Enhancing Quality and Controlling Costs: Using Internet Technology to Apply Workflow to Health Care

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Health care today requires providers and their organizations to respond to a multitude of new challenges. Health care organizations can no longer rely on a fee-for-service payment structure to finance the delivery of high-quality patient care. Instead, providers are being forced to accept lower fees and higher financial risk. To cope with this risk, health care providers are seeking to cut costs while maintaining the highest possible standards of care. Various initiatives are currently being employed toward this end, including enhanced utilization review programs, the creation of disease management programs, aggressive demand management, and general cost containment initiatives.

Recognizing the need to go beyond these initiatives, many organizations believe that their future success depends on embracing the next frontier in quality improvement and cost containment. These providers understand that future gains can only be obtained through innovative changes in the delivery (and documentation) of higher quality services which, at the same time, consume fewer resources. Other industries have met similar challenges by applying the concept of workflow to their business practices. Now, health care providers are turning to workflow and new technologies, such as Internet tools, to help them reach their goals.

Workflow

Workflow is defined as any task performed in series or parallel by two or more members of a work group to reach a common goal. "Tasks" refer to any activities or actions undertaken by individuals. "Series or parallel" implies tasks performed one after another or simultaneously. "Work group" means a team of individuals working on the same project. Finally, "common goal" indicates

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that a group's various activities are performed in concert and contribute to a well-defined and agreed on outcome.

At a granular level, workflow functions to (1) deliver information to the appropriate people, (2) organize information to be immediately useful, (3) ensure that the information is acted on, and (4) file information and record actions taken.

The specific needs of the health care industry make it an ideal match with workflow concepts. Health care involves complex procedures that include both clinical and administrative tasks. As a result, workflow increases efficiency and effectiveness through the maximal integration and use of relevant, timely information. Due to its heavy reliance on information, health care is in a unique position to take advantage of the information benefits provided by the implementation of workflow concepts.

Healthflow

The principles of workflow applied to the delivery of health care is termed healthflow.

Healthflow = Health care + Workflow

Creating a particular healthflow process requires the stringing together of various health care tasks, both clinical and administrative, to achieve a desired outcome in the most efficient manner possible. In health care today, clinical protocols represent one type of limited healthflow process. For example, a critical pathway attempts to sequence care tasks, coordinate medical and nonmedical care resources, and set a defined timeline to ensure that milestones are met.[1,2,3] Administrative protocols, which involve processes such as obtaining prior authorizations and providing clinic referrals, are healthflow processes as well. Historically protocols have remained limited in their usefulness in part because developers have rarely incorporated both clinical and administrative activities into one comprehensive care protocol. This lack of integration hinders the delivery of care, as the effectiveness of protocols often depends on many administrative tasks being properly executed at the correct time. An extensive healthflow approach merges clinical and administrative tasks, allowing providers to deliver higher quality care in a cost-efficient manner. In detail, a healthflow process involves

Identifying a target process—for example, well baby care or breast cancer treatment

Defining both clinical and administrative tasks to be performed by a work group

Breaking down tasks, in some cases, into more specific actions that can be performed by different individuals but which, when completed together, accomplish the original tasks

Deciding on the skill set required to perform each task or action (e.g., skills of a physician, nurse, technician, receptionist)
Understanding the sequence in which the tasks are to be performed
Recognizing and applying conditional rules and logic branching, so that only necessary and indicated tasks are performed
Planning the sequence of tasks, assigning the tasks to individuals, and then documenting the process so that others can understand and follow it
Creating the forms, documents, and instructions needed by individuals at each step to perform the tasks (e.g., disease management flowcharts).

Healthflow Automation

Healthflow automation comprises the following routines:

Graphical documentation of the health care workflow process
Electronic design and distribution of forms
Order initiation, completion, and documentation
Linkage of forms to databases
Routing of information gathered at each step to subsequent workers, as needed
Monitoring of the process on a real-time basis
Measuring and testing the efficiency and effectiveness of the workflow (e.g., tracking process time and cost statistics).

Automation allows standardized formatting of physician orders, thereby reducing the likelihood of error, duplication, or omission. Further, as completed tasks are documented, an easily accessible record of the care received by patients is created. This clear, accurate record of specific patient information improves communication among providers. Moreover, this information is available at the point of service, when and where the clinician needs it most. Finally, the logic branching inherent in healthflow allows flexible implementation of previously agreed on courses of action which produce the best outcomes. This decision support permits the clinician to concentrate on the more complex clinical choices presented by patients, rather than the routine clinical tasks, such as immunizations or cancer screenings, which can best be managed through automation.

Current paper-based procedures do not provide as many benefits. On the most basic level, paper protocols are not convenient point of service tools and integrate poorly into providers' schedules. The paper-based approach is also highly inflexible.[1,2] Workflow automation removes the limitations of paper-based protocols by using computers to handle many activities that are both labor-intensive and susceptible to human error.

For example, workflow automation of administrative tasks can seamlessly check membership eligibility by polling an external database, or generate follow up letters for patients requiring return office visits for blood pressure

monitoring. Workflow automation of clinical tasks is demonstrated by the collection and processing of all drug orders through drug interaction expert systems or a patient-specific allergy database.

Application of Internet Technology to Health Care Workflow

The enormous job of tracking multiple tasks by many individuals requires automation to implement complex workflow in the distributed health care environment. Personal computers, wireless local area networks (LANs), handheld input devices, and e-mail provide the backbone on which healthflow automation is based. Common Internet technologies, such as hypertext markup language (HTML), JavaScript (Netscape Communications, Mountain View, Calif.), Java applets, and ActiveX (Microsoft Corporation, Seattle) offer a strong opportunity to leverage and share in the enormous growth now occurring in networked computer applications.

HTML is the language used to prepare hypertext documents which are distributed on the World Wide Web; these documents are seen by users when they access a Web page. HTML pages contain commands, called tags, to mark text as headings, paragraphs, lists, etc. Tags exist for including images and fill-in forms that accept user input. Also, HTML allows for documents to be linked to other documents on a server or even to resources available elsewhere on the Internet. In a health care environment where disparate information must be accessed at multiple sites, this capability offers great promise to integrate information across facilities.[3,4]

JavaScript is among a new breed of scripting languages that allow the relatively easy addition of Java applications (i.e., Java applets) to otherwise static HTML documents. Most browsers, such as Netscape (Netscape Communications) and Internet Explorer (Microsoft Corporation), have an interpreter that can understand and execute applications in JavaScript, thereby allowing the embedding of programs in HTML documents.[5]

The use of Internet technology provides an opportunity to use documents that are smart; they can respond to input, perform calculations, and obtain necessary information from other sites in the background—all without much direction from a user. For example, a JavaScript application can calculate chemotherapy drug dosage based on weight and renal functioning (e.g., serum creatinine levels) using complicated formulas embedded in a single HTML form. In addition, the form can be linked to oncology protocols, drug information, and laboratory values, all of which are necessary information at the point of care.

An example of an Internet-based workflow document is shown in Figure 7.1. A Netscape browser displays an electronic form used by a receptionist to log insurance information in a patient's chart. Based on the responses, other forms can be displayed to collect additional information (e.g., choosing Span-

ish as the primary language causes the display of the patient form in Spanish). In addition, this technology allows a nurse using a different electronic form to use a browser on a hand-held computer to record vital signs in the same record through a wireless LAN connection.

The use of Web technology facilitates the creation of products that are truly independent of platform and modular, thereby simplifying their use in organizations that may have various types of computer systems. The flexibility of Web technology permits rapid customization on the client side without the need to develop multiple versions of the same application. At the same time, the server side of the application remains constant, preserving database integrity and ensuring the construction of a viable clinical data repository.

Health care requires a substantial amount of customization owing to the varied needs of clinicians and administrators; the flexibility and ease of use of Web technology offers enormous benefits to those who try to service the needs of these users. Using widely available and accepted Internet technologies in a workflow product ensures that the client application can be constructed using tools and knowledge that are becoming the common skill set of distributed application developers and support staff. In addition, such an investment in information technology will continue to offer benefits through on-going advances in Web technology and the ever-expanding richness of the Internet.

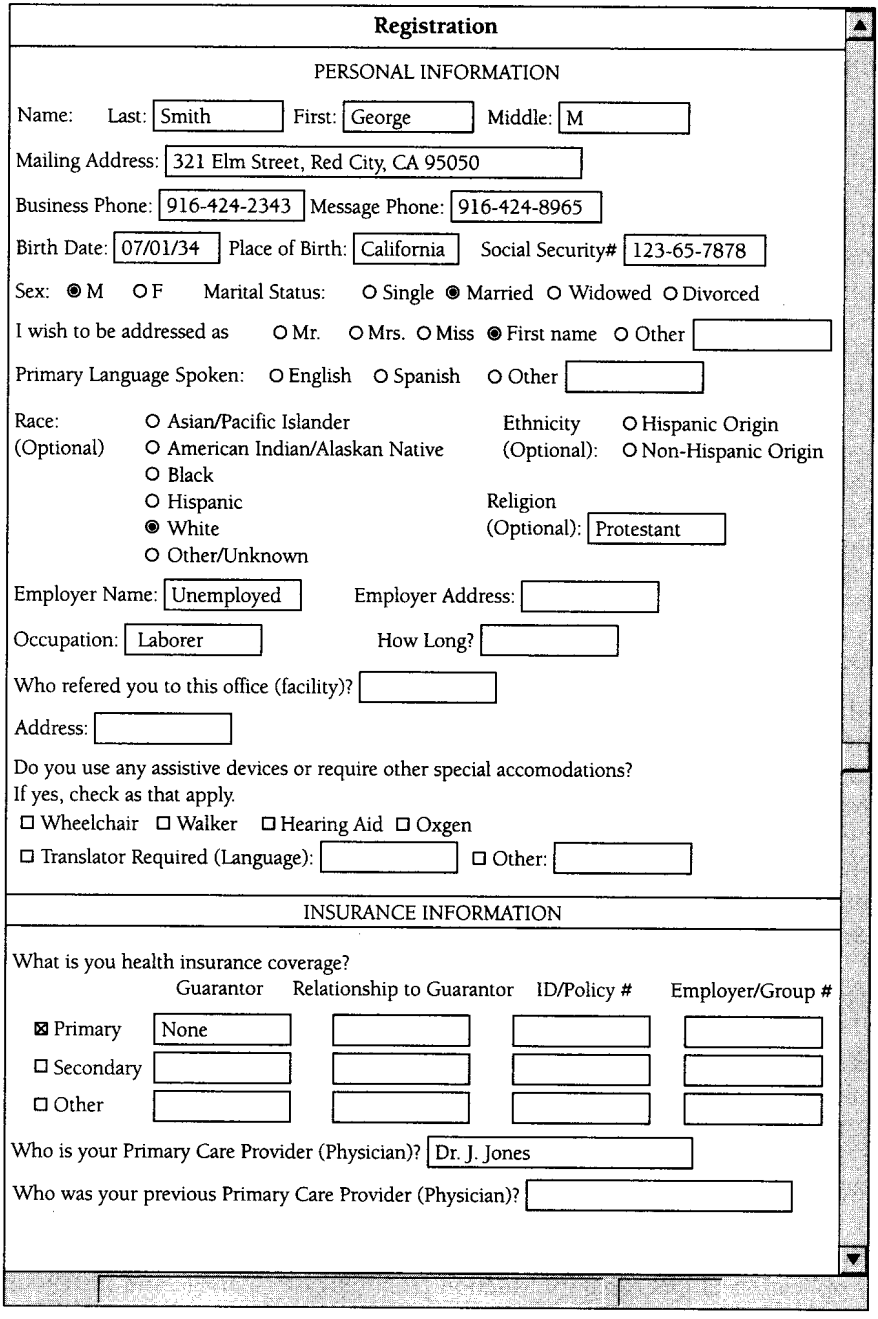
Benefits of Automated Healthflow

Many of the principles in health care workflow are already being applied in health care without the benefit of automation. Nearly all hospitals, managed care organizations, and utilization management firms use paper-based clinical protocols and care plans. Disease management strategies in the areas of oncology, cardiology, and specific diseases such as asthma include the widespread use of such protocols. Although these procedures and principles are widely used, they lack the enormous benefits associated with electronic distribution, decision support, and automation.

Automated health care workflow delivers significant and measurable benefits:

Standardization of delivery of care
Increased availability of information at the point of care
Linkage of processes with outcomes
Collection of primary clinical data for profiling and analysis by provider
Integration of varied clinical information from multiple sources into a central data repository
Electronic transfer of information through customizable, easy-to-use forms
Application of emerging information technology to manage and distribute health care data
Integration of clinical and administrative activities aimed at a specific outcome

Figure 7.1. HTML Registration Form as Seen in Browser



Registration

PERSONAL INFORMATION

Name: Last: Smith First: George Middle: M

Mailing Address: 321 Elm Street, Red City, CA 95050

Business Phone: 916-424-2343 Message Phone: 916-424-8965

Birth Date: 07/01/34 Place of Birth: California Social Security# 123-65-7878

Sex: ◉ M ○ F Marital Status: ○ Single ◉ Married ○ Widowed ○ Divorced

I wish to be addressed as ○ Mr. ○ Mrs. ○ Miss ◉ First name ○ Other

Primary Language Spoken: ○ English ○ Spanish ○ Other

Race: (Optional)
○ Asian/Pacific Islander
○ American Indian/Alaskan Native
○ Black
○ Hispanic
◉ White
○ Other/Unknown

Ethnicity (Optional): ○ Hispanic Origin ○ Non-Hispanic Origin

Religion (Optional): Protestant

Employer Name: Unemployed Employer Address:

Occupation: Laborer How Long?

Who refered you to this office (facility)?

Address:

Do you use any assistive devices or require other special accomodations?
If yes, check as that apply.

☐ Wheelchair ☐ Walker ☐ Hearing Aid ☐ Oxgen

☐ Translator Required (Language): ☐ Other:

INSURANCE INFORMATION

What is you health insurance coverage?

	Guarantor	Relationship to Guarantor	ID/Policy #	Employer/Group #
☒ Primary	None			
☐ Secondary				
☐ Other				

Who is your Primary Care Provider (Physician)? Dr. J. Jones

Who was your previous Primary Care Provider (Physician)?

Facilitated implementation of guidelines and modification through standardized guideline delivery process
Support of application of continuous quality improvement techniques.

By following a well-defined, carefully formulated process, automated health care workflow reduces the variance in outcomes of care. Standardized workflow processes are developed around diagnostic and treatment techniques that have been proven through extensive research and clinical practice (i.e., evidence-based medical care). When a particular workflow process is implemented, both its quality and its cost can be measured and monitored to determine the usefulness and efficiency of that process. If evidence suggests that the process does not produce a desired outcome, changes can be made quickly and the results of those changes measured. Automated health care workflow makes it possible to apply continuous quality improvement techniques which allow the easy monitoring and changing of processes to improve quality and reduce waste.

Large databases which provide storage for huge amounts of clinical data are a crucial component of automated workflow systems. The information stored in these databases can be accessed and analyzed instantaneously by physicians and clinicians at the point of care. In addition, the databases organize the process of care information into a format that allows providers to understand their patterns of care and modify them if necessary. These databases link process and related activities to outcomes.

Summary

The pressures associated with the competitive, quickly changing health care marketplace require the use of all available tools to deliver the highest quality care at the lowest cost. Workflow, as employed by other industries, delivers significant increases in both productivity and quality of services. Likewise, the application of automated workflow techniques to the health care industry offers measurable and immediate benefits. The very nature of a workflow product requires that it be available as widely as possible and be customized to fit the working patterns of the people who use it. To gain the advantages of customization and wide platform access, it is mandatory that the burgeoning technologies of the Internet be used in the creation of any modern networked computer application. Automated health care workflow provides the necessary information technology for caregivers to deliver efficient and effective high-quality care.

References

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