

The Impact of Healthcare Informatics on the Organization

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In addition to the challenges of moving clinical and financial information across geographical locations and types of services, technological advances are creating new opportunities for healthcare professionals. New services are now being provided, and established ways of doing work have become outmoded.

TELECOMMUNICATIONS APPLICATIONS IN CLINICAL PRACTICE

The most visible advance that most people are aware of is telecommunications applications for healthcare. The wireless telephone, the facsimile machine, teleconferencing capability, the Internet, and local area networks within healthcare organizations now make it possible for healthcare professionals to consult, confer, change orders, and update treatment plans without traveling to the patient encounter site. For example, patients may have specially designed telephones or computers to directly measure and transmit assessments of

vital signs, chest sounds, or images of wounds from their locations to nurses or physicians. This technology makes it possible to monitor disease or wound management or assess an emergency situation for appropriate care from a distance. Physicians in different countries may now consult on a complex health problem with real-time imaging of the patient, as well as diagnostic data, such as an ongoing electrocardiogram reading. Nurse case managers may now participate in multidisciplinary teleconferences with a client and other professionals at distant sites. Patients can make appointments via the Internet or obtain answers to their questions concerning their disease or disability via e-mail. Other applications include the following¹:

- Interinstitutional patient and clinical records and information systems
- Community health information networks for surveillance of infectious diseases, environmental risk factors, and epidemiologic analysis
- Health information and education networks and multimedia sources
- Distance learning for both continuing education and degree-granting programs
- Networked research databases and libraries

Telecommunication devices make healthcare delivery more effective and efficient by reducing the time and effort needed by healthcare personnel to share

information with primary care offices, nursing units, and ancillary services, such as pharmacy, radiology, and social work. The devices also reduce patient and family travel time needed to pick up referrals and managed care authorizations before seeing a specialist. New telecommunications applications are continually being developed and implemented.

TECHNOLOGY CHANGING THE DEMAND FOR INPATIENT CARE

New pharmaceuticals, surgical procedures and devices, and knowledge about disease and disability processes, coupled with financial pressures, are moving many healthcare services out of the inpatient overnight hospital stay and into the office, home, or same-day-service mode. This trend, along with advances in telecommunications, is dramatically reducing the demand for inpatient centralized hospital services and expanding the demand for community-based services. Simultaneously, the pressure to demonstrate effectiveness in reducing costs and increasing desired outcomes is creating new jobs for healthcare professionals to monitor, measure, manage, and coordinate care for patients across episodes of treatment at multiple sites with multiple providers. These jobs often require computer and telecommunication skills.

Another growing area for healthcare professionals with additional information systems (IS) training is in information technology (IT)

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departments, where their clinical knowledge and technical knowledge of computers and telecommunications provide an ability to work with "both sides." These individuals are effective at problem solving to reduce service gaps and errors, as well as promoting and implementing the use of new applications in a clinical environment.

HEALTHCARE PROFESSIONALS' RESPONSES TO INFORMATICS ADVANCES

New IT applications are both desired and feared by those healthcare professionals with a clinical orientation. Clinicians value individualized care, direct service provision to prolong life, professional autonomy, and a hierarchy of authority. These values may act as barriers to use of many IT applications that standardize language and care processes. Healthcare professionals place a higher value on providing direct services using an individual provider's clinical judgment than on following protocols and documenting observations, services, and outcomes. An assumption is made that "doing the right thing" will result in the right outcome; there is also the belief that documenting desired outcomes is redundant. Clinicians are more motivated to use applications that they perceive as reducing error and transmission time to gateways for services, such as wireless telephone contact between nurses and physicians or facsimile sending of orders between departments or agencies.

Traditional values and practice patterns have created organizational cultures (norms, values, and informal standards of behavior that guide behavior in organizations) that conflict with the current trend for evidence-based practice to achieve long-term outcomes defined in conjunction with the patient. Evidence-based practice includes the use of interventions and treatments that are research based to support clinical decision making. Payers, researchers, regulators, accreditation agencies, and administrators seeking to identify the effectiveness of interventions and the quality of patient

outcomes are creating coercive pressure, based on power relationships, for clinicians to establish "best practice" standards, develop clinical pathways of recommended interventions, and determine desired outcomes for each clinical condition, disease, and disability. Deviations from these standards and guidelines should be justified with patient data.

These groups are also demanding the reduction of costs of care in the final year of a person's life and increased compliance with advanced directives and patients' desires for hospice care.² This conflict with healthcare providers' values and usual practice patterns must be addressed to gain their cooperation and collaboration. Signs that leading clinicians are promoting evidence-based practice are shown by the themes of workshops, publications, and "best practice" reports, creating mimetic pressures for others to follow. In other words, healthcare professionals are encouraged to practice in ways that imitate standards that have been incorporated into the practice of recognized experts. In time, values will shift to support evidence-based practice creating normative pressures for peer acceptance. Normative pressures encourage adoption of behaviors that are accepted by one's group.

The speed of these changes will be influenced by the strategies used by payers, researchers, and administrators to introduce and institutionalize evidence-based practice.³ IT systems are needed to effectively support evidence-based practice implementation and to convince healthcare professionals of its value. Limitations to development of software for outcomes measurement are shown in Figure 1.

The inclusion of patient input for treatment options, advanced directives, and definition of desired outcomes makes the algorithms even more complex. Once these algorithms are in place, IT issues of programming, user-friendly software and hardware features, immediate reporting, patient information security, and faster load time for access can be addressed by the IT industry. In return, healthcare organi-

zations must decide to invest more in IT systems, employee hardware, IT maintenance, and IT training.⁴

CHANGES IN PROFESSIONAL PRACTICE RESULTING FROM ADVANCES IN HEALTHCARE INFORMATICS

ACCESS TO MORE INFORMATION VIA THE INTERNET

Advances in healthcare informatics are increasing clinicians' access to information that is vital to improving their practice. More and more healthcare organizations are providing Internet access to staff clinicians at the same time that they are creating Web-based policy manuals, formularies, pharmacologic protocols, and other internal documents. Clinicians are also using Internet access to obtain information on practice guidelines, continuing education, patient/family educational materials, and even distance-learning for academic degrees. Increasingly, integrated healthcare systems are contracting with multimedia education firms to deliver interactive training simultaneously to multiple sites instead of either sending trainers to sites or having employees travel to central sites.⁵ This is especially useful when introducing new technology or meeting regulatory requirements for training.

CHANGES IN TIME DISTRIBUTION OF WORK IN HEALTHCARE SERVICES

The adoption of other telecommunication devices is discussed earlier. Use of

- Prerequisite of agreement on standards for treatment and desired outcomes across practitioners and settings.
- Clinicians' wariness of technology interfering with practice or lowering productivity.
- Lack of a standardized clinical vocabulary across disciplines and settings.

Figure 1. Limitations to development of software for outcomes measurement.⁴

telecommunication technology has changed the time distribution of clinical activity and reduced the time for information transmission. It has also increased the frequency and timeliness of interaction among staff nurses, allied professionals, and physicians, often resulting in increased collaboration and coordination of care. Simultaneously, it has increased expectations and reduced control of time for nurses and allied professionals carrying cellular phones. Their day is now filled with interruptions for real-time communication.

ISSUES AND SOLUTIONS WHEN IMPLEMENTING PHYSICIAN ORDER ENTRY

The electronic health record (EHR), also referred to as the computerized patient record (CPR), is being only partially implemented. The most frequent application now being used is physician order entry (POE), connecting patient care sites with the pharmacy, laboratory, and radiology departments. Adoption of a POE often takes years; for instance, implementation on a pilot unit at Johns Hopkins took 2.5 years of planning and an additional 11 months to fully implement. Issues that delayed implementation included the following:

- Development and approval of order sets for frequent configurations of orders specific to high-volume diagnoses on that unit
- State approval for an electronic signature
- Allocation of sufficient personnel hours to task forces
- Alternative paper backup for computer downtime
- Clarification of terminology for the laboratory
- Reduction of the number and complexity of screens for order entry of medications
- Staff acceptance of clinical pathways

Few of these issues could be resolved through technology. Resolution required dealing with the interpersonal barriers relating to the culture of

healthcare, which are discussed earlier in this article.

Planning for information systems in healthcare must include an understanding that all problems cannot be anticipated. Therefore, senior management must be available at a moment's notice when problems affect patient care delivery. A POE requires ongoing involvement of physicians, staff, and all areas of the information system throughout the adoption process and periodically thereafter as treatment protocols change. Often organizations underestimate the time and commitment of administrators, physicians, other healthcare professionals, and IT staff that are needed during a period of several years to take any informatics project from planning to adoption throughout an agency. The transition may take several years.

Parallel paper and electronic systems, as well as interfaced paper and electronic systems, must be in place to support continuous delivery of services during this time. This duplication of documentation increases time commitments for clinicians. This can dampen their long-term commitment to the project. Once adopted, these systems increase accuracy, eliminate transcription errors, decrease time between order and service, and reduce time needed to track an order within the system. However, the systems do not always reduce the time needed to place an order. Therefore, the institution may benefit from the automation, but not every staff person will experience the same benefit.

ACCEPTANCE OF HEALTHCARE INFORMATICS BY HEALTHCARE PROFESSIONALS

In inpatient and ambulatory care facilities, informatics results in a total change in the work of administrative support personnel, as well as many changes in the workflow of physicians, nurses, and allied health professionals while increasing the need for training in computer and telecommunication skills. Reduction of the transcribing, copying, and distribution work has

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broadened the responsibilities for administrative support personnel. Once an application such as order entry is in place, all professionals need some level of keyboarding skills to interact with most information systems. Technical support for users of the information system during all business hours is essential.

The acceptance by healthcare professionals has varied from refusal to use the system to pushing for the addition of new applications. For example, some physicians have been so resistant to direct order entry that agencies have hired scribes to provide computer input for physicians' verbal or written documentation, which is then signed off by the physician. Other physicians have been leaders in the design of screens and coordination of rollouts of new applications. In IT environments, nurses and allied health professionals spend less time tracking the status of orders, calling physicians for clarification of orders, or transcribing orders and more time communicating using telecommunication devices and computers.

Access to hardware is an issue on many units. A limited number of workstations or poor geographic distribution of access points can reduce efficiency gains from automation. System downtime and time for reprogramming changes, such as updates in protocols, are issues for some agencies. Often staff members need retraining and additional information to ensure that they are using the new system appropriately and to communicate changes as problems are addressed and resolved.

Informatics has also provided the communication links to support dispersed services to specialized populations. There has been a rise in healthcare businesses for specific market niches, such as pain management, incontinence management, wellness and fitness management, independent living of the frail elderly, and parish nursing. For these services, telecommunications and computer applications have improved the quality of services and health of the individual patients.

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CHANGES IN MANAGEMENT ROLES RESULTING FROM ADVANCES IN HEALTHCARE INFORMATICS

INFORMATION SYSTEMS SUPPORTING RAPID RESPONSE TO CHANGE

Today's turbulent healthcare environment with changing reimbursement mechanisms—along with rapid advances in technology and clinical knowledge—requires rapid response to change through integrated informatics for organizational and system survival. The trend toward larger systems provides the capital and variety of services needed to survive severe cuts in resources and technological obsolescence and to purchase expensive new technology. Conversely, informatics also supports the localization of decision making. Information systems that support localization of decision making are responsive to changes and needs in specialized service areas. Decentralized decision making creates the need to restructure healthcare organizations, which have traditionally been hierarchical and bureaucratic. These changes demand a dramatic change in management strategies and skills at all levels.

LEADERS' NEED FOR INFORMATION SYSTEMS SKILLS

At all levels of management, IT applications are increasingly complex, with increased sources of input between levels of management and the environment. More objective data to support decision making are available. Administrators need information about trends throughout all business sectors, not just healthcare. The challenge for information systems design is to create faster, condensed, organized, and more accurate feedback that supports decision making without overloading users with information. IT is essential for leaders to "read the signposts" and recognize trends in time to envision a plan and respond in an effective manner.⁷

The administrator may be the leader or deterrent for an organization to successfully adopt new IT

technology. Successful adoption often depends on the administrator's persistence when problems arise. Martins and Kambil⁸ have found that managers must be aware that previous experience with adoptions of new IT may lead to overconfidence regarding adoption or to a negative attitude; these responses are independent of the issues presented by the new IT change. Successful managers must be mindful of potential bias caused by untested assumptions.

Critical analysis of sometimes-conflicting information is now a requirement for all administrators working in environments with dispersed power. Even unit or local office managers are being asked to be more accountable for productivity and quality outcomes and cannot rely on "just carrying out orders." Resource dependency theory, an organization theory about political power interactions within organizations, points out that power will accumulate to those who can effectively sort and use information to improve productivity and quality. As IT systems provide more information to managers and clinicians, they will be expected to interpret information and act on their analysis to benefit the organization and its customers. Those who use the information well will be rewarded, and those who do not will be sanctioned. In other words, accountability for outcomes is being dispersed throughout the organization; no longer are only executives accountable for the financial, personnel, and quality outcomes of an organization.

DANGER OF A CASCADE EFFECT WHEN IMPLEMENTING CHANGES

Decisions about organizational changes should always include attention to the balance of financial, personnel, and quality factors. Imbalance may create a cascade effect, where small errors replicate and grow until they destabilize the organization with long-term negative outcomes. One example of a cascade is seen in the reengineering efforts of hospitals that downsized by

eliminating most middle-management positions, reduced clinical staffing to a theoretical safe minimum, and simultaneously introduced new technical positions. Some organizations did not allow sufficient staffing for training and support of these changes, absorption of existing dysfunctions in the system, or turnover of those who decided not to cope with revolutionary changes. Others made abrupt changes and ignored the slower pace that people need to absorb and collaborate in major changes.

A cascade effect occurred; problems beginning at the pilot stage were ignored and were replicated and multiplied as they reverberated throughout the institutions. Like an error in the beginning of an algebra problem, which results in the wrong outcome even if all of the calculation processes are correct, the agencies could not come to the desired outcome of reduced costs because they did not pay attention to balance in their planning. In these hospitals, this led to destabilization of nursing and a tarnished image in the nursing community, making recruitment difficult. This destabilization resulted in bed closures and loss of revenue.⁹ Information specialists should take notice when implementing major changes, such as the electronic patient record or a staffing and scheduling system, being mindful of the need to balance financial, quality, and personnel factors and to respond to problems quickly as they arise, to prevent a cascade effect that could occur and take years for organizational recovery.

CHANGING WORKGROUP CULTURE

Department managers' work has changed from monitoring to ensure that people follow established policies and procedures to promoting and supporting change and critical thinking for decision making. Leadership has new salience in the managerial role. Having information on using information systems is vital for managers to be effective in their new roles. They are the leaders enabling change to occur that improves services at the point of service. Often this means changing the

workgroup culture and establishing new practice patterns. People who become healthcare professionals share the value of desiring to help patients; this is a unifying theme that many managers have used to motivate changes in practice patterns. For instance, how can information systems be used to maximize the benefit to patients who have a limited length of stay or a limited number of visits as a result of limited insurance coverage? How can information systems be used to provide information on outcomes of patient care? These questions must be addressed by clinicians to improve practice patterns.

The manager must encourage decision making about what the workgroup can preserve that supports communication and cohesiveness and what it must discard to better meet the needs of patients. For many clinicians, this means learning to use IT. It means getting beyond the initial embarrassment of not being able to do new behaviors well. It also means a reorientation from being concerned only with diagnosis and process to focusing on outcomes. Advocacy responsibilities of managers are shown in Figure 2.

SHORT-TERM VERSUS LONG-TERM PERFORMANCE MEASURES

Department managers are often the leaders participating in developing performance measures included in IT reports. IT managers working with administrators and clinicians must be sensitive to the potential use of the data that they organize into information. They must try to include more than financial outcome data. Qualitative information is needed to reflect human tacit wisdom used in decision making. Both long-term trends and immediate objective data are needed for analysis of a broad range of measures, such as financial status, adverse events, and personnel turnover. Pfeffer and Veiga¹⁰ pointed out that organizations that view employees as assets and take a long-term goal-achievement approach have substantial financial gains. Yet the focus on long-term goals is counter to American business practices, which

- Budget to include the staffing time needed for task force and committee work.
- Resources for staff to make informed decisions.
- The power to implement recommendations that originate at the local level.
- Budget to include time for staff to plan, receive training, and implement change on a reasonable learning curve.

Figure 2. Managers' advocacy responsibilities.⁷

usually emphasize short-term return on investment, dependence on quantitative measures, and close tough supervision. This short-term view treats employees as costs rather than assets.

Administrators must work to change this orientation and increase practices that reflect a commitment to employees and the development of autonomous work teams. This will require dramatic changes in organizational structure and the work of both clinicians and administrators in time. Figure 3 shows the steps Pfeffer and Veiga¹⁰ have outlined to accomplish this change.

Widespread information system changes are needed to monitor progress

- Change the processes for finding and hiring the right clinicians and managers to emphasize enduring attributes, skill sets for critical thinking, and decision making rather than immediate tasks.
- Develop training programs to prepare workers to do immediate tasks and retrain them as they change.
- Retain the right people through employment security, comparatively high compensation based on performance by the workgroup, and development of autonomous work teams.

Figure 3. Organizational changes needed to focus on long-term goal achievement.¹⁰

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and provide financial and clinical information to the teams so that the work teams are able to make decisions that support the organizational mission and strategic vision. With these changes, many traditional management functions, such as monitoring and adapting work processes, will shift to clinicians. Managers will become system experts, intervening to facilitate change, institutionalize new work processes, and smooth communication. Over time, the gap between managers and clinicians will narrow in both status and salary.

THE PARADOX OF INCREASED EFFICIENCY

A major change in administrators' work that results from the increased efficiencies allowed by integrated information system networks is the paradox of increased efficiency. The new information system processes allow faster communication between and among clinicians and administrators even at distant sites. This has raised expectations for the effective immediate use of information. Both administrators and clinicians now are expected to do multitasking, or simultaneous processing of multiple sources of information for multiple issues and customers. Gleick¹¹ noted that expectations often begin to outstrip human capacity. To deal with this problem, organizations must devise administrative policies that provide checkpoints ensuring that new information is accurately and effectively being incorporated. These checkpoints slow down expectations and work processes to correspond with the capacity of workers.

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LETTER TO THE EDITOR

**ORGANIZATIONAL SILENCE:
THE THREAT TO NURSE
EMPOWERMENT**

I recently read a commentary by a former professor who described her recent personal experiences with the healthcare system. Experiencing "woefully inadequate" nursing care at times, she questioned why nurses do not see it as their responsibility to intervene and take action regarding colleagues who are not clinically competent or compassionate. As a full-time certified registered nurse in a busy labor and delivery unit at a prestigious New Jersey hospital, I agree with her that this is the reality of bedside nursing today.

My professor said the reason relates to the concept of organizational silence; Perlow and Williams call it the spiral of science.¹ Nurses are afraid to speak out and join together. I see it all the time on my unit and in my institution. We have more power than ever before due to the acute nursing shortage, yet the fear of nurses to speak out and stand up for patient care and nursing standards is as strong as ever before. Why? Because nurses who do are labeled and punished. This is organizational silence: most organizations do not want nor does they value nurses who speak out; noteworthy is the fact that if the issues and concerns are addressed in writing, that is an absolute cardinal sin.

Over the years as a bedside nurse, I have been verbal about

nursing and patient care standards. I have tried to use my education, experience, and knowledge professionally. I have tried to practice the art of nursing according to the standards set forth by the professional associations and the New Jersey State Board of Nursing. Voicing my concerns and, more importantly, putting them in writing, has not been well received by nursing leadership and management or by my own coworkers.

Those who have the courage to speak out about patient care standards and safety issues are often stigmatized. There are no choice promotions, because we are not considered "team players" and we are viewed as "negative." We are not asked to share our knowledge and talent by joining choice committees where change can be effected; those positions are offered only to those nurses who enforce the concept of organizational silence and do not question the "agenda." We are not rewarded or recognized for our achievements in education or elsewhere. Indeed, our education and knowledge are often viewed as a threat to those who do not possess it. When we question staffing levels and workload, we are discounted.

While there are nurses at the bedside who advocate that all must be proactive in promoting and ensuring patient and nursing care standards, doing so is a double-edge sword: speak out and you are si-

lenced and labeled as a "problem." There is a deep intrinsic problem with this pervasive philosophy.

My colleagues and I do not have the solution to end this kind of philosophy demonstrated in nursing leadership circles because we just don't understand it. I believe it stems from a lack of transformational leadership, specifically at the middle-management level. In my institution, there is a tremendous dichotomy between the mantra of the upper-level administrators and middle managers. Transformational leadership is blocked at the middle-management level. For those of us who have the courage and desire to effect change, administration makes sure there are no opportunities for us to do so. We are silenced.

I believe that educators, such as my professor and her colleagues, are more in a position to truly influence and effect change than any bedside nurse, because their primary agenda is promoting advanced and continuing education so that all nurses take responsibility, both individually and as team members, to uphold the standards of care and be advocates of the public.

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