VITAL LINKS FOR TODAY AND TOMORROW

I n late 1993 Provenant Health Partners (PHP), Denver, completed development and implementation of a management information system designed to address the organization's current needs.

PHP began planning the system in 1989 when a new administrative team—including a chief executive officer, chief financial officer, and chief information officer—joined the organization. Members of the new administration agreed that Provenant required a more efficient, effective data-gathering system to gain access to information addressing vital performance parameters, including utilization and market share, costs by patient and payer, and customer satisfaction. Work on the system was initiated in 1990.

The system now provides Provenant a basis for internal management and external communications links for its integrated delivery network, which includes three Denver-area hospitals and several outpatient facilities. It also lays the groundwork for creating a health management information system for the future.

THE CURRENT SYSTEM

The current management information system is composed of the following information networks:

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With One Stage of MIS Development Complete, An Integrated Delivery Network Looks to the Future

BY R. SCOTT MacSTRAVIC, PhD, & THOMAS H. ROCKERS

• Internal management
• Electronic claims processing
• Purchasing
• Physician communications
• Clinic communications
• Physician practices
• Other hospitals
• Managed health

Although the projected cost of implementing

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Summary Over the past four years, Provenant Health Partners (PHP), Denver, has been developing and implementing a management information system to meet the organization's current needs. The system consists of the following information networks:

• Internal management
• Electronic claims processing
• Purchasing
• Physician communications
• Clinic communications
• Physician practices
• Other hospitals
• Managed health

In the past, PHP used the system primarily for traditional management and control purposes. Recently, however, the organization has extended the use of its data outputs to include internal and external marketing purposes as well. Clinical, service, and management quality data are now tracked and shared with internal and external constituents.

PHP is also working to develop a health information system for the future. Such a system will include all the components of the current management information system, but will also facilitate effective health management of populations enrolled in the organization's integrated delivery network.

the system was $16 million, PHP was able to install the complete network for between $13 million and $14 million. One source of these cost savings was a decision to use standard vendor packages wherever possible and avoid customizing applications to meet individual departments' needs. The strategy not only kept initial costs down; it also lowers the cost of upgrades. In addition, use of more standardized applications facilitates communications among various networks within the overall system.

Internal Management The internal management information network links the divisions and departments of PHP's three hospitals and its senior care facilities. It includes data bases for planning, marketing, and competitor analyses to support strategic and tactical marketing efforts. The network's physician practice profiles support quality management and physician relations activities, and a patient data base incorporating medical records and billing data tracks all contacts with patients under conventional financing arrangements. The internal network also includes a procedures cost data base reflecting material usage and costs, utilization of specific departments, and general ledger data to aid in operations management and contract pricing. In addition, a product line management data base facilitates essential planning, budgeting, and control functions; contract pricing; and make-buy decisions.

The system maintains the basic financial and large patient data bases on mainframe, with departmental systems on minicomputers linked via local area networks. The internal communications network is moving to fiber-optics and microwave transmission, whereas the external communications network uses lower-speed landlines.

Claims Processing The electronic claims processing network links Medicare and Medicaid intermediaries, Blue Cross, and more than 20 commercial insurers to PHP's claims system through the Queen City Clearinghouse in Cincinnati, home of the Sisters of Charity Health Care Systems, of which PHP is a member. The clearinghouse processes claims and forwards them to the appropriate carriers for payment, with electronic remittance advices coming back to PHP.

Purchasing The purchasing communications network links PHP with the Sisters of Charity Health Care Systems and the Daughters of Charity group purchasing alliance. Through the

> The physician communications network has substantially improved the efficiency of patient care.

network, PHP receives vendor catalogs and price updates and transmits purchase orders and purchasing statistics. The network connection to the alliance has cut costs for PHP by enabling it to make a higher percentages of its purchases through the alliance.

Physician Communications The physician communications network, an electronic mail interchange system, transmits patient abstract, admission, and emergency room fact sheets; laboratory and radiology results; radiologic images; and notices and messages. It also offers electronic attestation for medical records and discharge reports and access to the Micromedex drug and diagnosis/treatment data base.

The physician communications network links PHP facilities with more than 400 medical staff physicians, as well as 15 rural hospitals and physician practices in outreach areas. It also links PHP and the physicians with other hospitals, laboratories, and pharmacies, promoting early reporting, prompt patient management, and effective tracking for case management. It is a nonproprietary system, although Provenant was the original sponsor, was the beta test site, and remains the largest participant.

The ability to "sign" medical records electronically is one example of the kind of benefits the network makes available. This feature saves physicians time and also speeds the billing process. Provenant was the first provider to receive approval for electronic medical record attestation from the Health Care Financing Administration.

The network has substantially improved the efficiency of patient care management at PHP facilities. Physicians can now get laboratory test results within hours, instead of waiting overnight for them to be mailed. The system also allows physicians to view x-rays. Finally, the network's ease of use and effectiveness has helped increase the number of referrals to PHP facilities.
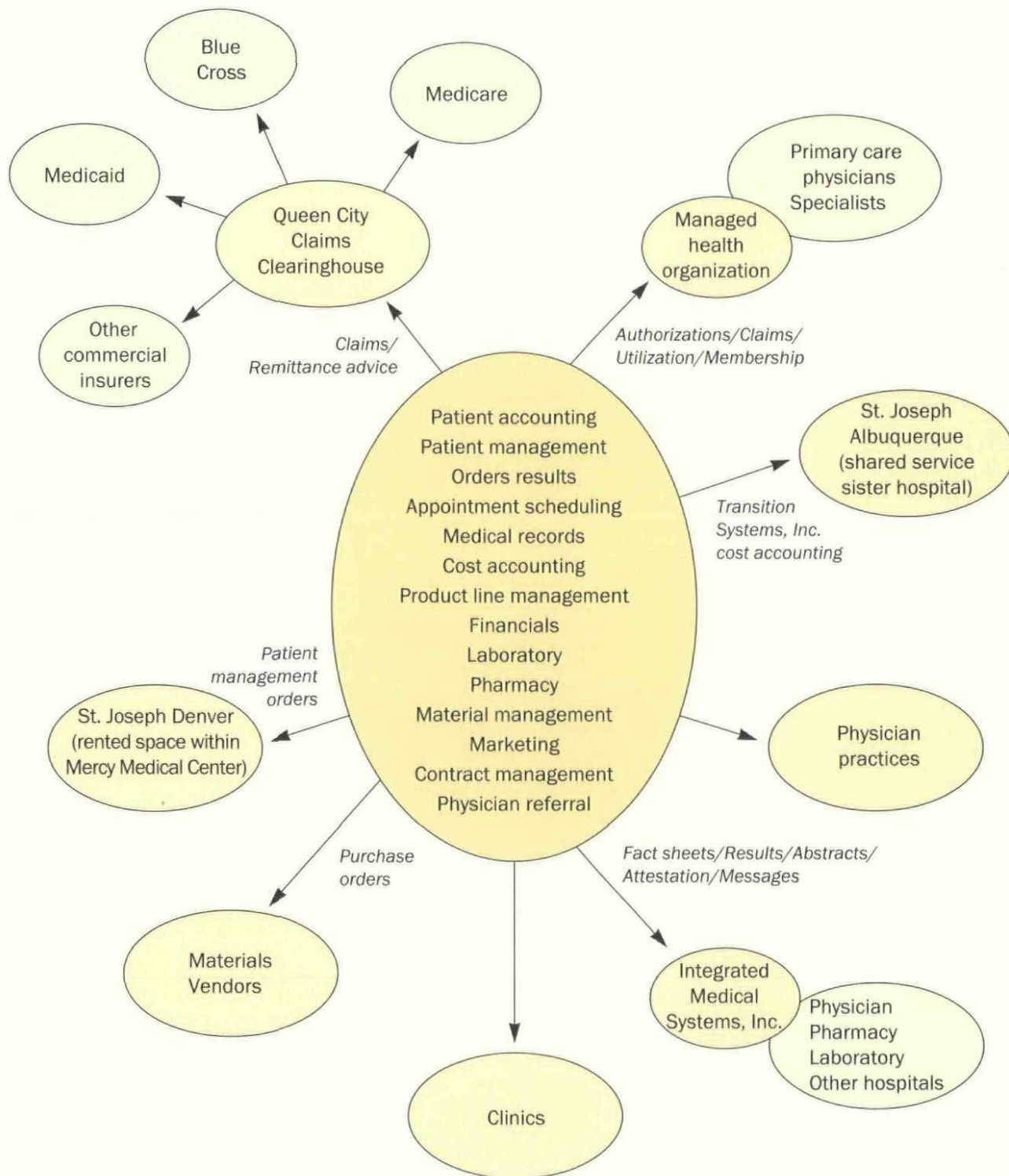
Clinic Communications The clinic communications network links Provenant's inpatient facilities and support divisions to its outpatient facilities. This network provides for the transmission of patient admission, service utilization, and charge data to the finance division, as well as to PHP's strategic planning and clinic management divisions.

Physician Practices The physician practices communications network links PHP to the contracting

PHP COMPUTER SYSTEM NETWORK

Blue
Cross

Medicare

Medicaid

Primary care
physicians
Specialists

Queen City
Claims
Clearinghouse

Managed
health
organization

Other
commercial
insurers

*Claims/
Remittance advice*

*Authorizations/Claims/
Utilization/Membership*

Patient accounting
Patient management
Orders results
Appointment scheduling
Medical records
Cost accounting
Product line management
Financials
Laboratory
Pharmacy
Material management
Marketing
Contract management
Physician referral

St. Joseph
Albuquerque
(shared service
sister hospital)

*Transition
Systems, Inc.
cost accounting*

*Patient
management
orders*

St. Joseph Denver
(rented space within
Mercy Medical Center)

Physician
practices

*Purchase
orders*

*Fact sheets/Results/Abstracts/
Attestation/Messages*

Materials
Vendors

Integrated
Medical
Systems, Inc.

Physician
Pharmacy
Laboratory
Other hospitals

Clinics

physician groups that practice in PHP-owned family medicine (residency training) centers, senior health centers, and two rural after-hours urgent care programs. This network transmits patient and practice management data, claims processing, and financial data, as well as utilization data for Provenant Managed Health Organization, PHP's integrated delivery network.

Other Hospitals A communication network currently links PHP with two other organizations: St. Joseph Hospital, Denver (part of the Sisters of Charity of Leavenworth Healthcare System), which leases a patient floor in one of PHP's hospitals for its psychiatric unit; and St. Joseph Health System, Albuquerque, fellow member of the Sisters of Charity Health Care Systems of Cincinnati, for communications regarding shared services between the system and PHP.

Managed Health The managed health communications network was developed to enhance PHP's integrated delivery network. It links this managed health organization to contracting payers (including health maintenance organizations and commercial insurance plans), to primary care physicians and specialists treating patients under capitation contracts, and to PHP's health management group/third-party administrator. The network transmits membership and enrollment data, procedure and admission authorizations, claims data, payment and contract maintenance information, and general ledger data to the partners in the integrated delivery network.

BENEFITS

Since beginning implementation of its management information system, PHP has improved the quality and efficiency of its management information system performance in several quantifiable ways. Operating costs in 1993, for example, were $1.5 million lower than they were in 1989. In addition, the new information system requires from 15 to 20 fewer full-time equivalents to operate and manage.

Several improvements in quality of hospital performance have also been observed. For example, the ratio of observed versus expected mortality rates has declined from 0.838 in fiscal 1992, to 0.802 in fiscal 1993, to 0.679 for the first quarter of fiscal 1994.

One of the most dramatic improvements has come in the area of patient loyalty. In 1992, 43.8 percent of patients discharged from PHP facilities said they would choose the organization's hospital above all others for a future hospitalization. That number increased to 65.9 percent in the

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most recent survey. The increase in patient loyalty has been greatly augmented by PHP's ability to use the management information system to pursue multiple follow-up contacts with patients on topics of interest to them.

NEW USES

In the past, PHP used its management information system primarily for traditional management and control purposes. Recently, however, the organization has extended the use of its data outputs for internal and external marketing purposes as well. Three classes of "quality" data are now tracked and reported to internal constituents such as board members, medical staff physicians, and employees. In addition, such data are shared with current and prospective partners, including employers, insurers, and managed care organizations.

Measuring Quality Currently, such data include measures of:

- *Clinical quality*—mortality, morbidity, incident data, adjusted for case severity where possible and compared with Colorado or national data bases when available.

- *Service quality*—patient satisfaction and past patient and community perception and preference data. So far, these cannot be compared with data from other hospitals except those within Sisters of Charity Health Care Systems, which use similar data-collection procedures.

- *Management quality*—actually hospital "cost" data composed of three measures of costs: average charges, average payments, and average expenses per admission. These measures are case-mix adjusted and compared with those of all hospitals in the immediate market area (metropolitan Denver), as well as with data from the state of Colorado as a whole.

Community Health Information Although these data and the management information system that produces them are adequate for the present, PHP is working to develop a health information system for the future. Such a system will include all the components mentioned above, but will go further to enable effective health management of populations enrolled in Provenant's integrated delivery network.

The health management information system will include data on perceived access and patient satisfaction, information regarding members' reenrollment intentions, and information on behavior, perceptions, and attitudes among prospective members. It will track measures of health risk behavior (e.g., smoking, seat belt use,

The success
of a CPR system depends on its
acceptance by the system's users—
the care givers.

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diet), health risk status (e.g., blood pressure, chronic conditions, cholesterol), self-care knowledge and confidence, patterns of utilization of health services, use of preventive and early detection/intervention services (e.g., immunizations, mammography, prostate screenings, Pap smears), and utilization of services for preventable events (e.g., asthma and diabetes crises).

LESSONS LEARNED

One of the key lessons the process taught was the importance of patience and of a clear understanding of what implementing a system entails. Planners should recognize that installing a new information system is a major commitment of time and energy. For the process to succeed, managers must closely watch every step and evaluate every piece of the system for its compatibility with other components and its effectiveness. Administrators should also avoid the temptation to customize the system in response to every request, which increases system costs enormously.

It is also important to ensure that reliable data are input into the system. This will often delay implementation—sometimes by many quarters—but it will be critical to the network's effectiveness.

Finally, managers and administrators can expect to encounter some initial resistance to the system. Educating users about the benefits of a comprehensive management information network is perhaps the most effective approach to overcoming such resistance. ▫

communications in medical practice. Within five years, voice/data/multimedia devices will enable two physicians in different locations to look at the same information simultaneously and discuss the patient's status.

SPECIAL DESIGN CONSIDERATIONS

The plethora of computer-based applications and systems either available or being developed can make choosing system components a difficult challenge. Preliminary studies by a Genesys Health System consultant show that a typical medium-sized hospital can expect to spend between $15 million and $30 million to create and implement a CPR system like the one being developed at Genesys. Although this is a major investment, Genesys projects that overall cost savings will be achieved within five years after implementation.

Among care givers' most serious concerns about CPRs is that the computer will get in the way of "hands-on" care. Physicians have also expressed concern that patient information might be used in a manner not in physicians' or patients' best interests. The involvement of physicians, staff, and all departments in the design process is crucial to allaying such fears and promoting the CPR's acceptance and effectiveness.

Security and patient confidentiality in the CPR system are also important concerns in the healthcare community. Many researchers and vendors emphasize that, when used properly, the CPR offers more security than paper records and charts. Organizations can, for example, establish an audit trail that tracks everyone in the system who

actually accesses the record. In addition, CPR system users can be required to use identification cards, keys, or passwords that are changed periodically. One scenario could involve requiring a password, plus another level of access (e.g., a two-tiered password or a password and a biometrics identifier such as fingerprints). However, too many security measures can be burdensome and actually hurt the speed and efficiency gained in the first place. Ease of access must be balanced with appropriateness.

ENSURING USER ACCEPTANCE

Genesys put together a team of evaluators on the CPR project that included 25 to 30 clinicians from various parts of the system. The team members had numerous day-long sessions with vendors, where they reviewed and rated the potential of each CPR system based on established criteria.

Ultimately, the success of a CPR system depends on its acceptance by the system's users—the care givers. Four to five products could be equally effective for a health system. Every system has users who rave about it, and others who feel it does not meet their needs.

A good portion of every potential system considered by Genesys has been in use elsewhere. Some are very close to what we require, but none completely fits our new environment. Approximately 80 percent of what is needed for the health system of the future is available now. Designing and implementing the other 20 percent is the key to the success of any CPR system, requiring customization to the individual health network and continued technology improvements. ▫