and reconsider the member’s clinical condition in an explicit and shared manner.

   Not all interventions will meet the above “standard of evidence.” In applying evidence to clinical decision making, David Eddy, MD, PhD\(^3\) has characterized a pragmatic clinical approach which can be summarized as follows:

   - If evidence of benefit exists for an intervention, support use of the intervention and, for each patient, balance the intervention with other, “competing” interventions of comparable effectiveness;
   - If the intervention produces no effect or harms a patient, do not use it for that patient;
   - If the evidence supporting use of the intervention is inconclusive, use a conservative approach:
     - For new technology, examine it in a research setting (otherwise, evidence of effectiveness will remain inconclusive);
     - For “old” technology, do not promote its use beyond its known benefits.

   In the subsequent part of this discussion, to be published in the next issue of *The Permanente Journal*, the challenge of integrating technology assessment into the pursuit of an informed and ideally shared clinical decision between clinician and member will be considered.

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In October 1999, Kaiser Permanente (KP) Online became an established program in all nine KP Regions. KP Online is the World Wide Web portal through which KP members can interact directly with the Health Plan and Permanente Medical Groups. The KP Online Web site (http://www.kponline.org) is a place where members can find answers to their medical questions and can interact both with other members and with KP professionals. By the time this article is published, more than 300,000 members will have registered with KP Online. If current projections are correct, close to a million members will be using the service by the end of 2001.

KP Online: One of Several Web Portals to KP

KP Online is sometimes confused with Kaiser Permanente’s other Web portals. There are five major portals to KP, two of which are accessed from the World Wide Web, and three of which are accessed from the Kaiser Permanente Intranet:

- KP Online (http://www.kponline.org) is the members’ portal. It can be accessed from the World Wide Web and requires that users be Health Plan members who have registered and selected a password.
- The Kaiser Permanente public site (http://www.kaiserpermanente.org) is also accessed from the World Wide Web. Anyone with a Web browser can visit the site and view its content.
- The clinician site (http://pkc.kp.org), also known as the Permanente Knowledge Connection, is part of the KP Intranet and cannot be accessed directly from the Web.
- The employee site (http://kpnet.kp.org) carries news and announcements of interest to KP employees and is also an intranet site.
- The vendor portal (URL not defined at this time) will include e-commerce and supply-chain content.

The best way to understand KP Online is to go to the site and register. To register, you must be a member of the Health Plan, although guest accounts can be arranged for KP professionals who are not Health Plan members. When you register, you can specify a user name and a password and can view the noninteractive portions of the site. A few days after registering, an activation code will be mailed to you. When you return to the site and enter your activation code, you will then be able to use the interactive features. The activation code need only be entered once. Once registered, KP Online members are presented with five major options when they visit the site (Figure 1):

- **What’s new.** This is a frequently updated review of member-oriented health news.
- **Learn.** Access to a remarkably detailed Encyclopedia of Medical Conditions, a Drug Encyclopedia, and a personal health assessment test.
- **Explore.** This feature presents a guide to KP facilities, listings of health education classes, and a link to the KP public site (http://www.kaiserpermanente.org).
- **Communicate.** This feature contains links to advice nurses, pharmacists, and online discussion groups and a place to book nonurgent appointments for primary care.
- **Using.** This area contains information about security policies, passwords, and searching the site.

Figure 1. Entry Screen for KP Online. Accessed via the World Wide Web: https://kponline.kp.org/home.shtml [accessible only to members]. (Reproduced by permission of the National Member Technology Group, Kaiser Permanente Online.)
Special Qualities, Special Purposes

All features of KP Online are subjected to regular quality assurance review that focuses on both the content and its presentation.

KP Online distinguishes itself from the tens of thousands of other “health” sites on the Web inasmuch as it exists to support the clinical mission of the Health Plan and Permanente Medical Groups. Unlike many other sites, KP Online is not a “dot com” — a company which exists to sell a product or to compile data for sale to commercial users. Instead, KP Online is an alternative way for members to access the Health Plan — and this access is a high priority of the organization. Access can take the form of a question to an advice nurse or pharmacist or can be a request for a nonurgent appointment for primary care. In KP Online discussion groups, members can share information with each other and with KP professionals who serve as trained moderators.

How KP Online Came To Be

In the early 1990s, Tim Kieschnick (who now serves as Product Definition Manager for KP Online) authored a white paper discussing the need for an overall organizational strategy to approach the issues of media and technology. At the time, Mr Kieschnick was working for the Northern California Permanente Medical Group Regional Health Education Department. Dr David Sobel and Laura Keranen, each a Director of Regional Health Education, supported his work.

Early on, when Mr Kieschnick and his colleagues realized that the issues relevant to KP Online went beyond health education, other programs became involved. Mr Kieschnick and Bill Caplan (who was working on New Practice Models) formed the Interactive Technology Task Force. The Task Force generated scenarios of “a good future” that included four core elements:

- Lay decision support
- Clinical medicine (telemedicine and remote consultation)
- Psychosocial support
- Member business functions

In mid-1995, recommendations of the Task Force were submitted to Dr Robert Klein, head of TPMG Operations. The recommendations proposed specific sequences of activities and funding levels for a strategic approach to using these new online technologies and resulted in both the funding of the Interactive Technology Initiative (ITI) and the hiring of Anna-Lisa Silvestre as Business Manager. The ITI sponsored and managed a variety of new projects, including several innovative telemedicine projects.

At about this time, the World Wide Web emerged as the dominant mode for digital communication. The ITI began to reformulate its plans to take advantage of the Web. To meet its strategic goals, ITI set a goal of providing a Web site that would have “basic functionality” and that would be available to 1000 members by the end of 1996.

The Netscape Company was hired to build the first ITI Web site, which was first deployed for the KP Santa Clara Medical Center. Members were recruited through mailings to targeted employee groups. The discussion groups, health information, facility directories, and the ability to book nonurgent appointments or to communicate with an advice nurse were in place by the end of 1996.

In 1997, the project was moved to the KP Program Offices. The National Member Technology Group was formed, and KP Online was the Group’s main project. Shortly thereafter, the project was expanded to the Mid-Atlantic and Northwest Regions.

In 1998, the infrastructure of KP Online was enhanced by installation of a robust server in Silver Spring, Maryland, to provide Kaiser Permanente’s first secure Internet service based at the KP Data Center. In 1999, the rollout of KP Online was completed in all nine KP Regions.

Table 1. Satisfaction with KP Online as reported by users responding to survey(s) (n = 2998 for 1998; n = 3930 for 1999)*

<table>
<thead>
<tr>
<th>Level of satisfaction</th>
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Who Uses KP Online—and Why They Do

The Web's impact on health care cannot be ignored. According to the US Department of Commerce, 116.5 million Americans had access to online services in August 2000, and more than half of all Americans will have Internet connectivity by 2001. Moreover, 52 million Americans have used the Web for medical information. Of Kaiser Permanente members Programwide, 72 percent have Internet access, ranging from 82.7 percent in the Mid-Atlantic Region to 50.7 percent in the Ohio Region.

The approximately 117,000 KP Online users in 1999 had the following characteristics:

- Forty-two percent of members who registered on the site are aged between 45 years and 64 years, and 32 percent are aged between 30 years and 44 years.
- Overall, 57 percent of KP Online users are female, and 43 percent are male.
- One fourth of KP members who registered on the site have belonged to the Health Plan for two to five years.
- Many KP Online users work for large and strategic employer groups.
- The number of Medicare members registered on the site ranged from 4 percent to 12 percent in KP Regions where data were available.

Initial e-mail surveys of our members who have used KP Online suggest that they are generally satisfied with the site and that their trust in the information on the site is heightened by knowing that it is an official service of our organization. During 1999, 68 percent of the 749 members responding said that KP Online was helpful to them, and an additional 12 percent reported that the site was helpful to others.

We were not surprised that the most popular features of the site were the convenience features that allow members to communicate with pharmacists and advice nurses and to schedule appointments online. Eighty-eight percent of 437 members responding were satisfied with the pharmacist questions feature; 80 percent of 591 members responding were satisfied with the advice nurse function; and 73 percent of 526 members responding were satisfied with the appointment request feature. Figures 2 and 3 summarize members' reports of how these services were helpful.

Requests and Concerns

Kaiser Permanente members are nearly unanimous in what they want next from KP Online. From member responses to monthly surveys, several themes—more convenience, more connectivity, and more customized information—have emerged. Members want to view laboratory results and medical records; make appointments in more departments than just Medicine, Obstetrics-Gynecology, or Pediatrics; and communicate directly with their physicians and other providers via e-mail. They also want to view provider biographies online and to use these biographies to guide the choice of personal physician. Members also want to fill and refill prescriptions online.

Although all these transactions are technically fea-
Using the hardware currently available, implementation is definitely not—as some members believe—simply a matter of “just throwing a switch.”

First and foremost, any new portal between our members and our providers must be secure. Further, such new services should not increase the workload. Replying to e-mail, for example, can take as long as a routine office visit; if even three or four such messages reach a provider in a single day, the workday becomes an hour longer. Some system must therefore be set in place to triage incoming messages so that only the most crucial ones reach providers. Moreover, members must understand that having an e-mail portal does not guarantee unlimited access. And providers need to learn online communications skills and develop procedures for rapidly responding to frequently asked questions.

Having lab results available to members online also poses formidable problems, including, again, security. How will we communicate to members the clinical significance of “normal” and “abnormal?” Many clinicians, I’m sure, have had the experience of having a distraught patient fixate on an abnormal lab value of no clinical significance—for example, an aspartate transaminase of 41 (upper limit of normal is 40). How do you explain to such a patient that there is no problem despite the “abnormal” asterisk next to the result? Or how to release x-ray results? Radiologists are in the habit of including a differential diagnosis in their reports, and some of these differentials can include rather terrifying (or unclear) terms such as “cannot exclude neoplasm” or “spondylolisthesis.” Can we devise a system that works as well as a calm, face-to-face presentation of lab results?

KP Online and KP Clinical Information Systems (KP CIS) are working together to plan for how CIS data will be shared with members. A major piece of the technical infrastructure to be developed is known by the acronym MUMU, which stands for Member Universal Messaging Utility. MUMU is intended to be the switching network that routes clinical data, appointment information, and member inquiries. KP Online will develop the application that allows members to view the data, receive personal health prompts, update their own personal health records, and exchange messages with their care team.

Building the “virtual medical center” is an exciting challenge. The impact of the forms we develop will be as transforming for clinical medicine as the telephone was in the late 19th Century—perhaps even more so, because the Internet has grown explosively over a much shorter period than the telephone did.

This year, KP Online began to feature online prescription refills (for the KP Northwest Region and the California Division), Automated Appointments (for parts of KP Northern California), and Provider Selection and Empanelment (also for parts of KP Northern California). During the summer of 2000, KP Online conducted pilot studies on online care management of diabetes, congestive heart failure, and chronic pain—priorities of the KP Care Management Institute.

Our organization’s heavy investment in hardware, in software, and in the human beings who manage this technology creates the business imperative to show a return on our investment. Will having a world-class interactive Web site help retain members? Can health education or chronic disease management be performed effectively online? Does the ability to connect

Figure 3. Graph shows percentage of users of KP Online surveyed in 1999 who reported being helped by its advice nurse and pharmacist features. (Adapted and reproduced by permission of the publisher and author from: Maxwell V, Shafer J. Kaiser Permanente Online: 1999 evaluation results [Oakland, CA]: National Member Technology Group: [2000] p 43, 49.)
with providers or with other members online reduce the demand for office services or decrease telephone traffic? How can our older members or lower-income members—the groups that now stand on the other side of the “digital divide”—gain access to KP Online?

Might it make sense to give some members a personal computer with Internet connectivity?

These questions form the basis for a great deal of research that has yet to be done. It is fitting that Kaiser Permanente, so long a leader in developing the forms of high-quality, reasonably priced medical care, has the chance to be a leader here, too.

Acknowledgment: Dennis Sweeney, MBA Senior Technical Project Manager, Cap Gemini Ernst & Young, assisted in compiling descriptions of the various Kaiser Permanente Web portals.

References


Disconnected Strangers

“If you get too large, you don’t have enough work in common. You don’t have enough things in common, and then you start to become strangers and that close-knit fellowship starts to get lost.”

Malcolm Gladwell, “The Tipping Point,” Little, Brown, and Company
The curtains are closed. The room smells of chrysanthemums and baby powder. A wet sheet pastes itself to the bed, drying slowly in faint brown rings. The commode is overturned. Morphine tablets lie deliquescent beside an empty glass. Someone knew he was not coming back, unplugged the TV and left.

by Sharon Carter, MD
Previously published “Spindrift” 2000

More of Dr Carter’s artwork can be seen on the cover and pages 49 and 68.
**Nephrology Symposium**

The Third Annual Nephrology Symposium will be held March 30-31, 2001 at the Westin Hotel in Long Beach, California. Topics to be discussed will include:

- Optimization of Pre-ESRD Care
- Treatment of Hypertension
- Care of the Pre-ESRD Patient with Diabetes
- Prevention of ESRD;
- Nutrition and the DOQI Guidelines
- End of Life Issues
- CRRT
- Hyperphosphatemia and Hyperparathyroidism
- Pharmacological Management
- Calcifications in ESRD
- Using the Internet for Effective Health Care
- Vascular Access Update
- Pre-ESRD Research Study Results
- SPK and PAK Update

Contact Lisa Butterworth at 626-564-5378, or LQButterwo@kp.org for more information.

**5th Annual Interregional Educational Symposium for NPs, PAs, CNMs, and CRNAs**

The 5th Annual Interregional Educational Symposium for NPs, PAs, CNMs, and CRNAs will be held August 16-18, 2001, at the Hyatt Newporter in Newport Beach, CA. Over 50 topics will be presented, including adult, pediatric, OB/GYN, anesthesiology and long-term care specialties. Brochures will be mailed in May. For more information, please contact Wendy Friedman, tieline: 8-338-3075, or 626-564-3075.

**10th Annual Interregional Internal Medicine Conference**

The 10th Annual Interregional Internal Medicine Conference will be held July 22-27, 2001 (please note corrected date), at the Sheraton Orchid, Kona, Hawaii. The five-day program is designed for internists, family physicians, nurse practitioners, nurses and other primary care providers.

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Jon Kabat-Zinn, PhD, featured in this user-friendly practical video, instructs beginners and advanced practitioners in mindfulness meditation. Dr Kabat-Zinn and physician faculty discuss and demonstrate tools for integrating mindfulness in treating patients, staff, and oneself with greater moment-to-moment awareness. Dr Kabat-Zinn is the founder and former director of the UMMHC Stress Reduction Clinic and is a Professor of Medicine in the division of Preventive and Behavioral Medicine at the University of Massachusetts Medical School. He is the author of two best-selling books: *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress; and, Wherever You Go There You Are: Mindfulness Meditation in Everyday Life.*

A maximum of one hour in Category 1 CME credit is available through the National CME Program. Tapes will be available for purchase Spring 2001. Contact: claire.cohn@ncal.kaiper.org or TPMG Physician Health Department, 1800 Harrison Street, 7th Floor, Oakland, CA 94612; 510-267-4105.

**Kaiser Permanente Primary Care Conference**

April 9-13, 2001
Outrigger Wailea Resort, Wailea, Maui, HI

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The Healthy Mind, Healthy Body Handbook
by David S Sobel, MD and Robert Ornstein, PhD

Book Review by Katherine M Jakstis, MS

The Healthy Mind, Healthy Body Handbook, authored by Dr David Sobel, a Kaiser Permanente physician, and Dr Robert Ornstein, a research psychologist, is the perfect complement to the Healthwise Handbook, which was reviewed in *The Permanente Journal*, Volume 4 No. 3 (Summer 2000, p 86). Whereas the Healthwise Handbook touches on the mind-body connection, *The Healthy Mind, Healthy Body Handbook* explains in practical, easy-to-understand detail how the power of the mind can benefit both physical and emotional health. Along with enlightening the reader about this crucial link, the authors lay out in step-by-step format dozens of exercises and techniques to help prevent health problems, lessen uncomfortable symptoms of illness, enhance well-being, and—in some cases—actually treat and cure disease.

The book is divided into three logical segments. The first section, Staying Well, covers such expected topics as relaxation, physical activity, and imagery and communication, but also included are the less-discussed topics of how to successfully make life changes, the role of humor and laughter in wellness, healthy sex, healthy thinking, and others. The second portion of the book, Managing Common Problems, deals with circumstances that can erode health. The focus in this section is on the causes of and what can be done about anxiety, depression, anger, time pressure, sleep problems, trauma, addiction, chronic pain, and chronic illness. The third part of the book, Managing Medical Care, addresses how a person can collaborate effectively with health professionals in order to achieve his or her optimum health potential. Topics in this section include making the most of the doctor-patient relationship, discussing and making decisions about medical tests, managing medications, and preparing for major medical interventions such as surgery.

Although clear throughout their work that “mind-body prescriptions” are not panaceas and are not meant to take the place of professional help, the authors make an impressive and credible case for employing the techniques and recommendations put forth in *The Healthy Mind, Healthy Body Handbook*. As the research cited in the book demonstrates, people who regularly practice self-help strategies need medical intervention less often. And when professional help is needed, such a person’s response to treatment—whether pharmacologic or surgical—is often better than expected and the overall outcomes more successful.

This easily digested book is for health care professionals and patients alike. It’s well-organized 284 pages are brimming with practical, easy-to-follow health-enhancing strategies that almost anyone can take advantage of. Also worth noting is that benefiting from *The Healthy Mind, Healthy Body Handbook* does not require reading the entire book. In fact, when recommending the handbook, clinicians may find it more effective and less overwhelming to direct patients to the chapters which address their personal concerns. If patients read and apply information from only a limited portion of the book, they will still be doing themselves—and possibly you, their health care practitioner—a considerable favor. ❖
Beyond Managed Care: How Consumers and Technology Are Changing the Future of Health Care

By Dean C Coddington, Elizabeth A Fischer, Keith D Moore, Ronald L Clarke

Review by Vincent J Felitti, MD

This easy-to-read book will appeal to physicians and others interested in becoming more knowledgeable about the social, political, and economic problems facing medical practice. Insulated and protected though we are by the size, integrated nature, and prepayment system of our own health care environment, the Kaiser Permanente Medical Care Program, we are only less problem-laden than our colleagues in the community; we are not problem-free. The problems facing all of medical practice are difficult ones about which to become knowledgeable; those physicians who come away from Board report meetings feeling confused by the current jargon may find some relief in the understandable approach provided by the editors of this book.

The book starts with a brief review of how medical practice has changed in recent times and of the role Kaiser Permanente played in changing the dynamics of medical care. A graph shows how the past 20 years have brought about a distinct decrease in number of hospital days—a decrease coincident with a major increase in number of outpatient visits. Why is this? In part, of course, this phenomenon reflects a shift in location of care, but are other explanations possible? Might the present system of symptom-driven primary care be showing its weaknesses more prominently now that this care has become more widely available (ie, because of the distinctly increased number of physicians practicing during the same period)? Why have advances in medical technology increased costs whereas advances in the electronics industry have decreased costs? How do Kaiser Permanente measurements on these points compare with those of the community?

Especially useful are the book’s discussions of various actual and proposed payment plans. The closing chapters propose and analyze four different health care scenarios and present a memorable graph in which the proposed scenarios are plotted against axes of legislative effort and individual control and responsibility. To say that everyone in a wealthy country should have adequate health care is easy, but defining this care is difficult—especially when legislatures impose piecemeal coverage requirements on private insurers.

Beyond Managed Care is worth a quick read for its analysis of problems from the standpoint of consumer and health care payer. The book is not designed to provide answers but does clarify the questions and the key issues from which those questions arise. As the book clearly shows, being a technically astute clinician is no longer sufficient for successful medical practice.

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Health Systems

The Lighter Side of Medicine

Original Research

Soul of the Healer
Index of Articles — by Author

**Volume 4**


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- **Clinical Contributions** (word count range is 725-2500)
  Clinical articles on the practice of medicine within the Permanente Medical Groups and their affiliates. Article topics may include reviews of “successful” practices, programs and policies, and analyses of new technologies.
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Section A.

The new technology of Pharmacogenomics will allow us to choose medications for treatment based on an individual’s genetic makeup. This technology takes advantage of the following principle:
   a. There are variations in each of our genomes known as “SNPs” (Single Nucleotide Polymorphism)
   b. All of the genes for diseases will eventually be found
   c. The nucleotide sequence of the genome has been or will be soon completed
   d. Cloning technologies will be useful for the choice of medications
Cloning technologies will be used in clinical medicine for the following:
   a. Production of pharmaceutical agents
   b. In the production of stem cells for the treatment of human disease
   c. To produce organs from animals for transplantation into humans
   d. All of the above

Article 2. Clinical Management for Survivors of Sudden Cardiac Death (page 18)
A cardiac arrest survivor who is found to have normal left ventricular function in association with a severe narrowing of the left main coronary artery requires coronary revascularization and
   a. an electrophysiology study
   b. no additional treatment for his arrhythmia
   c. life-long treatment with amiodarone
   d. implantation of a cardioverter-defibrillator
According to the AVID (Amiodarone Versus Implantable Defibrillators) study, patients who have suffered a ventricular fibrillation cardiac arrest had the best survival if they
   a. received an electrophysiology study
   b. were treated with sotalol
   c. were treated with amiodarone
   d. received an implantable cardioverter-defibrillator
   e. received both amiodarone and a cardioverter-defibrillator

Article 3. A Commentary on Technology and the Future of Health Care (page 5)
A high priority for the future will be:
   a. Assisting health care providers to practice medicine alone in a complex environment
   b. Incorporating high-quality, empirically derived evidence into medical practice
   c. Relying exclusively on the expertise of geneticists and genetic counselors to communicate complex information to patients
   d. All of the above
In 1998, what proportion of hospitals used the Internet to give information directly to patients?

a. 98%
b. 76%
c. 53%
d. 20%

Article 4. Clinician Champions and Leaders for Electronic Medical Record Innovations (page 40)
Which of the following statements is FALSE?

a. Champions or leaders for change can be developed through training
b. Champions need reliable and ready information
c. Champions need opportunities to demonstrate and model their knowledge and attitudes
d. Champions are likely to be effective even if purely voluntary and on their own time
e. Champions should be supported and developed for optimal project success

Which of the following statements is TRUE?

a. Achieving clinician acceptance of an electronic medical record can be difficult
b. Electronic medical records may require change in work patterns
c. Electronic medical records may catalyze organizational transformations
d. Effective peer leadership may ease the transition and promote successful diffusion of innovations
e. All of the above

Section B. Referring to the CME articles and the stated objectives, please check the box next to each statement as appropriate

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<td>I plan to seek more information on this topic.</td>
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<td>I understood what the author was trying to say.</td>
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Section C.
What change(s) (if any) do you plan to make in your practice as a result of reading these articles? ______________________
___________________________________________________________________________________________________________
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Section D. (Please print)
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