

INFORMATION MANAGEMENT

(A Summary of the Literature)

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INFORMATION MANAGEMENT

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INFORMATION MANAGEMENT

I. BACKGROUND

A. General

With the advent of Integrated Delivery Systems (IDS), information is the cornerstone for the building of networks and the conduct of managed care. Sufficient data and information must be available to new systems in support of managed care. These new systems are one of the more costly components of integrated delivery systems.

Information systems are a major hurdle for integration. Every commentary on integration points to information systems as the glue that holds the organization of the future together--more important glue in fact than buildings and organizational structure. Despite the volumes of data hospitals produce, and the obvious critical nature of this information, hospitals spend about half of what their counterparts spend on information systems. However, it is not only an investment issue, it is a design issue as well.²

The success of integrated delivery systems hinges on the ability to create a seamless delivery system in which patients' clinical histories and latest medical encounters can move along with them from one treatment site to another. The concept of the computerized patient record has been around since the 1960s. The idea is for all sources of clinical information to contribute their patient assessments to a computerized hub that organizes the data by patient. A computerized record is starting to become a reality for a small number of regional healthcare systems that have been working on vertical integration piece by piece over several years. Their efforts have been complicated by the fact that no two independently created medical records are likely to be the same, even in one facility. William B. Finney of HealthSpan Health Systems Corp. says that the company must commit to organizing as one operation before computer systems can be integrated. The process of integration, while expensive, is not merely an issue of money. Integration has to be broken down into a series of steps that envisions a finished product.⁹

Most computer-based information systems operating in hospitals are creatures of finance and as such are not value-added, since they do not contain any information that would allow an organization to respond more effectively and profitably to customer needs. David Nadler, President of Delta Consulting Group, describes information's new role:

"Information technology has begun to revolutionize organizational design by providing alternatives to hierarchy as the primary means of coordination. Information systems, common architectures, shared data bases, decision support tools, and expert systems facilitate the coordination of behavior without control through hierarchy, thus enabling the creation of autonomous units linked together through information."²

Information systems are essential in the ongoing evaluation of the performance of the physicians in the integrated delivery system. It is a concern that there will be many integrated contracting systems created that are not well managed from a utilization and quality standpoint. Tools for quality and utilization evaluation must be developed and implemented for the integrated delivery system to be successful.²

The ongoing management of the integrated delivery system physicians in the processes of care will be the validation for the creation of integrated systems. Merely creating a governance structure, organizational chart, and hordes of committees and task forces will not create a successful system. Managing the system to meet the customers needs will be the bottom line. A medical director who understands how to present utilization data to physicians and then inspire and convince physicians to change their behavior in an appropriate fashion is another important characteristic of a successful integrated system. This medical director must have access to ample data, both on the inpatient and the outpatient mode, and have effective ways to communicate that data. Creating small groups of eight to 12 peer physicians and having them accept some form of financial risk together is an effective first step. Supplying this group with data and individuals to interpret the data is a successful method of assisting in the development of effective utilization management. From a software standpoint, there are numerous HMO industry products that are available and that can be adapted for use within an integrated delivery system, either on a freestanding basis or in collaboration with a payer partner. Managing the risk is crucial for the integrated delivery system and a significant amount of effort, time, and capital must be spent in this area. As integrated systems begin to more fully evolve, linking the compensation and aligning the incentives of the entire system will ultimately produce the high performance integrated delivery system. Integrated delivery systems that have achieved the ability to maximize the health of their population and minimize resource consumption will be successful.²

Recently, multispecialty groups (MSGPS) have begun to expand the role of computers in medicine beyond documentation and information

retrieval. Computers have become active tools for patient management, reminding clinicians of preventive services needed, providing warnings about potential adverse drug interactions, and serving as an interactive source of information to patients about the expected outcomes of surgical procedures. The large size of the MSGP patient populations warrants the major investments required to build such systems.²

II. INTEGRATED PATIENT INFORMATION SYSTEMS

A. General

Upgrading information systems is a costly undertaking. Large integrated systems such as Sharp and Henry Ford expect to invest in excess of \$30 million on information systems development. The magnitude of the required investment will drive hospitals and physicians into larger economic units and will contribute to the formation of large, vertically integrated systems.¹

Health insurance is in an enormous state of change. Many insurance companies are leaning toward becoming managed care companies. The emerging vision of health reform involves changing medical practice by providing empirically-based clinical guidance to the practitioner in real-time. The technological revolution will consist mainly of on-line, real-time information that the primary care physician will have to work with in medical practice. As the doctor examines and makes decisions related to a specific patient, artificial intelligence will assist in the process in real-time. The successful insurance company will be the one that is conversant with the information technology that makes the production of medicine itself increasingly more efficient.¹⁰

B. Current Status of Health Care Information Systems¹

Medical practices, clinics, and hospitals across the U.S. are discovering that billing systems that address practice complexities can help recoup millions of dollars annually from HMOs, patients, and 3rd-party providers for medical procedures that are rightfully considered a shared risk. However, many managed-care organizations lose more than \$1 million a year because of information systems that do not address the nuances of today's medical-billing processes. Monitoring billable charges and accurate per-capita payments are two of the most important steps in cutting expenses and maximizing revenue.¹¹

Steve Rushing with Andersen Consulting says that the abundance of information will be a driving factor in today's era of health care reform.

Changes will force insurers to be less processors of claims and financial transactions and more integrators of health systems. Insurers are now involved in contracting with providers and setting up closed panels for their own managed care networks, all in an effort to reduce costs. To remain competitive, insurers need to recognize that information is their most valuable asset. To keep up with changes, Andersen Consulting recently revamped its Hospital of the Future and renamed it the Health Strategy Center, emphasizing business integration.¹²

The health care industry has under invested in information technology and over invested in administrative personnel. The industry currently spends an estimated 1-2% of its annual budget on information technology, compared with 10% for the banking industry and 6% to 7% for insurance. To a large extent, health care expenditures on information systems have been concentrated on billing and charge applications, as well as on stand-alone computers for ancillary departments that typically are not linked to other clinical and administrative functions. Meanwhile, the number of "record-keepers" has spiraled. The *New England Journal of Medicine* reported in its August 5, 1993, issue that "on an average day in 1968, U.S. hospitals employed 435,100 managers and clerks to assist in the care of 1,378,000 patients. By 1990, the average daily number of patients had fallen to 853,000; the number of administrators and clerks had risen to 1,221,600."

The rise in health care alliances and the growth of integration demand systemwide information networks. Integrating health care delivery involves a fundamental shift in orientation--from focusing on episodes of illness to assuming responsibility for the total health care needs of a defined population. Information systems designed to serve integrated networks must support this continuum of responsibility and be capable of achieving the following goals:

- Replacing the standard paper patient record with a computerized record that details inpatient stay information and incorporates clinical and functional outcomes, physician visit information, patient histories, and other patient-focused information that supports the continuum of care.
- Integrating existing information bases, including financial and administrative as well as clinical information.
- Providing access to clinical management information, including preferred protocols, practice guidelines, practice pattern information, and quality measures.

Technological advances now support a variety of new applications that range from the creation of community wide information networks; to the telecom-enabled transmission of data from home-based patient monitoring equipment; to the fiber-optic transmission of X-ray images that enable radiologists to provide multisite support.

C. Developing Data-Based Measures¹

1. ***Cost Management.*** With the advent of capitation and other modified risk-sharing arrangements, hospitals and health care systems must have or develop the capacity to measure the cost of functions performed; they must also tie these costs back to the cost of producing a service and ultimately to the total cost of assuming financial responsibility for a defined population. While most hospitals are able to identify the unit costs of goods and services purchased, they are less equipped to measure time costs. (For example, to compare the true costs of surgical procedures, it is necessary to count the labor inputs and to judge relative efficiency based on the cost of these inputs, coupled with the cost of supplies and equipment.)

Until hospitals introduce cost-accounting systems that allow them to develop credible "benchmarks" based on true production costs, it will be difficult to institute the continuous quality improvement programs that are deemed essential to managing capitation contracts. (This will be true for both clinical and administrative quality improvement programs.)

D. Measuring Medical Management¹

Medical management programs provide objective data that are used by physicians to measure their performance against that of their peers. At a minimum, such data should include the following:

- Cost comparisons on a per-case basis (DRG or ICD-9), including routine cost and ancillary costs.
- Units of service per case, including length of stay, tests, and procedures.
- A severity-of-illness measure to ensure that comparisons are made among patients with comparable conditions.

To ensure physician support of these programs, physicians should be

involved in designing, implementing, and reviewing all clinical data programs, similarly, medical management standards and guidelines must be based on data largely generated from "best practices" of physicians within the organization.

1. **Clinical Quality.** Clinical quality has become, at least nominally, the basis upon which HMOs, other managed care plans, and employers are seeking to differentiate providers and to make purchasing decisions. For these criteria to be credible, it is important to establish the medical community's ability to measure and document quality objectively. Although significant strides in this direction have been made, we believe that the medical industry is still in the early stages of compiling and providing reliable information on clinical quality.

Clinical quality consists of four components:

- Appropriateness of care, including compliance with practice guidelines.
- Technical effectiveness, including measurable clinical outcomes.
- Functional outcomes, including patient satisfaction and whether the treatment accomplished its state objectives.
- Efficiency (i.e., whether the appropriate clinical resources were used to achieve the desired result).

Gathering and formatting information to be used in establishing the criteria for evaluating clinical quality (and for its continuing measurement and dissemination) is a major undertaking that is becoming increasingly critical to the clinical management processes of integrated delivery systems.

E. Data Quality²

The validity of reported outcomes data depends, in large part, on the quality and reliability of the abstracted patient data. The Cleveland program implemented a number of steps to ensure data quality. Minimum thresholds for patient volumes were identified to ensure sufficient numbers of cases to provide statistical significance for all measurements. Abstracter training by each vendor is an ongoing requirement. All vendors employ manual and electronic data quality

check procedures. Data is reviewed by each hospital before it is reported. An internal and external audit program is designed to identify data quality issues and systematic bias by over/under predicting severity.

F. Data Collection²

Many of the strategies taken to date in approaching measurement and feedback to physicians have had a focus on "finding the bad apple." This is contrary to any of the (CQI) processes that are being implemented in health care today. CQI is designed to focus on processes (i.e., system instead of individual causes of quality problems). In the health care setting, this can be used to address system problems from the clinical (i.e., delays in seeking consultations, overuse of diagnostic tests, late initiation of discharge planning) to administrative (i.e., insufficient staff, delays in laboratory results, lost medical records, extended turn-around time in the operating room).

An essential strategy is to collect, compare and share comparative data and information among physicians and hospitals. These comparisons when shown to providers who are interested in competing for business, are quite compelling and motivating. Hospitals and physicians who utilize comparative performance data do change and improve their processes, sometimes quite dramatically. The purchasers that are interested in this type of change need to use data and information to identify and select the most efficient providers.

While HMO and PPO networks and insurance companies have collected various types of data over time, they have had minimal success at using it to facilitate change in physician practice pattern and hospital process of care delivery. One of the reasons for this is that these network entities' primary focus has been on contracting with providers based on price discounting rather than identifying the most efficient providers. As time goes on and the government continues its attempt at health care reform it is inevitable that constraints will be placed on dollars available for the subsidization of health care. It then becomes critical to be able to distinguish providers through the use of data and information. This data and information must be used carefully and knowledgeably because the market for it is in the infancy stages of development and sophistication. This fact however should not deter its use. It is a very effective tool for fostering partnerships, meaningful dialogues, and education among the purchasers and suppliers of health care.

Whether a purchaser uses data directly or contracts with an entity to perform data analysis and selection, it is useful to utilize the purchaser's

health care strategy, its findings, and objectives to collate with the provider analysis in a given community or region.

The type of data being referred to can be obtained from three sources. The first two are publicly available. Medicare data from the MEDPAR file can be obtained in all 50 states and includes all hospitals. State databases, which include Medicare, Medicaid and all other payer data, are procurable in 17 states. The third source of data are the hospitals themselves. This data is the most complete because it contains physician-specific information.

When performing provider profiling it is important to use large databases so that statistical meaningfulness is achieved. In order to motivate hospitals and physicians to use the data comparisons to facilitate improvement, the data should be severity-adjusted. When performing a community or provider profiling analysis it is best to utilize a "peel the onion" approach. This means that you logically analyze and focus on areas of high volume and cost initially, in order to gain perspective and achieve results. This approach can be illustrated utilizing the experiences gained in Cincinnati.

III. ELECTRONIC MEDICAL RECORDS

If information management systems are the cornerstone of integrated delivery systems, then the electronic medical record will be the single most important system for succeeding in the future. It will facilitate access, significantly lower costs, be critical and essential to quality and will contribute in a major way to the improvement of service. Its acceptance and use by the players in managed care will be met with a great deal of resistance and it will be costly to develop, standardize, and implement.⁶

Dr. Solomon lists several important elements of any electronic medical records system.⁵

1. Summary Screen
2. Progress Notes
3. Templates (preformatted text)
4. Medication lists
5. Laboratory Results
6. Health Maintenance (scheduling)
7. Search Options
8. Graphics
9. Confidentiality and Security
10. Reliability

11. Data Entry
12. Outside Reports
13. Hardware and Software
14. Savings
15. Setting Up The System

The rising cost of health care has increased the call for cost control. The pressing need to control cost, coupled with the increase in managed care and prospective payment, has placed new urgency on administrators and clinicians to work collaboratively in providing efficient and effective care. The integrated inpatient management model (IIMM) has been developed to assist in this collaborative effort. The IIMM's clinical information system, which provides decision support to both administrators and clinicians, is described. This clinical information system is the information backbone for the development and monitoring of practice guidelines or critical pathways. An integrated information system of this type is essential if hospitals are to prosper during the next decade.¹³

Hospitals have been developing computer communications networks as a physician bonding strategy because of their success in promoting hospital admissions and additional referrals to the sponsoring hospitals' specialists. An alternative, nonproprietary network may also be worthy of consideration because of the services and benefits it delivers to the total health care delivery system and to society as a whole, in addition to the advantages it provides to the sponsoring hospital. Since February 1990, Integrated Medical Systems and Provenant Health Partners have been developing and testing a medical information network - the Colorado Medical Information Network (COMIN) - that provides for the rapid exchange of information on patients among network participants, which includes pharmacies, drug companies, managed care organizations, plus other hospitals and health care organizations.¹⁴

IV. HENRY FORD MEDICAL GROUP (HFMG)⁷

A. General

"Next to integrating physicians into the organization, the most important strategy for systems like ours is creating the ability to share clinical and management data among the various operating units," says Gail Warden, Henry Ford's CEO. The ability to share data is particularly important for a system the size of Henry Ford, which owns and operates two health maintenance organization companies.

The barrier to automation of provider networks is not a lack of technology to get the job done, but rather the cultural issues involved,

Pavia argues. "It's difficult to get everyone to agree on common definitions, on what data needs to be captured and how; and on how to measure and evaluate the results," he says.

B. Automating Managed Care

At Henry Ford, the most recent automation achievement is the development of a system to support the gatekeeper function of primary care physicians in managed care. HMO patients must visit a primary care physician before they can see a specialist. These primary care doctors--typically internists, pediatricians and family practitioners--review the medical necessity for special treatment and then issue authorizations for further treatment. In most managed care systems--including, until recently, Henry Ford--these authorizations, along with subsequent referrals to a specific specialist, clinic or hospital and the actual scheduling of an appointment--are handled on paper. Using the new automated system, physicians and other clinicians can complete all of these transactions electronically and in real-time. In this way, a specialist gets immediate notification that specific treatment has been authorized for a patient who has been referred for a visit.

Henry Ford spent 18 months developing the new Patient Care and Referral System in a joint venture with Computer Sciences Corp. of Farmington Hills, Michigan. The company will begin marketing the automated system now, being tested at three Henry Ford clinics, to others this fall. The Detroit-area network expects to implement the system at all 35 of its clinics next year.

Using the new system, which is tied to an IBM mainframe, physicians or case managers can make real-time authorizations for durable medical equipment, home care and hospital admissions, in addition to specialty physician treatment.

"We have integrated the new system with our appointment scheduling system so that when the referral is entered and the doctor schedules an appointment, the system will automatically verify the appointment against the referral," says James B. Kuhn, project manager for information services. Doctors have real-time access to the status of any referral, which means they can immediately determine if, for example, a cardiologist received the referral and scheduled an appointment for a specific day.

Although several companies have developed software to support the payer-side functions of an HMO, the provider-side has been relatively

unautomated until now, Kuhn says. "This system allows us to link all of the treatment authorizations together to get a true picture of the cost of care," he says.

Case managers, who are assigned to review the care of critically ill patients who run up the biggest medical bills, can use the new system to monitor treatment patterns. "If a caregiver requests a wheelchair for you, the system will flag to them that the patient is under case management and request that the caregiver confer with the case manager before ordering the device," Kuhn says.

C. Computerized Record

In addition to seeking out ways to eliminate the blizzard of paperwork involved in a managed care system, the nation's largest hospitals and health networks are tackling the challenge of creating an electronic medical record. Physicians, nurses and others could use such a record to obtain detailed patient information by making a few quick keystrokes on a computer terminal, rather than shuffling through mountains of paperwork scattered at many sites.

In the last four years, Henry Ford has made substantial progress in its effort to automate the medical record. Today, its Medical Information Management System is in use at the 26 ambulatory care sites staffed by its 850-physician Henry Ford Medical Group and at its flagship 903-bed Henry Ford Hospital in downtown Detroit. The computerized record system will be phased in at the network's other sites in the months to come.

Rather than attempting to build a computerized medical record from scratch, the provider network started the difficult automation project by identifying the data it already collected in its dozens of separate departmental information systems. "We started four years ago by reviewing the data we could obtain in some electronic form and then coming up with ways to display the data in a format the physicians could use," says Sinisi, the vice president for information services. Every week, physicians met with in-house data processing experts to refine how all data would be displayed for easy access.

Today, the real-time, computerized medical record system, which runs on a mainframe, ties together data gathered through eight different types of hardware and dozens of software applications.

Physicians and other caregivers gain access to the system by using

computer terminals clustered in work areas at the hospital and clinic sites. "The system is designed so that as the patient or the physician moves from one site in our network to another, the information on that patient is available electronically," Sinisi says. That's a big change from the paper-based method and its logistical headaches.

Long-term plans call for converting from terminals to intelligent work stations. Henry Ford already is working on refinements so that the records can be called up using Microsoft Windows on a personal computer.

Today's users can gain instant access to a wide variety of data using the Medical Information Management System. This includes a history of patient visits to the clinics and hospitals; demographic information; laboratory, radiology cardiology and neurology test results; certain prescription records; and physicians' discharge summaries for hospital inpatients.

"The system is updated immediately," Sinisi says. "So moments after a test is completed at a satellite clinic, the primary care physician at another site can make an inquiry and get the results."

The biggest challenge in building the system was writing all the computer protocols for interfaces that enable the various departmental informational systems to work together in harmony to create one record, Sinisi adds.

Henry Ford is taking an important step toward gathering the data necessary to conduct meaningful research on the clinical effectiveness of treatment. But gathering specific data to support outcomes research could bog down the real-time record system. That's why the Detroit-area network plans to create a separate repository of clinical data to support research.

"I don't want researchers doing ad hoc reporting against real-time data," Sinisi says, pointing out that such research could slow down the system. Today, Henry Ford is offering about 70 users access to limited data for specific studies--such as comparison of how the day of admission affects a patient's length of stay at a hospital. But a separate clinical data repository would enable researchers to conduct in-depth studies of treatment patterns.

Sinisi also envisions a day when Henry Ford will feed outcomes data into a regional data base that incorporate information from all the providers

throughout the state. But he says he would be reluctant to share Henry Ford's complete medical records with other providers because of the competitive issues involved.

D. Electronic Claims

Henry Ford's automation efforts on the clinical side have served it well on the financial side as well.

In fact, the bulk of the charge information necessary to build a patient bill is obtained electronically through various departmental information systems. For example, hospital patient accounting systems automatically generate room and board charges, while laboratory, pharmacy and surgery systems funnel charge data into the billing system as well.

For inpatients, the only charge information that has to be keyed into the billing system are the charges associated with a physician visiting a patient, says Patrick H. Milostan, director of system design and analysis in the information services division. For outpatients, data entry of physician exam charges is being replaced by the optical mark reader system.

Of Henry Ford's 2.7 million annual hospital claims and 3 million physician claims, 80% are filed electronically; the remainder are transmitted either on tape or on paper. Because the system employs more than 900 physicians, it files claims on their behalf as well.

The provider network has a central business office for three of its hospitals. Since switching to the centralized approach, Henry Ford has cut its total number of business office employees and substantially improved its cash flow. For example, Cottage hospital's average gross days in accounts receivable stood at 65 days June 30, compared to 85 days just one year ago.

The Detroit provider files its Blue Cross/Blue Shield claims and Medicare claims electronically through the Automated Claims Control Electronic Submission clearinghouse, also known as ACCESS. Blue Cross and Blue Shield of Michigan, the local Medicare fiscal intermediary, owns ACCESS. Claims destined for major national commercial insurance companies are filed electronically through the National Electronic Information Corp., Secaucus, N.J. Medicaid claims, now submitted on tape, soon will be added to the ACCESS system.

Unlike clinical data, which is collected in real-time, all claims-related data is filed in batches. Henry Ford has no plans to convert to real-time filing of claims because of the expense involved, Milostan says.

Henry Ford will begin piloting use of the American National Standards Institute's 835 format for electronic funds transfers and remittance advice early next year for Medicare claims. Milostan says. Today, most major payers send their remittance advice on tape, which is loaded into Henry Ford's mainframe. The provider network plans to phase in the ANSI 837 format for electronic claims next year as well.

E. Managed Care Data

Because the Detroit-area network generates most of its revenues from managed care, its volume of claims is lighter than many other systems of comparable size. It does not file claims for patients enrolled in its HMOs that are capitated plans, meaning they pay providers fixed amounts monthly, regardless of services rendered. Nevertheless, the network collects encounter data describing services provided to all HMO patients and shares this data with the Health Alliance Plan--its managed care division--electronically each week.

The system sends information on 100,000 patient encounters per month to the Health Alliance Plan, which in turn provides employers with reports on health care utilization.

In addition, Henry Ford collects charge data for these capitated managed care patients on a monthly basis. It uses this charge information to determine profitability under capitation. "Providers are responsible for managing the cost and quality of care, so you need to know what your internal activity is even though you are not billing the payer for it," Kuhn explains.

To better measure its true costs and determine profitability under capitated managed care, Henry Ford is investigating new ways of quantifying the resources used in treating patients. One approach being considered is the use of resource-consumption units, a more sophisticated approach to cost accounting.

V. COMPETITION

A. Metropolitan Life Insurance Company⁸

This article summarizes four design lessons from their experience in

1986.

1. Claims data are needed to augment review data.
2. Episodes of care should be reviewed.
3. System design should be high-tech and high touch.
4. Ambulatory review entails high volume review and high volume claim payment.

The articles also enumerates two implementation lessons learned.

1. Ambulatory utilization review requires close cooperation of claims and review personnel.
2. Communication to employers and providers is essential.

B. William M. Mercer, Inc.

In response to the health care industry's movement toward quality assurance and outcomes research, the software industry is introducing products and services designed to reach these goals. William M. Mercer, Inc. will enhance its health plan analysis system (CHAMP) with the Practice Review System (PRS), a product of Value Health Inc. CHAMP is a personal computer-based system that analyzes health programs. PRS will allow CHAMP users to profile physicians and managed care networks. A product already in use that assists medical decision making and resource allocation is QualityFIRST, developed by the Institute for Healthcare Quality. The product is comprised of more than 450 guidelines that address the diagnosis, treatment, facility, and resource use for 600-plus procedures.¹⁵

VI. SUMMARY

A. The health care industry is moving away from data only toward information that is automated:

- ◆ Financial
- ◆ Clinical

B. Information is critical for:

- ◆ Decision support

- ◆ Evaluation outcomes/performance
 - ◆ Communication between individuals and organizations
- C. Interactive systems are evolving and will be required to effectively manage the continuum of care.
- D. More data about individual/group will be collected and managed to make information available for Care Management.
- E. Information Management will cause us to focus on major questions/ issues:
- ◆ Proprietary/ownership of/access to data/information
 - ◆ Confidentiality of certain types of information
 - ◆ Ethical use of information
 - ◆ Access/security of data/information
- F. Data integration is occurring within and across organizations in all industries.
- G. Advanced managed care organizations have more advanced information Management Systems.
- H. The patient specific clinical information required to effectively manage care is not currently accessible.

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