

ELECTRONIC COMMERCE

IN U.S. HEALTH CARE

INPUT

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EDI and Electronic Commerce Program
(EDEDI)

Electronic Commerce in U.S. Health Care

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Abstract

Electronic commerce in health care refers to the use of inter-organizational networks that connect computer systems and that allow health care community participants (including providers, insurance payors, suppliers, and others) to coordinate their activities. In particular, this report examines the four most critical areas where electronic network systems have been deployed and are currently undergoing an expansion of use: (1) Medical Claims Processing—from enrollment and eligibility checking to claims submission from hospitals, physician's offices, dental offices, and pharmacies. (2) Medical Claims Payment—from government and private payor to provider. (3) Procurement of medical-surgical, pharmaceutical, and dietary supplies for hospitals. (4) Utilization review, preferred-provider organization management systems, and other related information services involving networks.

For these applications, INPUT reviews what the issues are, what the volumes of activity are (including the number of claims made per year by each health care player and what percentage are electronically filed), what the volumes of activity will grow to be by 1997, what companies are providing the information services and software needed for the expansion of these applications, what user organizations are leading the way and what their experiences have been, particularly in regard to cost savings and the use of standardized systems as opposed to proprietary systems, and what the background is on some of the leading information service and software companies.

In our analysis, we also discuss the extent to which other related information systems are being used in the health care community. Smart cards, e-mail, imaging systems, computerized patient records, and voice recognition are some important technologies in the electronic environment of health care commerce. We assess the extent to which these are being deployed and what their roles are in the overall electronic infrastructure.

The report is 84 pages and contains 24 exhibits.



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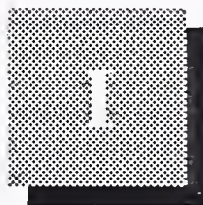
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Introduction

A

Scope of the Report

Electronic commerce in health care refers to the use of inter-organizational networks that connect computer systems and that allow health care community participants (including providers, insurance payors, suppliers, and others) to coordinate their activities.

In particular, this report examines the four most critical areas where electronic network systems have been deployed and are currently undergoing an expansion of use:

- Medical Claims Processing—from enrollment and eligibility checking to claims submission from hospitals, physicians' offices, dental offices, and pharmacies
- Medical Claims Payment—from government and private payor to provider
- Procurement of medical-surgical, pharmaceutical, and dietary supplies for hospitals
- Utilization review, preferred-provider organization management systems, and other related information services involving networks

For these applications, this report reviews what the issues are, what the volumes of activity are (including the number of claims made per year by each health care player and what percentage are electronically filed), what the volumes of activity will grow to be by 1997, what companies are providing the information services and software needed for the expansion of these applications, what user organizations are leading the way and what their experiences have been, particularly in regard to cost savings and the use of standardized systems as opposed to proprietary systems, and what the background is on some of the leading information service and software companies.

This report also discusses the extent to which other related information systems are being used in the health care community. Smart cards, e-mail, imaging systems, computerized patient records, and voice recognition are some important technologies in the electronic environment of health care commerce. The extent to which these are being deployed and what their roles are in the overall electronic infrastructure is assessed.

This report focuses on the U.S. health care industry. Canadian, European, and Japanese health care industries are mentioned at various points only for comparison purposes.

This analysis of U.S. health care, of course, outlines the initiatives, consortia, and legislation that have taken place recently as the U.S. grapples with its health care crisis.

INPUT believes that it is helping the resolution of the health care crisis in the United States by providing participants—users of electronic information systems and vendors of such systems—concrete empirical data that quantifies and characterizes the economics of streamlining health care delivery through better information and communications. Only with a knowledge of the parameters of the situation can effective action be taken.

Hospitals, clinics, private physicians' offices, insurance companies, and other health care players will see how EDI and other similar systems have saved hundreds of thousands of dollars in administrative expenses at certain hospitals.

They will learn why it is now advantageous to adopt standard medical claims and supply procurement systems rather than vendor-supplied proprietary systems.

Vendors of information services and software (such as PCS, CyCare, and the many others) will have all the pertinent data they need to assess the applications and market opportunities for their products and services.

Vendors will get a complete picture of the competitive environment for information services in the health care marketplace. Specifically, INPUT covers who has won what recent contracts, what the capabilities are of specific vendors, what the governmental and quasi-governmental bodies are mandating, and other points that show where the market needs and opportunities lie.

B

Structure of the Report

As in all of INPUT's electronic commerce reports (see section D of this chapter, Related INPUT Reports), Chapter III is an overview of the specific industry covered, in this case the health care community. The overview consists of identifying who the players are in the community, how many of them there are, who transacts with whom, what the respective volumes of these transactions are, and what the current trends and issues in the community are (over and above those regarding specifically information systems).

Once this general "lay of the land" is established, Chapter IV examines in detail the specific electronic commerce applications. This is a detailed look at how health community players are using EDI and other electronic network systems to communicate with each other.

Once the community workflow and how electronic systems are enhancing it have been examined, Chapter V profiles those companies that are providing the electronic systems.

Finally, Chapter VI summarizes INPUT's findings with conclusions and points out where the opportunities are for future development.

For a quick overview of the whole report, see Chapter II for an executive overview.

C

Methodology

A wide variety of sources was used for this report. For basic health care statistics, government and trade association publications were used. These included the Statistical Abstract, The Industrial Outlook, the Congressional Record, the Federal Register, and publications of the Health Care Financing Administration (HCFA), the American Dental Association, the Health Industry Business Communications Council, and the Electronic Mail Association.

The richest sources of data were telephone interviews with users and vendors of information services. For this report INPUT interviewed IS, procurement, and financial managers at five hospitals; two buying groups; two hospital supply manufacturers; representatives of HCFA, NEIC and the Health Care EDI Corporation; health care industry representatives from seven vendors of information services; and representatives from three industry associations.

In addition to these interviews, INPUT drew on interview data from other health care research projects that INPUT consultants have been involved in 1992. These included interviews from a number of privately contracted custom research projects as well as interviews for our regular, syndicated research (see the next section, Related INPUT Reports).

INPUT attended the Health Care EDI Corporation's October conference where interviews with representatives of the many vendors of health care electronic commerce services were conducted.

Also, a wide variety of other printed and electronic information sources were used, including extensive press publications, company literature, CD-ROM full text and abstracted information, and other miscellaneous documentation.

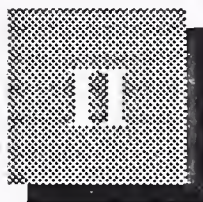
D

Related INPUT Reports

This report is part of a series of reports on electronic commerce. The series examines several vertical markets—or, more precisely, trading communities—where interorganizational electronic networks and information services are streamlining commercial transactions. INPUT maintains a research program on Electronic Commerce to which the leading EDI/ Electronic Commerce vendors and users subscribe.

Below are listed the recent reports that INPUT has published on Electronic Commerce, EDI and/or health care.

Electronic Commerce: Comprehensive Market Assessment
Electronic Commerce: The New Foundation for Trade
Electronic Commerce in the Media Industry
Electronic Commerce in Trade and Transportation
Electronic Commerce in Travel and Tourism
Electronic Commerce in Grocery Production and Distribution
Electronic Commerce in Apparel and Retail
Electronic Commerce in the U.S. Federal Government
Electronic Commerce in Banking and Finance (due 4th quarter 1992)
The U.S. Electronic Data Interchange Market, 1992-1997
International EDI Markets
The Electronic Data Interchange Market, Europe
The Electronic Data Interchange Market, Japan
Trends in Electronic Corporate Trade Payments
Information Services, Market Analysis Program, Health Services
Information Services, Market Analysis Program, Insurance



Executive Overview

A

Findings

Systems that support commercial transactions (“electronic commerce systems”) in health care are economically useful in four business functions, or workflows, in the health care industry:

- Procurement
- Claims Processing
- Claims Payment
- Utilization Review and Related Information Service

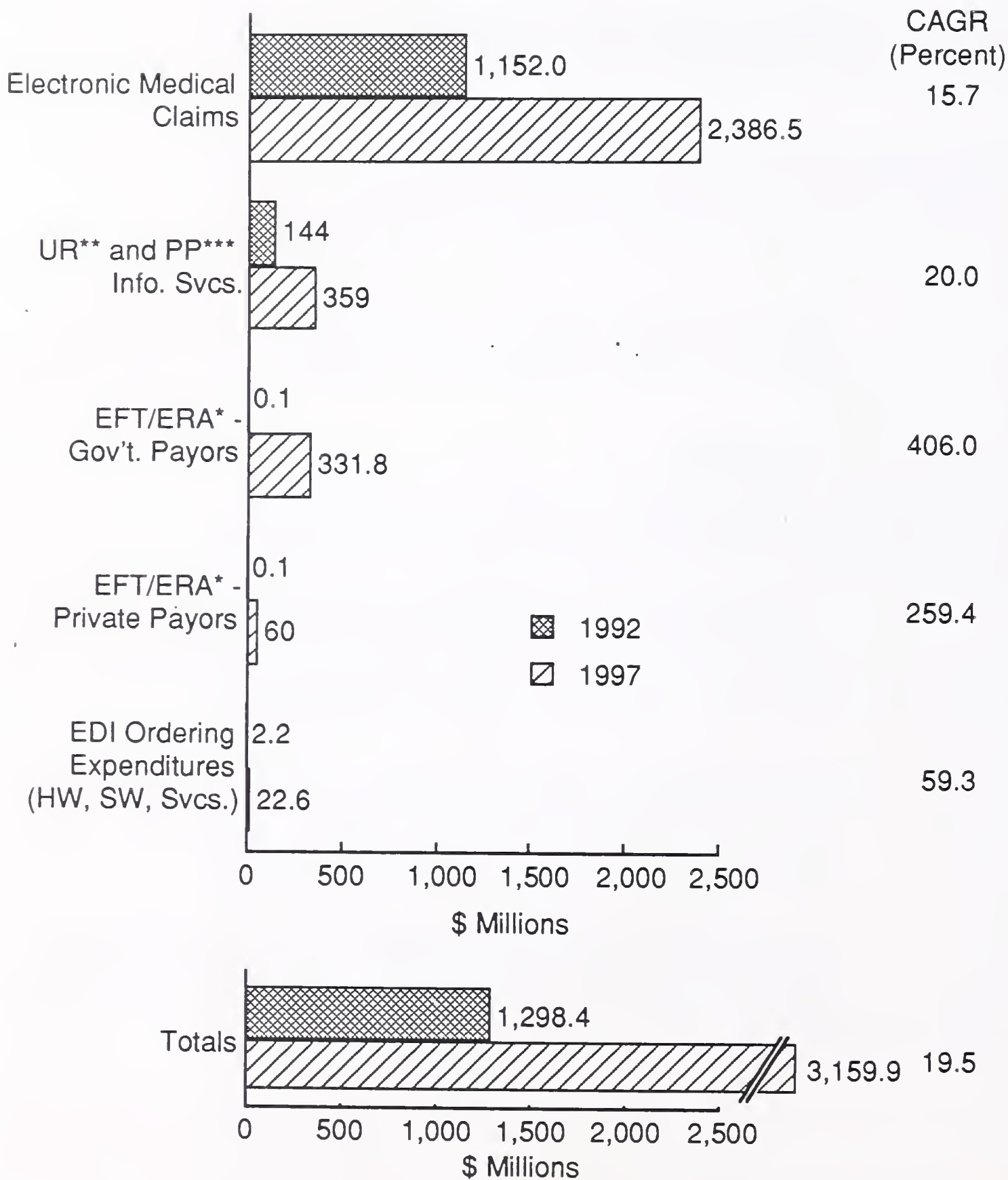
The expansion of these basic electronic commerce applications is laying the groundwork for a nationwide health information network that will streamline the delivery, financing, and administration of health care. The goal is a less costly health care delivery system, restructured to provide better, faster, and more appropriately targeted care.

Current developments are establishing the infrastructure required for such a system: emerging standards, EDI and other inter-organizational applications, and an increasing level of collaboration and communication among providers, payors, employers, and government agencies.

Exhibit II-1 depicts forecasted growth in the four key electronic commerce and EDI markets: EDI ordering, electronic medical claims, electronic payment and remittance, and utilization review and PPO-related information services.

EXHIBIT II-1

Summary: Key Health Care Electronic Commerce Markets



* Electronic Funds Transfer/Electronic Remittance Advice
 ** Utilization Review
 *** Preferred Provider Organization

INPUT believes that there are tremendous opportunities for both users of electronic commerce systems and vendors of these systems over the next five years.

As the exhibit shows, health care providers are expected to spend a rapidly increasing amount on these systems over the next five years.

The greatest growth area is in payment of medical claims. In part, this rapid increase stems from the fact that a small proportion of today's insurance claims are paid electronically.

EDI procurement shows the next most rapid adoption, and this stems from the transition now underway from proprietary pharmaceutical ordering systems (such as Baxter's and ASAP) to standardized, typically X12-based, systems that cover all material procurement functions for hospitals, including medical-surgical supplies, grocery/dietary material, and others in addition to pharmaceuticals.

While INPUT is confident that electronic claims growth will proceed at the rate shown, we are less certain as to who will realize the economic benefits. In Exhibit II-1, the dollar amounts spent on claims processing are the revenues earned by claims processing service bureaus (assuming the industry-standard fee of \$.75 per claim processed).

Electronic filing of claims will certainly impact revenues for these intermediaries, but these intermediaries will be eliminated or consolidated, so exactly who retains the revenue growth shown in Exhibit II-1 is unclear. It may be the claims processor, the network service providers, the newly merged or consolidated entities, or indeed, by using EDI software and communicating directly with insurers, it may be hospitals and other providers themselves. Health care providers may be the ultimate beneficiaries of these dollar values and realize them in terms of reduced costs.

Utilization review and other information services also show a substantial rate of growth. These services are typically used in conjunction with assessing medical claims and containing health costs.

B

Driving Market Forces

Cost pressures, demands from the electorate and from major health care payors, providers, and plan sponsors, and a growing awareness of the benefits of electronic commerce are contributing to the growth of EDI and other applications for electronic information exchange among health care organizations.

Exhibit II-2 lists the market forces driving the growth of electronic commerce in health care.

EXHIBIT II-2

Electronic Commerce in Health Care Driving Market Forces

- Government programs encouraging electronic medical claims processing including EDI/EFT use
- Financial incentives: health care costs are skyrocketing; major containment efforts are needed
- Large employers and the health care community are pushing for changes
- Increasing collaboration among health care players
- Benefits are tangible; success stories are accumulating
- Reduced implementation costs on downsized platforms
- Patient care applications offer the long-term prospects of major improvements to public welfare

These driving forces are explained in Chapter VI and in related sections of Chapters III and IV.

C

Inhibiting Market Forces

Restraints to the growth of electronic commerce applications in health care stem largely from the complexity of the multi-layered, multi-payor, public-private, modified free enterprise health system that exists in the U.S. These combined forces make the reform of the health care system an enormous undertaking.

Exhibit II-3 lists the market forces inhibiting the growth of electronic commerce in health care.

EXHIBIT II-3

Electronic Commerce in Health Care Inhibiting Market Forces

- Complexity of the U.S. health care system
- Lack of uniformity of health care information and the large number of proprietary designs already in use
- Costs of converting to EDI and lack of awareness of cost benefits
- Many provider sectors are not ready for EDI or electronic commerce
- Privacy and information security issues
- The magnitude of change required

Again, these inhibiting forces are explained in Chapter VI and in related sections of Chapters III and IV.

The magnitude of change required is significant, but change is occurring first in purchasing, claims, and insurance-related areas, and will progress swiftly over the next five years. A commonly stated target for computerized patient record (CPR) standard-based systems is the year 2000, although legislation now in Congress (commonly known as the Health Insurance Reform Act of 1992) calls for the Health and Human Services Secretary to encourage adoption of CPR standards by 1995, and for hospitals providing Medicare services to have a CPR system in place by January 1996.

D

Market Opportunities

There is a need for electronic medical claims processing and other EDI software and services opportunities among physicians' practices and other provider groups.

These other groups include inpatient-outpatient labs, skilled nursing facilities (nursing homes), and home health care providers. These are the groups which have the lowest installed base of administrative computing technology—Medicare Electronic Medical Claims ((EMC) rates from

these provider categories are all currently in the 50% or less range. Software and services should be user-oriented and perhaps bundled with non-technology (business) services.

There are systems integration needs for large-scale EDI rollout within managed care, buying groups, or other health care associations.

Development of in-house EDI order entry capabilities in hospitals and large clinics or physicians' practices promises to begin its take-off by 1994—the foundation is now being laid through initial success stories. Rollout of EDI capabilities into hospitals is a major undertaking, and the level of effort required will vary considerably depending on the platform selected and the readiness of the hospitals to use EDI. In cases where the number of hospitals is very large or the level of IS staff is relatively low, contracting with an outside services firm to plan, focus, implement, and monitor the success of the rollout is a cost-effective approach.

Materials management needs to be re-engineered as standard EDI ordering systems are implemented.

Hospitals are moving to just-in-time ordering and warehousing, and have realized significant savings through reduction in inventory and required warehouse space. EDI ordering may spur a re-design of inventory management processes, or vice versa.

New software and services are needed to support development of utilization review, claims analysis, and other systems aimed at cost containment.

A number of current players and projects are described in Chapter IV of this report. Insurance companies, self-insured employers, third party administrators, and managed care organizations are major users of these systems.

There are medical imaging opportunities both in patient care and claims-related applications.

Large-scale picture archiving, teleradiology, and related image transmission projects are now under way in many large hospitals. These are typically major integration projects with a large number of hardware, software, and services players represented. Image transmission opportunities in support of claims processing will begin to appear in 1995.

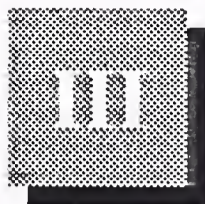
Human resources (HR) and employee benefits software products are needed to support electronic enrollments.

Employers' interest in this function stems from the reduction in costs they may realize in converting from one payor to another and electronically updating enrollments in the payor's office through a process that is less error-prone and more flexible and timely than magnetic tape submission. INPUT expects that employers who already have EDI capability will be the first to take advantage of EDI enrollment.

There is a need for inter-organizational E-mail as a precursor or complement to EDI transaction processing.

Inter-organizational E-mail is already widely used on the business side of health care, e.g., among insurance firms, materials vendors, and pharmaceutical companies. It is used among managed care organizations that have a significant level of interaction among primary care providers and specialists, and in support of referrals and pre-certification of services. Hospitals and physicians' practices are relatively low users of e-mail. As interaction among the health care community grows, demand for e-mail will be driven by its ability to streamline communication, and as a precursor or complement to EDI (see Chapter IV). Vendors should monitor trends toward collaboration and EDI implementation among the less e-mail-intensive sectors, and target those groups as they begin to focus on communications with trading partners and remote sites.

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The U.S. Health Care Trading Community

A

Health Care Expenditures

The U.S. Department of Commerce estimates that 1992 health care expenditures will be \$817 billion, an increase of 11% over 1991 expenditures of \$738 billion, and that average annual increases of 12% to 13% will occur from 1992 to 1997. 1991 expenditures accounted for approximately 13% of the Gross National Product.

Several factors are key to the high cost of health care:

- The U.S. health care system tends to put a greater emphasis on expensive, high-technology treatments and specialists' care rather than basic, preventative medical care. Only 33% of American physicians today train for work as primary care providers or general practitioners, in contrast to approximately 50% in Canada and 75% in Australia.
- The threat of malpractice suits has pressed many physicians to order expensive and sometimes unnecessary testing and/or procedures. Except under managed care systems, there is no financial incentive for doctors to limit testing.
- Consumers who are covered by medical insurance have little incentive to seek less costly health care, since the insurance company pays the bills.
- The vast network of players—consumers, providers, public and private insurers, and financial institutions—through which health care is administered needs re-engineering. The President's 1992 Health Reform Program report estimated that 12.2% of 1991 health care expenditures (approximately \$80 billion) was spent for public and private insurance administrative costs and provider billing costs. The complexity of the system through which we deliver and pay for health care is part of what makes it the most expensive care in the world.

Many proponents of U.S. health care reform have advocated a national health insurance system, to simplify the provider/payor relationship and allow for a more common level of coverage for all citizens. Exhibit III-1 provides a comparison of health care spending in the U.S. and three other industrialized nations, each of which have national health plans.

EXHIBIT III-1

Health Expenditures in Selected Industrial Nations—1988

Country	Total Health Expenditures as a % of GDP	Per Capita Health Care Expenditures
United States	11.2	2,123
Germany	8.6	1,212
Canada	8.5	1,554
Japan	6.7	978

Source: U.S. Dept of Commerce, 1991

Certain indicators of health care quality suggest that Germany, Canada, and Japan may be receiving more value for their health care expenditures. All three nations rank slightly to significantly higher than the U.S. in life expectancy and infant mortality rates, for example.

The high cost of medical care has become a competitive disadvantage for American businesses that face competition from other industrialized nations such as Germany or Japan. It now costs American automakers more for insurance premiums for their workers than for steel for producing products. According to A. Foster Higgins & Co.'s 1991 health benefits costs survey, health care benefit costs amounted to 26% of corporate earnings in 1990.

The Foster Higgins survey found that, despite intense cost-containment efforts, corporate medical bills soared an average of 21.1% between 1989 and 1990, and 20.4% the previous year. Besides the factors contributing to the overall rise in health care costs (averaging around 11-13 percent in annual increases), corporate sponsors of health benefits often end up footing the bill for underpayments by Federal Medicare and Medicaid

programs. Hospitals and physicians often shift the costs of services to Medicare/Medicaid patients by increasing charges to privately insured patients. With the burden to the private sector becoming unsupportable, demands for reform are becoming more urgent and forceful.

This multi-payor, combination public-private enterprise health system was created over many years, and proposals to implement structural changes to the system must overcome numerous obstacles. The debate on private versus public control of the health system and the merits of a single payor versus a multiple payor system is continuing. Meanwhile, efforts to improve the efficiency of health care administration through the implementation of EDI and electronic commerce applications are moving ahead.

B

Players in the Health Care Trading Community

Exhibit III-2 illustrates the health care trading community, with the hospital represented as the focal point of the network. Physicians' offices, long-term care facilities, and pharmacies play an analogous role in providing health services, and could each be represented as a trading community with similar supplier, payor, and other trading relationships.

There are three general categories of organizations: supply providers, service providers, and funds providers. Exhibit III-3 breaks these three general categories into 30 different types of players.

EXHIBIT III-2

The Health Care Trading Community

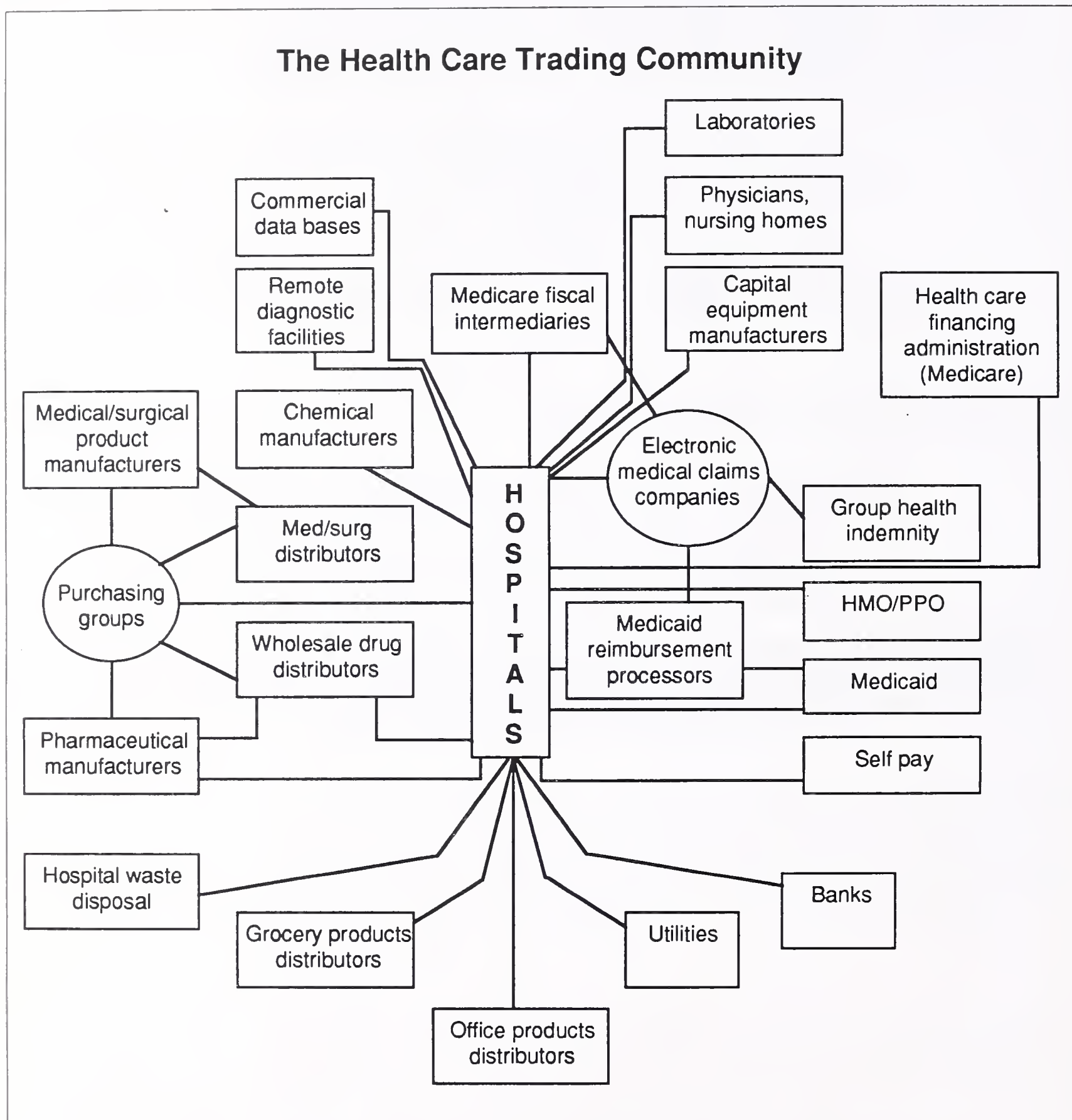


EXHIBIT III-3

Players in the Health Care Trading Community

- Supply Providers
 - Pharmaceuticals
 - Medical/surgical supplies
 - Grocery/food service/dietary products
 - Office supplies
 - Chemicals
 - Miscellaneous capital equipment (beds, lab equipment, office equipment, etc.)
 - Energy
 - Waste disposal
- Service Providers
 - Health care providers
 - Hospitals
 - Pharmacies
 - Health maintenance organizations/preferred provider organizations
 - Long-term care facilities
 - Doctors' offices/medical groups
 - Health care research and education
 - Laboratories
 - Remote diagnostic facilities
 - Universities
 - Publishers (including commercial data base publishers)

EXHIBIT III-3 (CON'T)

**Players in the Health Care
Trading Community (Con't)**

- Service Providers
 - Distribution services
 - Pharmaceutical
 - Medical/surgical supplies
 - Transportation
 - Service providers (excl. banks, finance, utilities, transport)
 - Claims processors
 - VANs
 - Medicare fiscal intermediaries/government bodies
 - Buying groups
 - Managed care providers
- Funds Providers
 - Banks
 - Government
 - Commercial insurers
 - Employer self-insurance plans
 - Recipients of medical services (patients)

Exhibit III-4 shows the number of organizations in each player category. These numbers are based on the registered members of the Health Industry Number (HIN) system data base maintained by the Health Industry Business Communications Council (HIBCC). HIBCC assigns unique identification numbers to member organizations, to facilitate EDI-based transactions between trading partners.

EXHIBIT III-4

The Number of Companies/Locations in Health Care by Segment

Segment	Number of Sites
Retail Pharmacies	59,338
Nursing Homes	15,712
Hospitals (including Canada)	10,396
Dist./Wholesalers	6,392
Buying Groups	2,542
Clinics	2,429
Health Misc.	2,200
Out-Patient Surg. Ctrs.	1,506
Home Health Corp.	826
Manufacturers	814
HMOs	694
PPOs	601
Group Purchasing Organizations	476
Nursing Home Chains	228
Non-Health Misc./Unallocated	192
Total	104,346

Source: Health Industry Business Communications Council

C

Community Workflow

Interorganizational workflow in the health care community occurs within a network of conversations among the players for the exchange of requests, promises, and other messages pertinent to commerce. These workflows are depicted in Exhibit III-2.

Interorganizational workflow among the different players has already been facilitated in several areas by electronic commerce technologies. Providers of medical, surgical and pharmaceutical products offer on-line electronic ordering and EDI systems for hospital purchasing. These systems are usually supplied by the vendor, typically a distributor.

On the funds provider side, a hospital typically submits health insurance claims to a third-party service bureau or fiscal intermediary. The bureau edits, sorts, and sends the claims on to the appropriate payer organizations, commercial or governmental. If the claims are submitted electronically to the bureau, the hospital has prepared them using software that it has purchased. Sometimes a claims processing bureau provides the software, other times the service uses software of other vendors.

D

Trade Volumes in the Health Care Community

Trade volumes among health care players are relevant to an analysis of electronic commerce because they indicate where electronic commerce systems will provide the greatest utility. The higher the dollar value transacted between players, the more likely the need for electronic commerce systems between players.

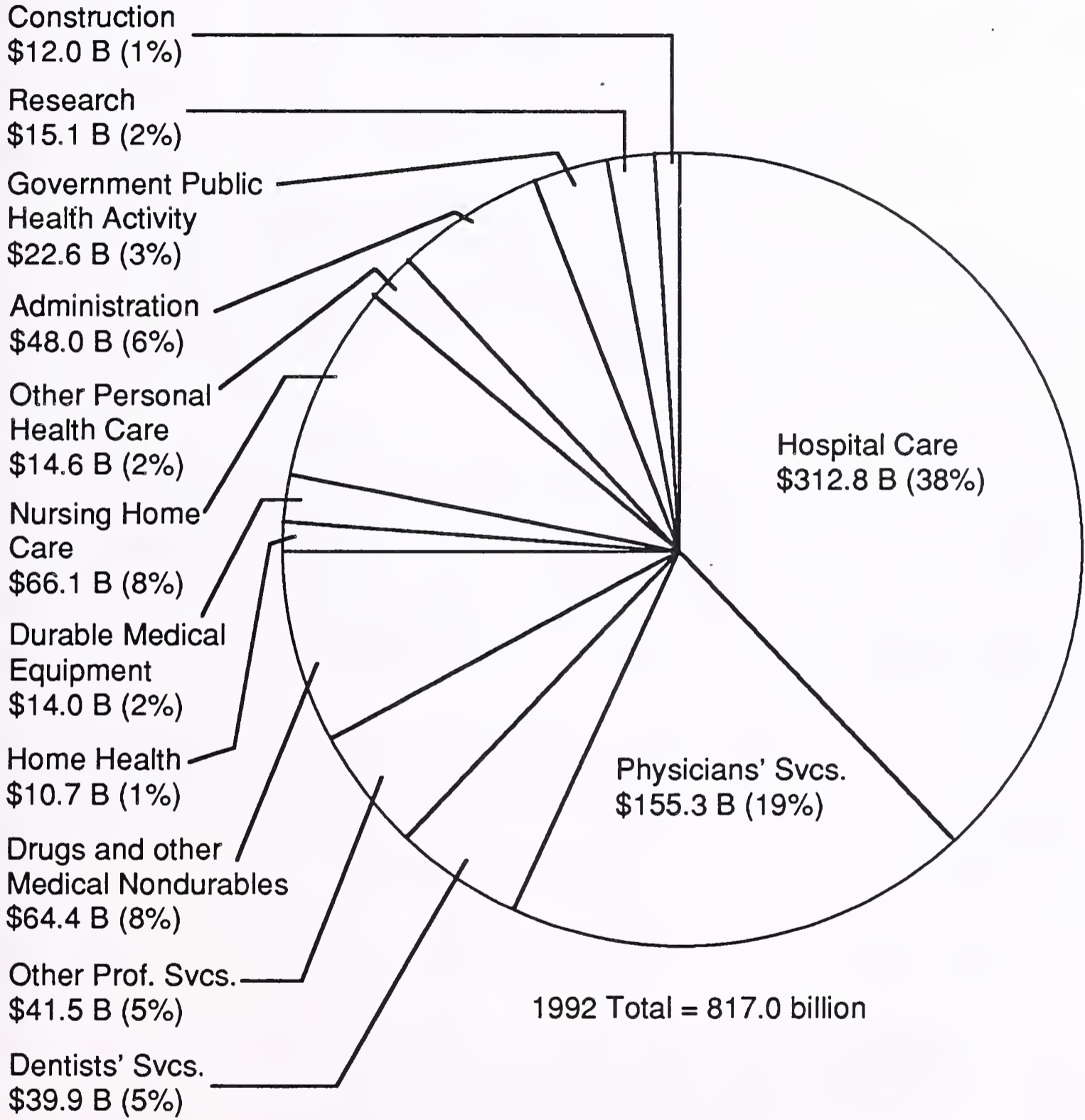
Exhibit III-5 breaks the \$817 billion 1992 Department of Commerce estimate of total health care expenditures into its component categories.

Hospital care is the dominant category of health care costs. Hospital care expenditures in 1992 were approximately \$313 billion (38 percent of all health care costs). Physicians' services were the second largest category, at \$155 billion, nursing home care was \$66 billion, and combined expenditures for dental services, other professional services, and other personal health services reached an estimated \$95 billion.

To examine electronic commerce in health care, INPUT focuses on the trading community that surrounds the hospital.

EXHIBIT III-5

Health Care Cost Categories



Source: Department of Commerce

1. U.S. Hospitals

There are approximately 6,800 hospitals and 1.2 million hospital beds in the U.S. Exhibit III-6 gives a regional breakdown of U.S. hospitals and hospital beds.

EXHIBIT III-6

U.S. Regional Hospitals and Hospital Beds

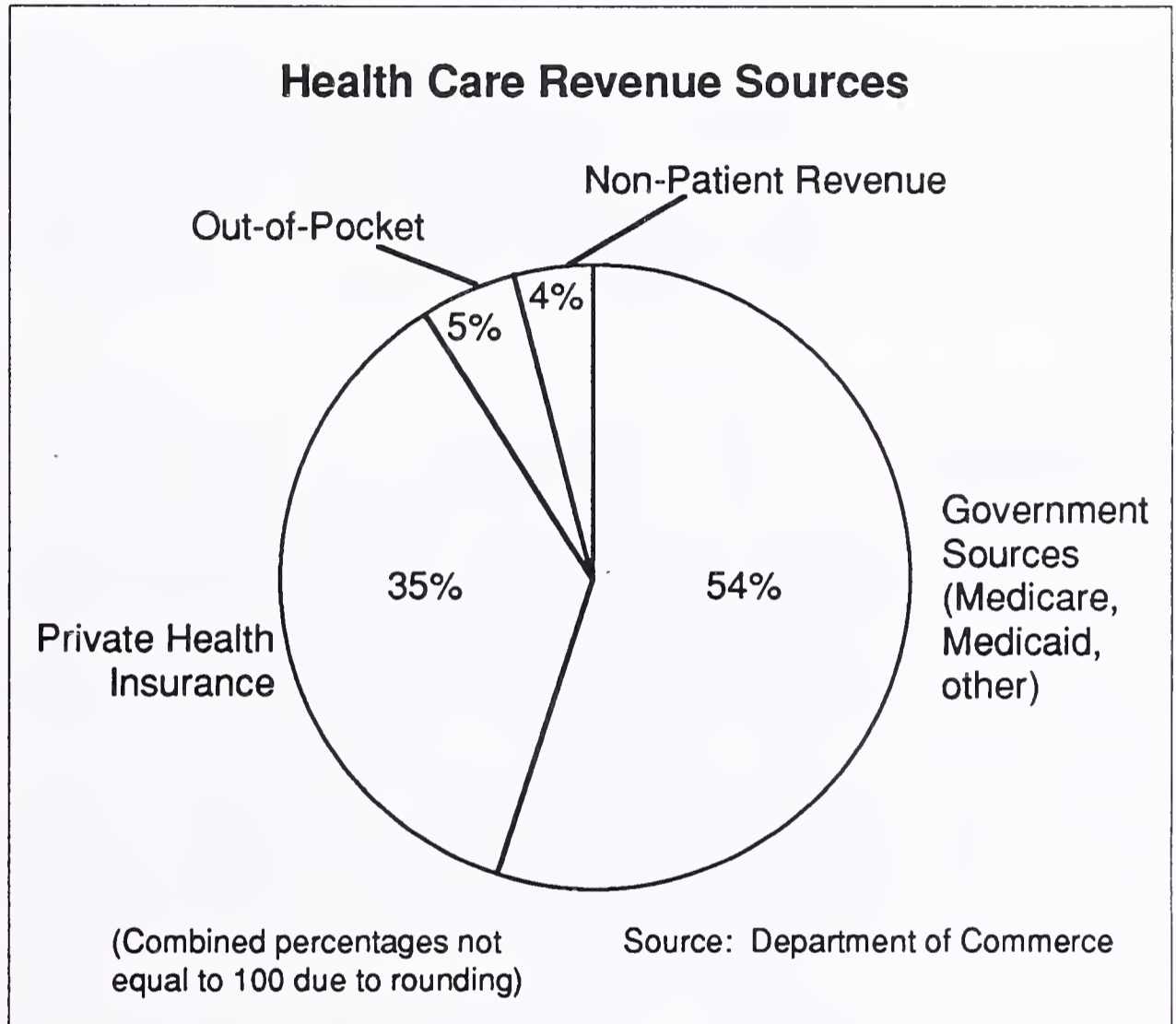
Region	No. of Hospitals	% of Total Hospitals	No. of Beds (Thousands)	% of Total Hospital Beds
Northeast	1,100	16	285.2	23
<i>Northeastern Sector</i> ME, NH, VT, MA, RI, CT	361		69.7	
<i>Mid-Atlantic States</i> NY, NJ, PA	739		215.5	
Midwest	1,835	27	322.0	26
<i>Eastern Sector</i> OH, IN, IL, MI, WI	976		210.1	
<i>Western Sector</i> MN, IA, MO, ND, SD, NE, KS	859		111.9	
South	2,557	38	438.3	35
<i>South Atlantic</i> DE, MD, DC, VA, WV, NC, SC, GA, FL	1,065		214.2	
<i>East South Central</i> KY, TN, AL, MS	540		89.7	
<i>West South Central</i> AR, LA, OK, TX	952		134.4	
West	1,288	19	195.5	16
<i>Mountain States</i> MT, ID, WY, CO, NM, AZ, UT, NV	480		56.4	
<i>Pacific States</i> WA, OR, CA, AK, HI	808		139.1	
U.S. (Only) Totals	6,780	100	1,241	100

Source: U.S. Department of Commerce, 1988

2. Hospital Revenues

Based on 1988 data from the Health Care Financing Administration (HCFA, the federal funding source for Medicaid and Medicare), 55% of hospital revenues came from government sources and 45% came from the private sector (including private health insurance, out-of-pocket payments, and non-patient revenues). Exhibit III-7 shows revenue sources for health care.

EXHIBIT III-7



3. Hospital Inventory Expenditures

Electronic commerce among suppliers is most applicable to transactions that are numerous and recurrent. Inventory items such as medical/surgical products, pharmaceuticals, and food products offer the greatest opportunities for electronic commerce, but non-inventory purchases such as office supplies, capital expenditures, and utility payments are not less suitable for electronic commerce applications.

The largest single category of inventory expenditure by hospitals is for pharmaceuticals. 1991 U.S. drug industry shipments totaled about \$59 billion—\$49 billion (83%) was for pharmaceutical preparations and the remainder was divided among the categories of diagnostics, biologicals, and medicinals/botanicals. INPUT estimates hospitals purchased approximately \$26 billion in pharmaceutical products last year.

Of almost equal value are hospital expenditures on food and dietary products, which INPUT estimates to be approximately \$22 billion.

U.S. expenditures on medical/dental instruments and supplies was \$29.6 billion, with half of this amount purchased by hospitals and the remainder purchased by solo physician practices, homes, nursing homes, and independent ambulatory centers.

4. In-Home Health Care

A new trend in health care is bringing services to the homes of patients. In-home health has grown at over 20% per year for the past four years, according to the Department of Commerce. This emerging market has important implications for providers of electronic mail, commercial data bases, network services, laptop devices, and other field-service support products and services.

E

Trends and Issues

Financing and delivery of adequate health care to the entire U.S. population continue to be major issues on the country's political agenda. Approximately 37 million Americans are without health insurance. The average cost per American to finance total health expenditures in the country is \$2,100. Reform is being called for at the national level.

Factors which have contributed to the rising cost of health care include the costs of advanced technologies, procedures, and equipment used in research and treatment, the rise in the average age of the U.S. population, and the effects of the growth of malpractice suits (physicians practicing "defensive medicine" and repeating tests or procedures), the costs of settlements, and swiftly increasing malpractice insurance premiums.

While government, providers, and insurers are making efforts to reduce or control these costs, a prime target of reform also continues to be the organizational and legal process for financing health care. Health care financing is administered through a labyrinth of commercial and governmental organizations. For insured patients, providers send insurance claims to any number of state agencies, third-party processing service bureaus, commercial insurers or processing bureaus set up by these insurers.

In addition, the "unbundling" of health care services and the emergence of managed care and preferred provider organizations (PPOs) and arrangements has required providers to increase record-keeping, verification, and auditing procedures.

Insurance enrollment, eligibility checking, claims submission, claims payment, and remittance reporting constitute an area that is ready for major overhaul and streamlining.

Below are some key trends and developments:

- National health care expenditures will cross the trillion dollar mark by 1994, growing to approximately \$1.4 trillion in 1997, according to the rates forecast by the Department of Commerce.
- Home health care, a source of transactions among different health care providers, will grow as a proportion of the overall health care market. When patients stayed in hospitals, most health care services (e.g., laboratory tests, x-rays, CAT-scans, and other specialized equipment uses) were provided under a single roof and were consolidated in a single bill. Now each service is outsourced to an individual third-party provider. Each provider generates a separate bill.
- Health care services are becoming “unbundled”—rendered by multiple, independent providers instead of a single hospital or clinic. This is creating a need for managed health care systems and services. Many large vendors in the health care market have organized to address this trend. EDS has created the Inter-Practice System, and GTE Health Systems Incorporated has a business unit called Systems Choice.
- As a result of the Omnibus Reconciliation Act of 1989, HCFA was required to provide physicians with technical information necessary for electronic claims submission and to encourage their movement to electronic claims submission. Recently, HCFA announced that it saved approximately \$110 million in administrative costs in its fiscal year 1991, a result of the 44% of Medicare physicians’ claims that were processed electronically.
- An industry-led workgroup known as Workgroup for Electronic Data Interchange (WEDI), was created in November 1991, at the direction of the Secretary of Health and Human Services, Louis B. Sullivan. WEDI is co-chaired by the presidents of Travelers Insurance Company and the Blue Cross and Blue Shield Association, to analyze the potential for uniform electronic billing and claims processing. The task force released its report on its first six months of work in July of this year, setting forth aggressive goals to move the health care industry toward the use of EDI in insurance-related transactions.
- The creation and/or adoption of standardized EDI data formats for both hospital procurement and insurance transaction processing is opening up the market to multivendor solutions. In the claims arena for example, there are now over 400 different proprietary designs being used. However, a consensus for ANSI X12 is emerging across applications. Three

major players are now backing ANSI X12: WEDI (per recommendations issued in July '92), Medicare, which announced in March that it would standardize on X12, and NEIC, which is building its new HCIN network to X12 standards as well.

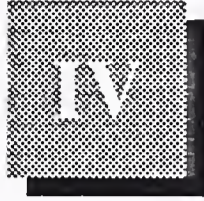
- Distribution and logistics vendors are offering new services to hospitals for materials management, including just-in-time inventory techniques, multiple-vendor electronic buying systems, and integrated supplier management programs for single-source/consolidated billing.
- The use of information technology to improve the quality and delivery of patient care is spurring a movement to develop industry-wide standards for computerized patient records. Health care organizations need to provide caregivers with bedside and remote access to patients' records, and to allow for communication of patient care information (including image transfer) between health care facilities, departments, and treatment sites.

The driving forces for electronic commerce in health care are summarized in Exhibit III-8.

EXHIBIT III-8

Driving Forces for Electronic Commerce in Health Care

- The need to control skyrocketing health care costs
- Unbundling of health care services among multiple providers
- Moves toward adoption of industry-wide EDI standards for purchasing and claims submission
- Government and industry partnerships aimed at reducing administrative costs
- Moves toward development of industry standards for computerized patient records



Electronic Commerce Applications

Electronic commerce in the health care trading community consists of an electronic infrastructure through which the different players in the community coordinate their recurring commercial transactions.

There are many areas where transactions occur that lend themselves to electronic network solutions. Exhibit IV-1 lists an inventory of health care technologies and shows which are potential electronic commerce applications.

This chapter covers key existing and emerging electronic commerce applications—those with the most market potential, the greatest industry-wide impact, and which will serve the largest number of patients and health care players.

EXHIBIT IV-1

Inventory of Health Care Technologies and Applications

Technology Application	Comm. Networks	Ext'l. Links	Electronic Messaging	Image Proc.	On-line Proc.	Batch Proc.	Expert System	Interface Equip.
Enrollment	(X)				X	X		X
Eligibility	(X)		(X)		X	X	X	X
Authorization	(X)		(X)		X	X	X	X
Referral	(X)		(X)		X	X		X
Claim Submission	(X)			X	X	X		X
Claim Adjudication	(X)				X	X	X	
Managed Care Utilization Review	(X)		(X)	X	X	X	X	X
Coordination of Benefits	(X)		(X)			X	X	
Explanation of Benefits	(X)		(X)					
Remittance Advice	(X)		(X)			X		
Funds Transfer	(X)	(X)				X		
Credit/Debit Card Transactions	(X)	(X)			X			X
Service Audits	(X)		(X)	X		X		
Appointment/ Admission	(X)		(X)		X		X	X
Laboratory Tests	(X)		(X)		X		X	X
Prescriptions	(X)		(X)				X	X
Supplies	(X)	(X)	(X)		X	X		X
Patient Survey	(X)		(X)			X		
Medical Library	(X)	(X)			X			X
Patient Records	(X)		(X)	X		X	X	
Laboratory Results	(X)		(X)	X		X	X	
Reporting	(X)		(X)			X	X	

Note: Items with (X) indicate potential electronic commerce applications

Source: WEDI

A

Electronic Claims Processing

The health care community recognizes the benefits of automating the claims processing function because automation will streamline a key part of health care administration, but industry-wide electronic claims processing has broader implications: it is the first step in building the infrastructure for a national health care information network.

According to the Workgroup for Electronic Data Interchange (WEDI), there are now over 400 different proprietary designs used in health care for the exchange of claims information. However, a consensus for ANSI X12 is emerging.

The movement toward development of computerized patient record standards (discussed in more detail later in this chapter) is in the organizational stage. Its goal is to develop standards for transmitting patient care information, which could be used to support medical claims, but even more importantly, to save lives by providing medical information wherever it is needed.

For now, the focus in claims processing is on developing industry-wide standards for claim information, and in increasing the percentage of claims processed electronically.

Exhibit IV-2 shows INPUT's estimates of the health care claims volumes for 1992 and 1997. Penetration of electronic medical claims (EMC) processing varies by type of provider and type of payor. Each major payor-provider category is discussed below.

EXHIBIT IV-2

Health Care Claims Transaction Volumes (Figures in \$ Millions)

Item	1992			1997			1992-1997 CAGR (%)
	No. of Claims	No. of EMC	Percent of EMC	No. of Claims	No. of EMC	Percent of EMC	
<i>Medical</i> Gov't. payor - provider- to-intermediary transactions							
Medicare hospital	116	93	80	148	148	100	10
Medicare physician	552	271	49	706	635	90	19
Medicaid hospital	70	63	90	90	90	100	7
Medicaid physician	333	117	35	425	361	85	25
Total gov't medical claims	1,071	543	51	1,369	1,234	90	18
<i>Private payor</i> Blues hospital	155	93	60	198	168	85	13
Blues physician	881	176	20	1,125	675	60	31
Non-Blue hospital	360	8	2	458	12	3	8
Non-Blue physician	1,421	11	1	1,815	22	1	15
Total private medical claims	2,816	289	10	3,596	877	24	25
<i>Total medical (Gov't. and private)</i>	3,887	831	21	4,965	2,112	43	21
<i>Pharmacy</i> Private payor, Medicaid claims	800	625	78	1,020	918	90	8
<i>Dental</i> Private payor claims	266	80	30	339	153	45	14
Claims Totals	4,953	1,536	31	6,324	3,182	50	16

Data may not add to totals due to rounding

1. Government-Sponsored Insurance

In 1992, approximately 1 billion claims were filed with government insurers, with just over half of these filed electronically. Government payors have been able to move ahead more quickly than private payors because of their size, coverage, and clout, and a long-term focus on electronic processing.

Medicare and Medicaid began establishing electronic medical claims (EMC) systems as early as the 1970s, and today process nearly all of their hospital claims and a significant portion of physician claims electronically. In the 1970s the emphasis was on claims submitted via electronic tape, but since the early 1980s more than a thousand hospitals have installed EDI hardware and software and now transmit on-line EDI transactions, using their regional fiscal intermediary's proprietary format in most cases. In physicians' offices, electronic claims are typically submitted via direct dial-up EDI.

The HCFA, which administers Medicare, plans to increase electronic claims filings to 100% of hospital claims and 75% of all other claims by 1995.

Approximate government-insured claims volumes were arrived at as follows. HCFA provided its 1992 total claims-processed and EMC rates (based on 4th quarter 1992 figures and 1993 budgeted workload) to INPUT, and these were used to update WEDI's EMC rates for Medicare. WEDI also published current EMC rates for Medicaid; overall claim volume for Medicaid was derived based on the relative proportion of Medicare and Medicaid payments and enrollments, published by the Department of Commerce in 1980 and 1989.

Fiscal intermediaries

Regional insurance carrier organizations serve as the local administrators for Medicare and Medicaid. Often the intermediary is a Blue Cross/Blue Shield organization, or sometimes it is a private carrier such as Aetna or Travelers Insurance. In any case, it is these intermediary organizations that receive and process the electronic claims submitted by providers.

Blue Cross/Blue Shield ("the Blues") helped to develop the government standards for electronic claims, and has also been aggressive in promoting electronic processing of its private insurance claims, though they have not achieved the same level of penetration for their private claims as for government-insured claims.

2. Hospitals versus Physicians' Offices

There is a major difference between the ability of hospitals to develop EDI capability and the readiness to make such a switch in physicians' offices and other less information technology-intensive environments. While hospitals are by comparison well-equipped with information technology hardware, software, and IS personnel, physicians' offices are far less automated.

A recent American Medical Association Report, "Electronic Data Interchange in Medical and Dental Practices," found that only about 41% of physicians have the capability to submit at least some portion of their claims electronically. While somewhere between 60% and 70% of physicians' practices and doctors' offices have some degree of automation, the level of sophistication of these systems varies widely.

The market for physician practice management software, the most common type of computerization among private physicians, is fragmented. Well over 1,000 physician practice management products are available, most of which are concentrated in regional markets. Few of these product vendors have capitalized on the trend toward electronic claims processing by adapting their products to support EMC.

3. Commercial Indemnity Plans

In 1992, there were approximately 2.8 billion claims filed to private insurers, with approximately 289 million (or 10%) filed electronically. The problem faced by private insurers is that each individual carrier typically makes up only a small part of each provider's practice, so proprietary systems from individual carriers are unacceptable in most practices.

As mentioned earlier, their role as fiscal intermediaries has helped many of the Blue Cross/Blue Shield organizations to achieve high levels of electronic claims processing, but many other large national carriers do not have the same kind of regional influence as a large "Blue" organization which administers government insurance programs and, in areas where there is a high concentration of military personnel, possibly a CHAMPUS program.

Due to the lack of an industry-wide standard, the intermediaries developed their EDI networks to proprietary transaction formats, and this has been an inhibiting factor in the growth of national claims clearinghouses, which large, private insurers lacking regional concentrations of plan members typically use.

Claims clearinghouses are the result of private carriers joining together to develop a system that accepts input of claims transactions directed to different payors using a common transaction format, translates the transaction to the format for each payor, then routes them to the payors for which they are intended.

Using the clearinghouse approach, commercial insurers process approximately 10% of all claims electronically. The larger insurance firms with aggressive EMC programs process claims electronically at approximately twice the industry average, or 20% of all claims.

INPUT's estimates of claims and EMC volumes are based on the known volume of NEIC claims processed in 1992 as well as EMC rates for private coverage under Blue Cross/Blue Shield plans ("Blues").

Total claim volumes were derived by taking total enrollment in private plans (per the U.S. Department of Commerce, 1988) and assuming an average of 14 claims per enrollee per year. This is slightly lower than the government insurance claim rate used (discussed in section 1 above), due to the higher proportion in government plans of elderly enrollees who are likely to need more medical care.

a. National Electronic Information Corporation (NEIC)

The first and largest multi-payor clearinghouse is NEIC, which began in 1981 and serves payors, providers, and intermediaries. 72 NEIC member-payors receive electronic claim filings from over 650 provider organizations. NEIC plans to expand its communications network to support eligibility, referral, authorization, encounter, and free-form message transactions via an open system that will support real-time information exchange 24 hours a day, 7 days a week.

The new system, called HCIN (Health Care Information Network) is planned for release early in 1993. The system is being developed by PCS, Inc., a subsidiary of McKesson Corporation and the nation's largest processor of prescription drug claims. Financial terms of the contract have not been disclosed, but bids on the project came from many large players from various sectors of the information technology services industry. The bidders included EDS, AMR Corp.'s AMRIS unit, AT&T, IBM, Digital, and American Express.

b. Other Consortia, Clearinghouses, and Joint Initiatives

Various regional payors and providers have joined together to promote the use of EMC and other EDI transaction processing:

- In New Jersey, Aetna and Prudential are working with Health Information Technologies, a vendor of point-of-service devices, to implement electronic eligibility checking and claims submission in approximately 500 physician facilities being targeted for this program. The system is to be linked to NEIC to include additional payors by the end of 1992.
- Blue Cross and Blue Shield of Missouri has developed a regional joint-venture clearinghouse with General American Life, Healthlink, and Healthnet to offer electronic claims services for any payor in the region, with the purpose of encouraging more hospitals and physicians to use EDI. The organizations together process about 60% of their claims electronically and plan to increase participation levels significantly over the next two years.

4. Managed Care Plans

The information required by managed care plans is greater than in traditional insurance plans because of the higher level of interaction between payor and provider. Besides claims processing, other required provider-payor transactions include eligibility information, pre-authorization of services, referral processing, and utilization review. Some managed care plans report EMC rates as high as 80%; most systems now in place are proprietary, single payor systems, but a second generation of systems that support multi-payor capabilities is emerging.

5. Pharmacy Claims

The total pharmacy claims volume in 1992 was approximately 800 million, of which 625 million (over 75%) were electronically processed. Prescription claims have moved swiftly to EMC, with a key driving factor being the relative simplicity of the claims compared to claims for medical services, which can cover a much broader spectrum of services, providers, and price levels.

PCS, the largest processor of electronic point-of-sale pharmacy claims, processed approximately 125 million pharmacy EMCs, and the remaining 500 million were processed by various other private point-of sale systems, usually included as part of private medical plans.

INPUT's estimates of total pharmacy claims volume were derived from U.S. Department of Commerce published figures of enrollment in Medicaid and private medical insurance plans (i.e., plans that provide prescription coverage), based on claim levels of 4 pharmacy claims per enrollee.

6. Dental Claims

Like pharmacy claims, a high proportion of dental claims are relatively straightforward (i.e. routine check-ups, dental cleaning, fillings), and come from a fairly similar group of providers.

Americans visited their dentists 590 million times in 1992, generating 266 million claims (the difference between visits and claims is based on claims covering multiple visits, and the portion of dental services provided which is not covered by insurance). At a 30% EMC rate, close to 80 million dental visits were processed electronically.

INPUT's estimate of dental visits is based on American Dental Association figures on dental visits in 1979 and 1986: 354.4 million and 466.8 million, respectively.

7. Expanding EMC Capabilities: Other Provider-Payor Transactions

EMC processing is the most extensive application of health care EDI, but claims submission is not the only type of transaction between payor and provider. Other transactions are gradually being added to broaden the scope of payor-provider electronic commerce. These include eligibility checking, claim inquiries, claim payment, and plan enrollment. EDI usage for these functions is just emerging, but increases the benefits to the users, increasing the likelihood for providers and payors to make the investment to convert to EDI. Each of these types of transactions is discussed in more detail below.

The WEDI report issued this July estimated likely savings in administrative costs which would result from EDI usage for these insurance-related transactions. Exhibit IV-3 lists these transaction types, and WEDI's estimate of potential savings (note that the savings estimates do not reflect systems development costs).

EXHIBIT IV-3

Insurance-Related Transactions Administrative Savings Potential

	Savings to			Total Savings (\$ M)
	Providers (\$ M)	Payors (\$ M)	Employers (\$ M)	
Claims Processing	DNA	1,400		1,400
Payment and Remittance	1,120	128		1,248
Eligibility Checking	DNA	300		300
Claim Inquiry	DNA	50		50
Plan Enrollment	50-100	50	70-110	170-260
Total	1,170-1,220	1,928	70-110	3,168-3,258

DNA: Data not available

Source: Workgroup for Electronic Data Interchange (WEDI), 1992

a. Claims Payment and Remittance

Electronic payment and remittance of health insurance claims is still virtually non-existent, but shows great promise, as the estimates of administrative savings in Exhibit IV-3 indicate.

An X12 standard EDI payment format for claims payment, transaction set number 835, the electronic remittance advice (ERA), has been approved by the American National Standards Institute's (ANSI) Accredited Standards Committee for X12. Medicare is now testing claims remittance and payment through its fiscal intermediaries. In 1992, around 100 providers, mostly hospitals, have been processing Medicare claims remittance and payments. Requirements for Medicare-participating providers to be able to receive claims payments were published in the Federal Register in November 1992. Physicians' offices must have electronic billing capabilities to be able to participate.

Medicare expects the use of electronic payment and remittance in hospitals to grow quickly—to 50% of claims by the end of 1994 and to 100% by 1997. Growth will be significantly slower for physicians' claims due to the lack of electronic sending and receiving capabilities among this group. Exhibit IV-4 indicates the level of ERA/EFT usage for transmissions between government payors and their participating providers for 1992 through 1997.

EXHIBIT IV-4

Claims Payment and Remittance Transaction Government Payors to Participating Providers

Type of Provider	1992			1997			1992-1997 CAGR (%)	
	Millions		Percent of ERA/EFT	Millions		Percent of ERA/EFT	No. of Txns	No. of ERA/EFT
	No. of Txns	No. ERA/EFT		No. of Txns	No. ERA/EFT			
Hospital	160.7	0.1	0.1	205	205	100.0	5	359
Physician	910.4	0.0	0.0	1,160	348	30.0	5	1,207
Total gov't medical payments*	1,071.1	0.1	0.0	1,365	553	40.5	5	460

* Medicare and Medicaid

Source: HCFA, INPUT, 1992

Private payors' implementation of ERA and EFT will be less swift, hindered by similar obstacles as those encountered to EMC implementation.

NEIC just began processing electronic remittance advice documents (ERAs) this spring for two large payors, but the total transactions processed in 1992 total only about 100,000 ERAs. This is far less than the 20 million total private insurer claims processed. NEIC estimates that about 250 ERAs will be processed in 1993. NEIC processes ERAs at no charge; they are offered as a free service to encourage providers to process claims

electronically. Only the ERA is processed by NEIC; electronic funds transfer (EFT) arrangements are made directly between payor and the provider's banks if the actual payments are to be processed electronically, since NEIC is not a funds processor.

INPUT estimates government and private programs will be responsible for approximately 300,000 electronically paid claims in 1992. This is a very small number, particularly in comparison with INPUT's estimate of 12.7 million electronic corporate trade payments in the U.S. for 1991 (see the INPUT report, *Developments in Corporate Electronic Trade Payments*).

b. Eligibility Checking and Claim Inquiries

Eligibility checks and other on-line EDI inquiries are seen as transactions which will make claims-related EDI more robust and encourage providers to make the switch to EMC.

Eligibility transactions are used to determine a patient's benefit coverage under a plan (i.e., whether they are covered for a particular procedure). Many indemnity and managed care plans also require approval by a health care professional prior to treatment. This "pre-certification" practice is sometimes provided by organizations separate from the insurance providers, companies known as "utilization review" providers.

Claim inquiries include requests for claims-related information from either the patient, the benefit plan sponsors (employers), or the providers. These inquiries are usually one of several questions: Was a particular claim received? Has it been processed? How much of the submitted expenses were covered? When was payment made? To whom was the payment made (i.e., patient or provider)?

Eligibility and claim-specific inquiries are now processed largely by phone, but EDI can be applied to support the need for this information. Electronic mail and automated voice response systems would also be appropriate technologies for this function.

c. Plan Enrollment

The process of enrolling Americans into public or private insurance plans is currently manual in most cases.

With employee benefit plans, the benefits or human resources department of the company offering the plan usually enters information from a plan selection enrollment form filled out by the employee. In a minority of companies, employees make their choices through an automated interface such as a PC in the company cafeteria from which they turn in a diskette to the benefits department, touch-tone telephone which connects with a voice response system, or perhaps a touch-screen kiosk or terminal.

Regardless of how the initial input is entered, the enrollment information must first reside in the employer's benefits or human resource system, and then be communicated to the appropriate payors, carriers, or plan administrators. Most large companies send enrollment information to carriers and administrators via magnetic tape, but this process is more error prone, less flexible, and less timely than a direct EDI connection.

The general information flow is similar with public insurance plans, with the need to communicate with local Medicare and Medicaid agencies, fiscal intermediaries, and the Federal agency in Washington.

A standard format for enrollment information would allow for electronic communication between plan sponsor and payor, or between payors. When computerized patient record standards are developed, payors should have controlled access to patient information, needed to certify the health status of enrollees.

There are at least 182.3 million individuals covered by private plans, and 55 million in Medicare and Medicaid. Not all of these would be separate enrollments (many of them are dependents), and a significant number of individuals also have multiple plan coverage. WEDI estimated the administrative savings for electronic enrollments based on provider time saved in responding to inquiries about enrollee health status, efficiency and reduced errors in processing, and reductions in telephone and postage costs.

INPUT expects that employers who already have EDI capability will be the first to take advantage of EDI enrollment (i.e., sectors where EDI usage is high such as transportation, grocery, financial sectors, health care and others).

d. Electronically Readable Cards

Health plans have long issued paper or embossed plastic cards as identification mechanisms for plan members. Massachusetts, New York, and Arkansas issue magnetic stripe cards similar to ATM or credit cards to their local Medicaid recipients. The cards are used for utilization review and eligibility checking. Several private insurance plans use bar-coded cards for similar purposes. Smart cards containing integrated circuits are used for combination purposes in several states, to monitor Aid to Dependent Families and Dependent Children, food stamp, and Medicare recipients.

- In July of this year, WEDI recommended further study to determine whether a broad-based, machine-readable health care card system similar to the ATM banking networks would provide justifiable utility, reliability, and payback above and beyond the enormous costs of build-

ing the infrastructure for such a system. To ensure nationwide access to a health care card network, a uniform technical standard (i.e., magnetic stripe, bar code, or smart card) would have to be selected.

- While other countries are considering the use of smart cards for the storage of patients' medical history or insurance coverage information, WEDI recommends against this option in the United States.
- Smart cards are capable of storing millions of characters of information, using media such as magnetic recording surfaces or laser recordings. They offer a means of distributing insurance and patient information to the point of use, which is particularly attractive in countries where data communication networks are not sufficiently advanced or available to support a nationwide health card system.
- If a broad-based health card system is implemented, WEDI recommends use of U.S. networks to access information (rather than storing the information on smart cards). This avoids the risk to encoded information in the event of loss or damage to smart cards.

B

Electronic Ordering and EDI for Hospital Procurement

1. Overview: Hospital Suppliers

Of all suppliers to hospitals, those that need electronic commerce most are the ones that supply materials on a highly variable yet frequent basis. These suppliers provide medical and surgical products, pharmaceuticals, and grocery/dietary products. More and more hospitals are moving toward just-in-time ordering strategies for these types of products.

Utility and waste disposal suppliers provide a steady, ongoing product to the hospital but require relatively little purchasing overhead to warrant electronic commerce systems. EDI payment for these services has begun among hospitals as they have with consumers, using pre-authorized debits. Transaction volumes (single monthly payments) are inherently low in this application.

Office supplies are highly amenable to EDI purchasing but little is being done here. The purchase of laboratory equipment, beds and bedding supplies, office equipment, and construction services are capital expenditures that do not lend themselves to EDI or EDI-like purchasing. INPUT sees little promise in the immediate future for electronic commerce systems to be built for these areas in the health care community. However, vendors in these industries are adopting EDI-based commerce with trading partners in other industries (see INPUT's *The U.S. Electronic Data Interchange Market, 1992-1997*).

2. Proprietary Electronic Order Entry (EOE) Systems

Today, over 99% of electronic purchases are done using proprietary electronic order entry (EOE) systems provided to hospitals by their supplies vendors. These systems first appeared in hospitals in the first half of the 1980s, led by American Hospital Supply's (now Baxter's) ASAP system, followed closely by similar systems from Abbott Labs, Johnson & Johnson, and other suppliers, including drug wholesalers and food suppliers.

The EOE systems were designed to give their owners a competitive advantage by making it faster and easier to order supplies from the vendor that owned the system and to encourage hospitals to consolidate their vendor relationships.

The systems have since broadened their approach to become in effect "electronic catalogs," distributing supplies from multiple manufacturers and suppliers. Baxter's new EDI-based system serves as a distribution channel for over 400 supplies manufacturers, and Abbott Labs' system is jointly owned by Abbott, 3M, and four other medical/surgical supplies providers.

Until recently, most hospitals saw little need to develop standard EDI ordering capabilities. Supplies vendors have traditionally charged only minimal monthly lease fees for the use of the revenue-generating EOE systems, so based on a high-level analysis of the situation, the financial incentives to stay with vendor-supplied systems have been strong.

Exhibit IV-5 details the degree to which hospitals use EOE systems to purchase medical/surgical supplies, pharmaceuticals, and food/dietary products.

EXHIBIT IV-5

Electronic Purchasing in Hospitals

Item	1992			1997			1992-1997 CAGR (%)
	Expenditures (\$ B)	% Ordered Electronically	Value of Electronic Purchases (\$ B)	Expenditures (\$ B)	% Ordered Electronically	Value of Electronic Purchases (\$ B)	
Med./surgical supplies	15	61.7	9.3	17.8	80	14.2	8.8
Pharmaceuticals	26	81.7	21.2	31.0	90	27.9	5.6
Food/dietary	22	10.0	2.2	26.5	25	6.6	24.6
Totals	63	51.9	32.7	75.3	64.8	48.7	8.3

Source: Department of Commerce, INPUT

a. Medical/Surgical Products

In 1992, approximately 62% of the \$15 billion in medical/surgical supplies, or \$9.3 billion, was ordered electronically. Baxter Health care Corp. alone earns approximately \$8 million per day (or \$2 billion per year) in revenue from products ordered through its EOE systems.

Hospitals typically purchase products from a large number of medical/surgical manufacturers via EOE systems. For example, Vanderbilt University Medical Center in Nashville, a user of ValueLink, Baxter's new EDI ordering system, uses the system to order from 330 of the 400 different manufacturers they have product contracts with.

Medical/surgical supply ordering systems have been the most visible electronic channel of distribution, probably because this is a complex area involving a large number of vendor contract relationships for most hospitals. While approximately 80-90% of U.S. hospitals are using electronic ordering for these purchases, they are ordering closer to just over 60% of their total medical/surgical expenditures electronically because of the number of vendors they deal with.

At the very least, a hospital requires a national distributor relationship (with Johnson & Johnson, Abbott Labs, Baxter, Owens & Minor, General Medical, or one of their counterparts) and a regional distributor relationship for obtaining items not sold through national suppliers, but it is more difficult to consolidate vendor relationships for medical/surgical purchasing than for pharmaceuticals or food.

Most hospitals (perhaps as many as 90-95%) now obtain discounts on materials purchases by buying through national and regional buying groups. Premier Hospital Alliance, a large national consortium of research and teaching hospitals—49 tertiary facility-owners and 150 member affiliates—acts as such a national buying group, in addition to playing an important role in coordinating national medical research. Premier has also been a leader in the development of standard EDI ordering capabilities in hospitals (this is discussed in more detail later in this section). Hospital buying groups who pool their members' buying power and information technology capabilities are emerging as an important factor in the development of electronic commerce in health care.

INPUT expects hospitals' 1997 electronic purchasing to reach the 90% level, primarily as a result of hospitals' further consolidating their vendor relationships and an increase in the number of vendors available through EOE systems.

b. Pharmaceuticals

INPUT estimates that approximately 82% of hospitals' \$26 billion in 1992 pharmaceutical purchases (about \$21 billion), were transmitted over proprietary EOE systems, and that the percent penetration of electronic pharmacy orders will reach 90% by 1997. Pharmaceutical purchasing is in many cases a separate function of the hospital pharmacy. The issue of multiple vendor relationships is not commonly applicable here—most hospitals purchase 85-90% of their pharmaceuticals from a drug wholesaler. The remaining 10-15% are typically special orders phoned in directly to the manufacturer. Several drug wholesalers provide electronic ordering capabilities, and the medical/surgical suppliers discussed above also provide links for pharmaceutical purchases.

c. Dietary/Food Products

The electronic purchase of food supplies for hospitals shows the greatest potential for growth of all hospital procurement categories. The level of electronic food ordering is very low today, but as with pharmaceuticals, hospitals typically purchase food from one or two primary suppliers, so coordinating trading partners is relatively simple.

INPUT found in a random sampling of three medium-sized hospitals that two of the three were using EOE systems for food purchasing. One of the hospitals orders 80% of its food and dietary supplies via Baxter's KraftLink, and the other uses Michigan-based Gordon Food's system for 12% of its purchases, and plans to link directly to Kraft within a year, bringing its total electronic food purchases to 85%.

Although other evidence indicates that the incidence of hospitals' electronic food purchasing is much lower than in this sample—INPUT estimates that no more than 10% of total hospital dietary purchases are transmitted electronically today, food EOE will grow steadily over the next five years. INPUT expects the value of food EOE purchases will grow from just over \$2 billion in 1992 to \$6.6 billion in 1997, at a compounded annual growth rate of 24.7%.

3. Movement from Proprietary to Standard EDI Systems

Hospitals are now beginning to recognize the advantages to be gained from integrating the electronic ordering function with their overall materials management processes and their in-house information systems. The costs of duplicate data entry (into the vendors' systems and the in-house materials system) and the fact that vendor-provided systems are not designed based on the functional needs of a hospital materials department add to the cost of using these systems.

INPUT estimates that the total value of hospital purchases using standard EDI systems was approximately \$16 million in 1992, or just about one tenth of one percent of hospitals' total medical/surgical purchases of \$15 billion. This compares to \$9.3 billion in medical/surgical purchases using EOE systems (shown in Exhibit IV-5), or 62% of total medical/surgical purchases.

Recently, the Health Care EDI Corporation (HEDIC) signed an agreement with Sears Communications Company (now merged with IBM Information Network and called Advantis) and AT&T EasyLink to provide EDI network services for HEDIC members, a move aimed at the growing interest among hospitals and hospital buying groups to establish their own EDI capabilities. A primary application of EDI is order transmission linked to the hospital materials management system.

The HEDIC agreement, signed in March 1992, allows member groups and associate members (including both hospitals and suppliers) to purchase EDI services at a discounted rate, based on total usage for all HEDIC members. Several large hospital buying groups have recently contracted with Sears or EasyLink. They include:

- Alverno Administrative Services (Mishawaka, IN),
- COHR-Connection (Los Angeles, CA), and
- Premier Hospitals Alliance (Westchester, IL)

The hospital groups are negotiating with their supplies vendors to share in the EDI network services costs, with the supplies vendors and hospital customers each bearing their portion of the charges.

Non-standard EDI ordering is also being used on a limited basis: Baxter's new ValueLink service uses EDI, but Baxter says it is undesirable for them to require their customers to move to X12 and to jeopardize revenue-producing relationships. Enterprise Systems is a vendor of integrated hospital materials management systems which supports dial-up EDI links to supplies vendors. Children's Memorial Hospital in Chicago, IL uses Enterprise Systems to order medical/surgical supplies from Baxter.

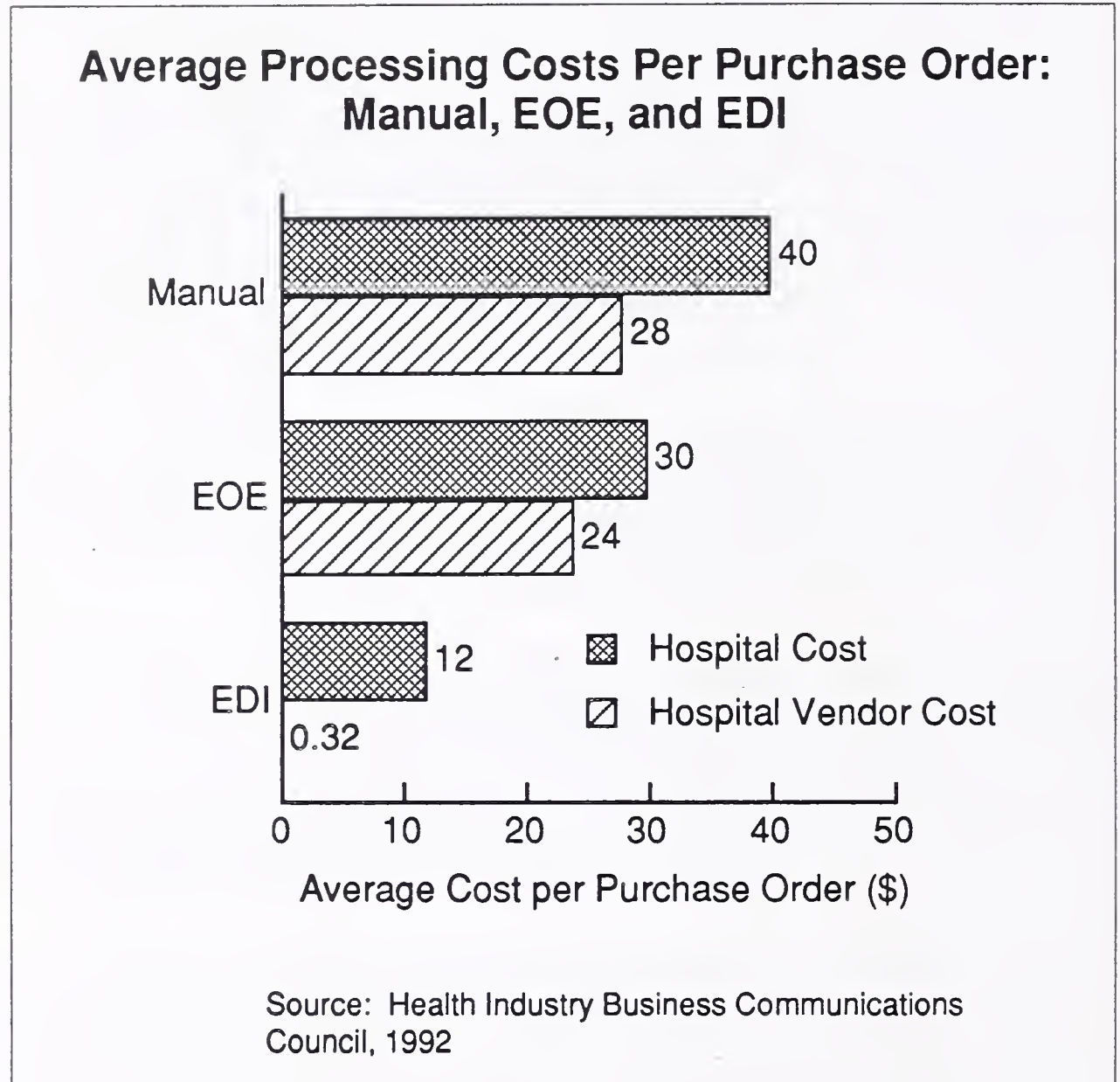
Standard EDI (using ANSI-X12 transaction sets) for hospital ordering is still extremely limited, but the cost benefits, not yet widely documented, but detailed in the next section, are certain to drive a surge of EDI ordering implementations once a few more success stories have accumulated.

a. Savings to Hospitals and Vendors from EDI Ordering

An analysis of the total costs to the supplier/vendor and hospital/buyer of processing orders reveals that while EOE systems are less costly to operate than manual purchasing systems, EDI reduces costs even further for

both supplier and hospitals. In other words, EDI for purchasing is a win-win opportunity for both hospitals and supplies vendors. Exhibit IV-6 compares the average costs of processing manual, EOE, and EDI purchase orders. As can be seen, costs fall for both hospitals and hospital vendors.

EXHIBIT IV-6



The EDI Technical Committee of the Health Industry Business Communications Council found that hospital processing costs are \$40 per manual order, \$30.40 per EOE system order, but only \$11.20 to \$12.80 per EDI order. For a typical 500-bed hospital that places 15,000 orders per year, EDI saves from \$27.20 to \$28.80 per order transaction, and as much as \$432,000 per year.

The same analysis found that vendor costs per order were \$28 with manual systems, \$24 with EOE, and \$0.32 with EDI. The vendors are encouraging the transition from proprietary EOE systems to standard EDI, because it promises to alleviate the burden imposed by costly proprietary systems, whose value as revenue producers and customer relationship builders has been surpassed by their high maintenance and operational costs.

b. Hospital Expenditures on Hardware, Software, and Services for EDI Ordering

Hospitals spent a total of approximately \$2.2 million on EDI ordering implementations in 1992 (including hardware, software, and outside or in-house implementation services). These expenditures will reach \$22.6 million in 1997. Exhibit IV-7 shows year-by-year hospital EDI implementation expenditures for 1992-1997 as estimated by INPUT.

EXHIBIT IV-7

Hardware, Software, and Implementation Expenditures: EDI Ordering Applications in Hospitals

	1992	1993	1994	1995	1996	1997	92-97 Totals	CAGR 92-97 (%)	
No. of Hospitals Implementing	22	35	50	100	200	200	607		
<i>Expenditures:</i>	\$ Thousands								
Hardware (Workstations)	112.2	178.5	255	510	1,020	1,020	3,095.7	55.5	
EDI Software	382.8	609.0	950	1,900	3,200	3,200	10,241.8	52.9	
Implementation Services	1,749.0	2,782.5	4,360	8,720	18,380	18,380	54,371.5	60.1	
Expenditure Totals	2,244.0	3,570.0	5,565	11,130	22,600	22,600	67,709.0	58.7	

Source: INPUT

EDI implementation for hospitals is far more affordable on PC platforms than mainframe EDI. Required PC hardware and EDI software together would cost a hospital up to \$16,000; the mainframe software alone costs over \$60,000.

Implementation costs on a PC platform (at \$1,000 per day total in-house staff time plus overhead or the same figure billed by contract staff) would total approximately \$30,000 for six weeks. Mainframe implementations, requiring up to 18 months of programmer time, cost an order of magnitude more. At the same rate (\$1,000 per day), this totals \$360,000 for a mainframe EDI implementation. INPUT's estimates in Exhibit IV-7 reflect the hardware, software, and implementation services averages described

above. Associated mainframe hardware upgrades or purchases are not included, since these would vary widely based on the hospital's existing configuration, and some hospitals can be expected to implement mainframe EDI ordering using their existing mainframe capacity.

Assuming that a relatively small percentage of hospitals will still opt for mainframe EDI over the next five years, we based our estimates on an 85-15% split between PC and mainframe EDI implementations for 1992-95, moving to a 90-10% PC-to-mainframe split for 1996-97.

The future for EDI order entry applications integrated with hospital materials management systems is promising. Hospitals' operational cost savings, at an average of \$432,000 per year, are impressive, and are a fraction of the costs of a PC-based EDI implementation.

C

Other Network Services

1. Computerized Patient Records (CPR)

EDI has made the largest inroads in health care administrative areas such as claims processing and procurement, but the health care community has also begun organizational effort aimed at the use of network applications to expand access to patient care information. In addition, medical image and voice transmission and management systems which hold great promise are emerging.

One reason for the need to transmit patient information is the increasing number of places where patient care is provided. The widespread acceptance of managed care plans has created a growing need for integration of patient information across multiple delivery sites. Also, treatment at alternative health care delivery sites is increasing. Health care is being delivered in locations as diverse as pharmacies in shopping centers, free-standing ambulatory clinics, at home, in physicians' offices, and long- and short-term care facilities. EDI is seen as a practical solution to the proliferation of alternative care sites; a means to allow for the trend towards specialization without compromising the information needed to deliver quality care.

The Computer-Based Patient Record Institute (CPRI), an association of providers, insurers, employers, health care systems vendors, and government health care agencies, held its first meeting in July 1992. CPRI's goals include defining standards for computerized patient records, to ultimately facilitate access to patients' medical histories from any provider site, for example when a business traveler has a heart attack far from home.

The Department of Health and Human Services has also formed a public-private organization that will coordinate the roles HHS agencies will play in the development of computerized patient records. Called the Task Force on Patient Information, this organization is chaired by Richard Davidson, the President of the American Hospital Association.

Legislation in Congress (commonly known as the Health Insurance Reform Act of 1992—sponsors say it is likely to be passed in 1993) may provide a mandate for computerized patient records (CPR). Key provisions of the bill call for the Health and Human Services Secretary to encourage adoption of standards for medical information to be kept on a CPR system by 1995, and for hospitals providing Medicare services to have a CPR in place by January 1996.

The expectations of CPRI and others promoting the development of computerized patient records are that these records will eventually be integrated into an EDI system to allow for electronic information exchange in support of health care administration, delivery, and financing.

a. Image Transmission

U.S. health care makes extensive use of advanced medical imaging technology such as CT-scans, MRIs, X-rays, and ultrasound for diagnosis and monitoring of treatments. Diagnostic image management systems, also known as picture archiving and communication systems, are used by a hospital's radiology department to receive images from one or more types of imaging equipment, and transmit them to other sites, including other hospital departments, remote clinics, and physicians' offices. These systems fall into three general technology categories:

- Computed radiography systems, which digitize images by scanning phosphor plates instead of traditional photographic X-ray film
- High-resolution film distribution systems that capture video images from digitized images
- Low-resolution film distribution systems, also known as teleradiology systems, which consist of an image transmission and receiver unit usually operating over telephone lines or over a network. Because the quality of images transmitted in this manner is not as high as with the other methods, teleradiology images are not used for final diagnoses, but are useful in on-call or emergency situations.

Current hospital image management implementations are primarily focused on internal systems integration (i.e., image transmission between departments or treatment locations within a hospital), or teleradiology transmission to remote sites to support diagnosis and consultation in emergency or trauma cases.

Other goals of emerging diagnostic imaging systems products and hospital or vendor-sponsored pilot and test projects include integrating voice (such as physicians' notes), image, and data, connecting multiple modalities (i.e., CT-scans, MRIs, and other forms of images), improving the speed of image retrievals, and developing links between image management systems and the hospital's patient information system.

The ACR-NEMA standard for display and data interpretation is gaining acceptance among medical imaging vendors. Exhibit IV-8 lists several image management systems and imaging equipment vendors, all of which are promoting the ACR-NEMA standard.

EXHIBIT IV-8

Suppliers of Medical Imaging Management Systems and Imaging Equipment

- Diagnostic Image Management Vendors
 - Advanced Video Products (Littleton, MA)
 - DeJarnette Research Systems (Towson, MD)
 - Vortech Data, Inc. (Reston, VA)
- Imaging Equipment Vendors
 - Siemens Medical Systems (Iselin, NJ)
 - Philips Medical Systems North America (Shelton, CT)
 - GE Medical Systems (Milwaukee, WI)

Examples of recently launched user and vendor-initiated medical imaging initiatives include the following:

- The Jamaica Hospital Trauma Center at the New York Medical Center of Cornell University is implementing Evergreen Technologies, Inc.'s Medvision medical visualization software through a hospital-wide network. Trauma Center surgeons will be able to use the application to view CT-scan images taken at remote locations prior to the arrival of the patient at the Center. This will enable the surgeon in charge to make treatment decisions quickly, without having to wait for the arrival of the patient, saving valuable time in the diagnosis and management of traumatic brain injuries.

- The same project is also initiating a national bulletin board system to enable access to CT-scan and trauma data. In conjunction with DataTech Consultants Inc. (Chatham, NJ), under a grant from New Medico Inc. (Lynn, MA), a head-injury rehabilitation hospital, Jamaica Hospital Trauma Center has developed a trauma-records database to store Medvision (CT-scan) data, which will go on-line as an electronic bulletin board early in 1993. The bulletin board will initially be available free of charge to any registered trauma center.
- Army hospitals are using a picture archive and communications system called the Medical Diagnostic Imaging Support system (MDIS) to transmit digitized X-rays and other images between medical facilities. The system uses the filmless computed radiography process, through which X-ray images are transmitted over networks after being digitized by computer tomography devices. The system was first tested during Operation Desert Storm. Two MDIS units located close to combat lines transmitted images of injured soldiers to U.S. Army hospitals, where specialists viewed the images and provided diagnosis and treatment advice. MDIS is now being installed in military hospitals throughout the U.S. under a \$207 million Army Medical Research and Development Command mandate.
- In June of this year, BellSouth announced that it is entering the remote medical diagnosis and imaging market, through the signing of a marketing agreement with CAE-Link (Binghamton, NY), a subsidiary of CAE Industries (Toronto, Canada). CAE-Link develops and markets hardware, software, and systems integration video teleconferencing packages. These systems will be jointly marketed with BellSouth's network-based private line and switched video and data services in the nine-state southeast U.S. service area covered by BellSouth. The joint market initiative is aimed at providing teleradiology services—transmission of X-rays and other image modalities over telephone lines, often to distant specialists providing radiology consultation and diagnosis.
- Sprint International is another network services vendor going after the medical imaging market. Sprint's medical services marketing organization provides medical image transmission services both over its fiber optic network and via wireless transmission, often from remote sites to central treatment facilities, or from ambulances en-route with trauma patients.

Medical image transmission, while still in the early stages of implementation, is receiving widespread interest and support from the medical community because it addresses their primary needs and concerns—it saves precious time in injury cases where hours or minutes may mean the difference between life and death or full or partial recovery.

These efforts are laying the groundwork for community-wide image transfer, by developing standards and accumulating experience using these technologies.

b. Imaging Support for EMC

While the focus of medical image management systems development has been on their use in providing faster and more flexible and responsive patient care, there is also a longer-term role for imaging in the claims process. X12 binary transaction formats exist, and offer a means for providing medical images in support of claims, in cases where the payor requests additional information on the treatment or diagnosis.

An EDI manager from a large hospital buying group which has been a leader in hospital EDI commented that their biggest obstacle is the problem of getting the images through the EDI translation software. NEIC is currently considering future use of its e-mail system to transmit medical images, but implementation of image transmission in the EMC process is still over 5 years away.

2. Cost Containment

a. Utilization Review (UR) and PPO Networks

As reported in Chapter III of this report, the high cost of medical care is severely impacting employers' bottom lines. According to A. Foster Higgins & Co.'s 1991 health benefits costs survey, health care benefit costs amounted to 26% of corporate earnings in 1990, and corporate medical bills soared an average of 21.1% between 1989 and 1990, and 20.4% the previous year.

Besides the factors contributing to the overall rise in health care costs (averaging 11-13% annual increases), corporate sponsors of health benefits often end up footing the bill for underpayments by Federal Medicare and Medicaid programs. Hospitals and physicians often shift the costs of services to Medicare/Medicaid patients by increasing charges to privately insured patients.

By 1990, 81% of 1,995 private and public sector employers surveyed by Foster and Higgins had utilization review (UR) programs in place, aimed at placing a financial and reasonability check on the use of medical services. UR is a way of monitoring high-ticket or discretionary medical services for medical necessity: hospital pre-certification, continued stay review, second surgical opinions, etc. The use of UR is growing by 10% per year.

The use of UR information services coincides with the implementation of preferred provider organization (PPO) networks within employer-sponsored medical plans. PPO networks are comprised of doctors or hospitals who have agreed to provide care at discount rates. UR with PPO management adds a measure of cost control along with the volume measures provided through UR programs.

Many large insurers have negotiated with providers to create regional PPO networks based on the combined buying power of their subscriber base. Independent UR providers (for example Health Care Compare, a large national UR services firm) have also entered the business of contracting with providers to join their PPO network. They in turn market these PPO networks to insurers or self-insured employers, based on a percentage of savings achieved, not the PPO providers' actual charges.

Health Care Compare's PPO services revenue is growing far faster than their UR revenues, which are now leveling off. Their PPO earnings grew 165% from 1989 to 1990, over 200% from 1990 to 1991, and are projected to grow between 85 and 90% from 1991 to 1992.

UR and PPO programs in the private sector are similar to service pre-certification procedures and provider reimbursement limits long used in public insurance programs. They are important to the future of health care electronic commerce because they modify the information flows within the industry and are an attempt to shift the economics of the health care industry. The pressure on large employers to implement UR and PPO programs has been intense, because they have borne the weight of cost shifting by government health programs for some time.

However, as noted by Walter Maher, Chrysler's director of Federal relations, in a 1991 quote by the Wall Street Journal, these programs are yet another way to shift costs. "You end up playing a little bit of the government's game, shifting costs to the next weakest player," he commented. In other words, smaller businesses are now increasingly bearing the brunt of skyrocketing costs, and yet another type of administrative overhead has been added to the delivery of health care services.

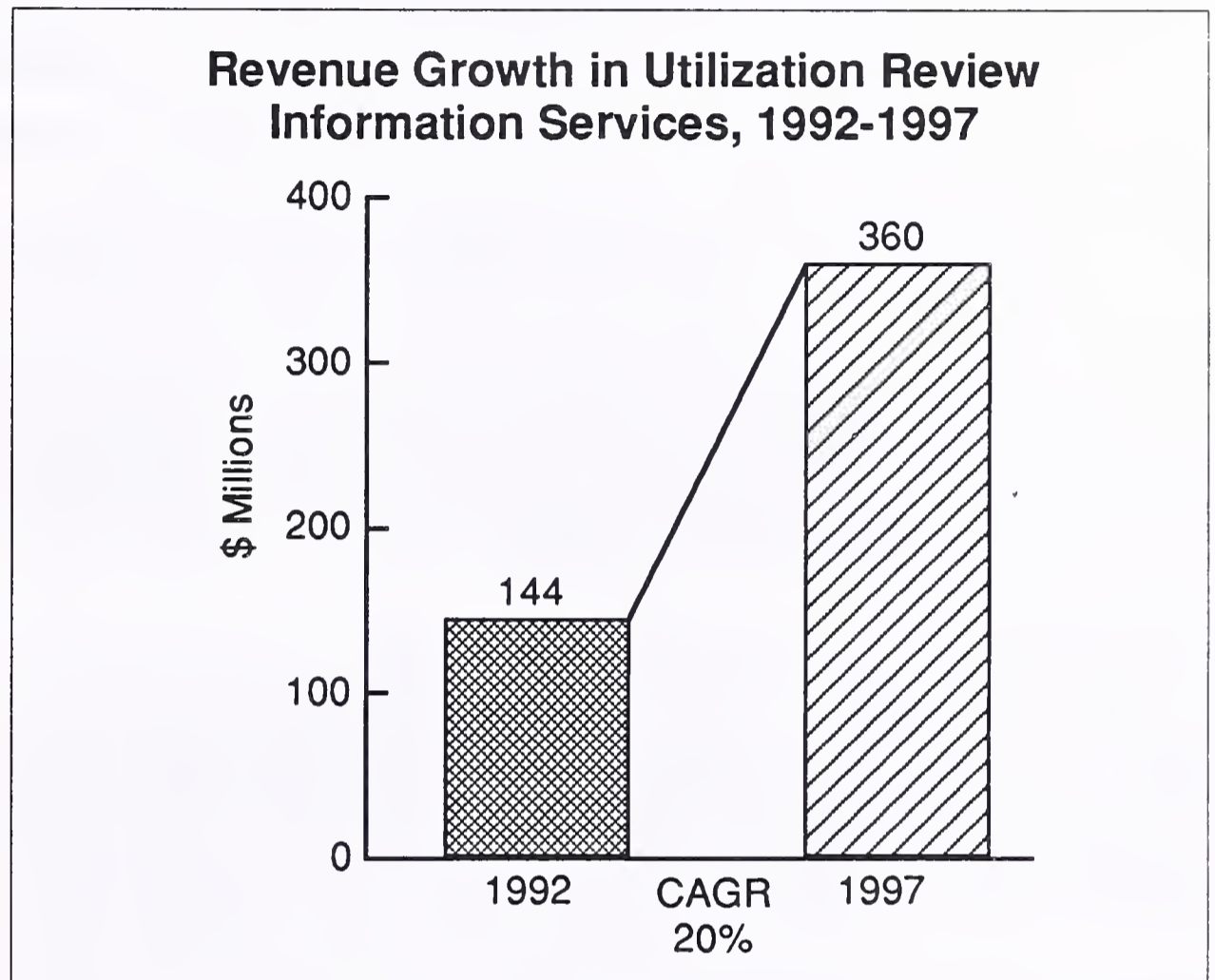
b. UR and PPO-Related Information

Cost containment programs such as UR and PPO services require extensive cost monitoring and measurement information systems to spot trends, identify problem areas, and document cost improvements. Following are a few examples of UR and PPO-related information services and systems development activity:

- Medstat Systems (Ann Arbor, MI) is a health care information company with data bases, software, and consulting services aimed at controlling medical costs and measuring the health care market. Medstat's MarketScan data base contains aggregate information on corporate health care expenditures, including national norms and Medstat client norms (based on detailed claims data collected from Medstat services subscribers). Large clients who signed up with Medstat in 1991 to use MarketScan and Medstat's software include Prudential Insurance Company of America (New York, NY), Blue Cross and Blue Shield of Massachusetts (Boston), Selectcare (Troy, MI), Coors Brewing Co. (Golden, CO), and Georgia Power Co. (Atlanta, GA).
- In February of this year, Medstat acquired Systemetrics, a unit of McGraw-Hill. Systemetrics is a health care research firm that compiles quality of care data and analysis of Medicaid and Medicare claims. Systemetrics' annualized sales for 1991 were approximately \$10 million. Combined with Medstat's 1991 revenues of \$12.9 million, INPUT estimates that Medstat's total revenues will exceed \$25 million in 1993.
- The Travelers Insurance company is using Value Health Sciences' (Santa Monica, CA) Medical Review system, which includes a comprehensive data base of medical necessity and diagnostic information for over 30 specific procedures. The Value Health Sciences (VHS) system is being used in Travelers' Practice Review System (PRS), which is being developed under contract by Perot Systems Corp. The system is now being tested with Travelers' Care Options plan, which encompasses 400,000 patients over a network of 1,000 hospitals and 70,000 physicians. The system automatically reviews providers' bills and will refuse payment for unsubstantiated charges.
- The Value Health Sciences (VHS) medical necessity database was developed based on interviews conducted by the Rand Corporation. It compares the patient's condition with consensus standards of care. The complete VHS Medical Review system is a UNIX workstation-based product, with an annual lease price ranging from \$50,000 to \$400,000. VHS 1991 revenues were \$4 million.
- Metropolitan Life Insurance Company is another insurer implementing a medical review application similar to the Travelers' system described above. Both insurers are using the systems to create profiles of doctors and note which diagnostic tests are ordered and whether these tests comply with the health coverage of the insurer. One of the software vendors involved in these projects claims that 85% of the rejected claims are generated by 12% of the doctors monitored.

INPUT estimates that 1992 software and information services expenditures on health care cost monitoring and containment applications was \$144 million, and that spending on these applications will grow at a compounded annual growth rate of 20%, to \$360 million in 1997. This is shown in Exhibit IV-9.

EXHIBIT IV-9



3. Unstructured Communications: Voice and E-mail

a. Voice Recognition

In a hospital or health care setting, doctors and nurses are working with their eyes and hands continually, so voice recognition systems show promise as a means of “documenting while doing,” whereas e-mail fits the working style and environment of office workers, who are more likely to be computer literate and have workstations on their desks.

Exhibit IV-10 lists several vendors of clinical voice recognition systems. These systems allow health care professionals to enter information about their tasks, which can then be sorted by the system into multiple data formats. Current -386 and -486 workstation-based systems are capable of recognizing up to 30,000 words.

EXHIBIT IV-10

Vendors Of Clinical Voice Recognition Systems

- Clinical Information Advantages, Inc. (Waltham, MA)
- Kurzweil Applied Intelligence (Waltham, MA)
- Lanier Voice Products Division (Atlanta, GA)
- Dragon Systems (Newton, MA)

Current systems are used in departmental applications such as radiology, emergency medicine, and intensive care nurse charting, but voice recognition will ultimately be part of the computerized patient record format, which will eventually support transmission of patient information outside the hospital, to physicians' offices, remote treatment facilities, payors, and other distant locations.

b. Network Services E-Mail

Even though electronic mail technology is here today and a significant body of large-scale implementation experience exists, E-mail is not being widely used in the health care industry on an inter-organizational basis. Banking, finance, and aerospace are major industries that use network services e-mail extensively—these are industry sectors with a large number of desk workers and the need for “hub and spoke” type communications, typically between regional offices and headquarters.

INPUT found some use of network services E-mail in insurance companies and hospital materials suppliers, often in conjunction with facsimile mail or postal connections to transmit documents to non-automated offices, and a few examples of administrative electronic mail communications within managed care organizations. In insurance and health care suppliers, E-mail is sometimes used to communicate with a widely dispersed sales force, for example in sales reporting from field reps to regional managers and regions to headquarters, or in the distribution of price lists.

E-mail is also used somewhat more extensively among managed care organizations or between health care providers that are linked administratively. For example, in investigating EDI ordering implementations among hospital buying groups, INPUT found that e-mail may be installed to facilitate efficient communications between sites during implementation.

Premier Hospital Alliance (Westchester, IL), a large buying group that is implementing EDI order entry, has e-mail installed in 150 locations where it is used in both the pharmacy and materials departments. COHR-Connection (Los Angeles, CA) is now installing E-mail in preparation for their EDI project.

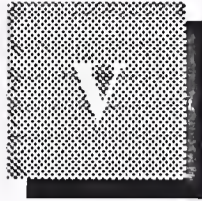
As this implies, there is some functional overlap possible between e-mail and EDI:

- Network services e-mail can serve as a precursor to EDI, allowing electronic transmission of documents and applications output to trading partners or remote sites without having to develop standards or translation capabilities. Some users implement e-mail first while weighing the benefits of implementing EDI.
- Eligibility and claim inquiries (e.g., Does my plan cover physical therapy services? Has the office visit and lab claim for John Smith submitted on May 15 received?) are well-suited for transmittal by e-mail (see "Eligibility Checking and Claim Inquiries" in Chapter III).
- NEIC has recently begun using facsimile mail to coordinate requests for additional information when the payor needs additional detail from the provider. The EDI claims processing system transmits a notice to the provider, requesting the information and providing a routing number that corresponds to the specific claim office requesting the information. The provider faxes the information via NEIC's store-and-forward faxmail network, using the routing number to send the information to the correct claim office.

In general, however, INPUT found low inter-organization e-mail usage in the health care industry, and expects EDI and other health care-specific applications and technologies (such as medical image transmission, voice processing and integration, multi-media systems combining voice, image, and text) to receive the most emphasis over the next several years.

Of course, all of these efforts are aimed at increasing inter-organizational communications and transactions in the health care community, and as such, network services e-mail usage can be expected to increase, simply as a result of increased community-wide interaction.

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Competitive Environment

This chapter profiles some of the principal players in delivering electronic commerce solutions to the health care community. Some of the players are information service vendors in the traditional sense, such as EDS or CyCare; others are information service users such as McKesson.

A

Ameritech

**30 South Wacker Drive
Chicago, IL 60606
(312) 750-5000
1991 Revenues = \$10.8 billion**

Ameritech, one of the seven regional telecommunications companies formed by the breakup of the Bell System in 1984, provides communications services to both the commercial and residential markets. The company's current operations include five Bell companies, Illinois Bell, Indiana Bell, Michigan Bell, Ohio Bell, and Wisconsin Bell, which provide advanced communications and information services for 12 million consumers and business customers in the Great Lakes region. The company's operations also include Ameritech Information Systems (AIS), the Bell Group sales channel for network services and products to major business, government, and institutional customers. In health care, AIS's Wisconsin Health Information Network (WHIN), operated through Wisconsin Bell, is a service that provides a systems solution for health care institutions, including hospitals and insurers, to electronically send and receive patient information through links to a common network and user interface.

In February 1991, AIS acquired Knowledge Data Systems, Inc. of Larkspur, CA for roughly \$26 million. Knowledge Data provides Tandem-based turnkey systems, implementation support, and data processing management services for hospitals, health maintenance organizations, private labs, and clients. The company's five major products include a patient care system, a clinical lab system, a pharmacy management system, an ambulatory care system, and an electronic medical record system

marketed under the name Knowledge Keystone. Each of these knowledge-based products can operate as a stand-alone system or as a fully integrated module of the company's Clinical Expert Series, the expert system Knowledge Data has developed for collecting and using intelligent data in the delivery of patient care and related personnel functions. Knowledge Data markets its products throughout the U.S. and internationally. Major customers include the Detroit-based Henry Ford Health System, Kaiser Permanente in Oakland, California, and the University of Minnesota Hospital and Clinics in Minneapolis. In the six months ending June 30, 1992, Ameritech reported revenues of \$5.5 billion.

B

Baxter International

**One Baxter Parkway
Deerfield, IL 60015
(708) 948-2000
1991 Revenues = \$8.9 billion**

Baxter conducts operations in four industry areas, including hospital products and services, medical systems and specialties, alternate site products and services, and industrial products. In hospital products and services, the company manufactures and distributes products to hospitals and clinical labs. Products include catheters and flow control devices for intravenous therapy. In medical systems and specialties, Baxter manufactures and distributes specialized products for patient care, blood therapy, diagnostic procedures, and cardiac care. For alternate site products and services, the company manufactures and distributes supplies, equipment, and services used by home patients and alternate-site providers. Baxter also markets and delivers drugs to home patients and provides a women's health care network and customized patient-monitoring programs. In industrial products, the company manufactures and distributes products for educational and governmental labs, industrial research and development facilities, and manufacturing facilities.

Baxter has created the ACCESS program to provide large hospitals and multi-hospital systems with a single point of contact for all the company's products, services, and value-added programs. ACCESS also allows Baxter to provide customers with products and services from leading companies in related industries, including Waste Management of America, Inc. for handling and disposal of medical waste; Comdisco, Inc. for high technology asset management and contingency services; Kraft Foodservice, a unit of Kraft General Foods, Inc. for hospital food service; and IBAX Health care Systems, an IBM-Baxter joint venture company which designs, develops, and markets information management systems for hospitals and private medical practices. Baxter also maintains the

ASAP automated purchasing system, which allows customers to order supplies directly using a telephone-linked terminal, and ValueLink, a hospital inventory management service that is designed to deliver health care products in ready-to-use packaging to individual hospital departments on a just-in-time basis, allowing hospitals to reduce inventories and related warehousing costs.

C

C.I.S. Technologies, Inc.

**One Warren Place
6100 South Yale Avenue
Suite 1900
Tulsa, OK 74136-9903
1991 Revenues = \$24.2 million**

Founded in 1985, C.I.S. Technologies (CIS) provides electronic claims processing and reimbursement management services to the health care industry. Approximately 56% of CIS' 1991 revenue derived from electronic claims processing and management services, 31% from on-site billing (systems operations) services, and 13% from charge recovery and auditing services. CIS' electronic claims processing (ECP) service allows hospitals to reduce the time between insurance claims submissions and payments. Health insurance claim data is downloaded electronically from the hospital's information system to an on-site microprocessor. The CIS software program, either MED-8000 or MED-7000, installed on the client's microprocessor then edits the claims against the 6,000 edits built into the system. Correct claims are stored for subsequent transmission to CIS, and claims with errors are highlighted for billing office personnel to review and correct. Corrected claims are re-edited by the system. Through The Electronic HighwayTM, hospitals then transmit all correct claims to the CIS host computer in Tulsa over toll-free phone lines. Editing and transmission to CIS can be done 24 hours a day, seven days a week. Claims CIS receives are grouped by insurance payor, reconfigured into the format requested by each payor, and transmitted via The Electronic HighwayTM (or mail) to the payors. CIS currently edits and transmits over one million claims each month, with an estimated dollar value of \$2 billion.

CIS currently serves more than 475 hospitals in 32 states, including 15 in New York that are participating in a \$7.1 million contract awarded in September 1991 for New York's Single Payor Demonstration Program. Under this pilot project, CIS provides reimbursement and professional consulting services to the New York hospitals to demonstrate the cost effectiveness of automating, coordinating, and standardizing private third-party insurance payors in a voluntary system, rather than limiting health

care to a single government payor. Also in September 1991, CIS acquired Hospital Billing Analysis, Inc. (HBA) of Palm Springs, California, for approximately \$3.7 million in cash and CIS common stock. HBA assists health care providers with their third-party insurance reimbursement audits, and services roughly 150 hospitals in 27 states. In 1991, HBA reported an annual revenue of approximately \$8 million.

Currently, CIS is expanding its claims processing services to include electronic remittance posting, an expected payment calculator, enhanced electronic claims management, automated follow-up, electronic eligibility verification, and electronic funds transfer. CIS Funding Corporation, a wholly-owned subsidiary of CIS formed in 1989, is developing services that will allow hospitals immediate funding of up to 90% of qualified receivables within 48 hours of processing patient claims. In the six months ending June 30, 1992, CIS reported revenues of \$13.8 million.

D

CyCare Systems Inc.

**7001 North Scottsdale Road
Suite 1000
Scottsdale, AZ 85253-3628
1991 Revenues = \$75.4 million**

CyCare Systems, Inc. (CyCare) was incorporated in 1969 and provides processing services, turnkey systems, facilities management (systems operations) and professional services to over 4,800 clients in the health care industry, physicians, dentists, medical group practices and medical schools. The company's 1991 financial performance was below expectations as a result of slower than anticipated revenue growth. The late release of *Practice Maximizer*, CyCare's newest UNIX-based physician/dentist practice management system, and the new Living Software pricing strategy both affected revenue growth adversely. Living Software, which took effect in the second half of 1991, is designed to shift a portion of the up-front revenues into recurring software license renewal fees over the life of a five-year contract. This strategy had the effect of lowering one-time sales revenue, and profit, by approximately \$1 million. CyCare is currently organized into three corporate and three business units. The corporate units consolidate corporate support services and include finance and administration, marketing, and technical services and development. The business units include the Group Practice unit, the Practice Management unit and the Physician and Dental Services unit.

The Group Practice unit, headquartered in Scottsdale, provides processing services, turnkey systems and systems operations services to the 16-plus physician group practice and faculty practice market. This unit supports applications that include medical billing and insurance claim processing, patient information and registration, patient appointment scheduling, financial and administrative products, prepaid health care, and third-party management. The most common delivery system within this unit's 180-plus client base is distributed processing. Clients perform processing on their own computers using CyCare software, whereas bills and insurance statements are processed and distributed by mail or electronically through CyCare's Corporate Information Center.

The Practice Management unit, headquartered in Mount Clemens, Michigan, provides processing, consulting, and collection management services to hospital-affiliated practice plans, faculty practice plans, and hospital-based physicians. The unit accepts responsibility for the entire business office management, procedure and diagnostic coding, complete billing and insurance claims processing, complete accounts receivable management, and consulting services for over 325 clients.

The Physician & Dental Services unit, headquartered in Scottsdale, provides processing systems and turnkey systems to medical practices with one to 15 physicians, and to dentists. The Software Publishing unit, a division of the Physician & Dental Services unit, provides applications software products for physician and dental groups of one to five practitioners. In fact, most of Physician & Dental's 4,800 clients are served through Software Publishing. Including the applications offered by the Group Practice unit, Physician & Dental markets the following systems: the UNIX-based Practice Maximizer, which is designed for small-to-intermediate size physician offices and includes electronic claims clearing-house capabilities that run on HP 9000 hardware; The C150 Distributed Medical Computer System, which is based on IBM microcomputers or Bull XPS-100 Series minicomputers. C150 is designed to handle daily record processing in-house, while statement and insurance processing is generated at CyCare's data center. In December, 1991 CyCare and HP's Health Care Information Systems Division entered into an agreement for CyCare to remarket HP 9000 systems while HP helps generate sales leads and provide services for *Practice Maximizer*.

E

Electronic Data Systems

**Health and Benefits Division
5400 Legacy Drive (A3-1D-11)
Plano, TX 75024
(214) 604-4398**

Electronic Data Systems Corporation (EDS), founded in 1962, is a leading information and communications services company providing information processing, consulting, systems management, systems integration, and communications services to the financial, insurance, commercial and communications industries, and to state and federal government. EDS' markets include banking; credit unions; property, life, health, and casualty insurance; distribution; manufacturing; transportation; retail; and energy. EDS currently has 66,000 employees and more than 7,400 clients in all 50 states and 28 other countries. As a division of General Motors acquired in 1984, EDS operates as an independent subsidiary, with GM and its subsidiaries as the company's largest client.

In health care, EDS' Health and Benefits Division (EHBD) provides facilities management, processing services, and turnkey systems to commercial insurance companies and Blue Cross/Blue Shield organizations (where state funds are not involved). During 1990, EDS processed over 450 million life, health, and casualty insurance claims. In the third quarter of 1992, EDS was selected by the California Department of Health Services to serve as the state's technology partner for the Medi-Cal program. Medi-Cal is the largest Medicaid program in the nation, providing health care services to 4.9 million people at an annual cost of nearly \$13 billion. In the second quarter of 1992, EDS signed a systems management agreement contract with Health care Management Alternatives, Inc. (HMA) of Philadelphia. HMA is under contract with the Pennsylvania Department of Public Welfare to operate HealthPASS, a health maintenance organization that serves Medicaid clients in South and West Philadelphia. EDS will supply comprehensive information technology services, consulting, and systems-engineering support to HMA. In the first quarter of 1992, EDS was awarded the largest contract ever in the health care and benefits area by Blue Cross/Blue Shield of Massachusetts. Under the 10-year systems management agreement, EDS is assuming responsibility for all information technology services for the nation's fourth largest Blue Cross/Blue Shield Plan.

In the second quarter of 1991, EDS unveiled a new, integrated medical information system for HMOs and large group practices. The system was designed by InterPractice Systems, a joint venture between EDS and the Harvard Community Health Plan of Brookline, Massachusetts. And in March, 1990, EDS and American International Health care, Inc. (AIH), a

subsidiary of American International Group, began jointly developing and marketing a managed-care information system for the health insurance marketplace. The foundation of the joint effort was TOPPS, an IBM-based multioption administrative system, initially developed by AIH, that processes insurance claims for health insurers, PPOs and HMOs. In addition to claims processing, TOPPS' main functions include membership, provider management, billing, benefit administration, referral management, and provider networking. In the nine months ending September 30, 1992, EDS reported overall revenues of \$6.03 billion.

F

First Data Corporation

**Health Systems Group
10101 Claude Freeman Drive
P.O. Box 1037
Charlotte, NC 28262-1037
(704) 549-6802
1991 Revenues = \$985 million**

Formerly known as American Express Information Services Company, First Data Corporation's Health Systems Group (HSG) provides management information systems and services to health care institutions, including hospitals and medical facilities, and physician groups in the U.S. and Puerto Rico. HSG offers a comprehensive range of computer-based services, including on-line patient file management, account billing, scheduling, accounting, payroll, and insurance and claims processing, in a user-friendly format. HSG's products are intended to contribute to improved cash flow and better financial and clinical administration for health care institutions.

In April 1989, HSG more than doubled its client base of domestic hospitals as a result of acquiring the McDonnell Douglas Health Systems Company for a cash purchase price of \$77 million. The remote, on-line system emerging from the acquisition is currently known as Hospital Financial Control (HFC) and HFC EXPRESS, which operates on large-scale mainframe processors. The system provides more than 30 modules and 4,000 reports, including accounts receivable, census, general ledger, payroll, physician statistics, registration, and third-party billing. The Patient Care System (PCS) is a Tandem-based distributed system that manages all patient information and recordkeeping, including patient admissions and registrations, test and procedure ordering, result reporting, historical recordkeeping, and nursing treatments. PCS is often used as a front end to HFC, and there are currently over 30 PCS installations.

HSG's in-house hospital information system, known as SAINT, is a data processing and management system designed for small to medium-sized hospitals. The system consists of computer hardware, which is installed on the client's premises, and software, which HSG licenses to the customer and manages after installation. Currently, HSG has installed SAINT in approximately 300 hospitals. In 1991, the company introduced HSG Business Office Services, a data management program designed to improve a hospital's cash flows through more effective collection of the "self-pay" portion of fees due from patients. It is also designed to increase the accuracy and timeliness in processing claims submitted by the hospital to third-party payors such as insurance companies, Medicare and Medicaid. Also in 1991, HSG introduced a complete medical record imaging system which automates a hospital's medical records department and integrates it with other departments such as admitting. Currently, HSG also offers Claim Exchange, a claims processing service.

HSG serves approximately 600 acute care hospitals, ranging in size from under 100 to over 700 beds, as well as medical centers across the U.S. HSG's revenues derive primarily from customer fees based on transaction volume, and, to a lesser extent from the licensing and maintenance of software and revenues from the resale and maintenance of equipment. In the three months ending March 31, 1992, First Data Corporation reported overall revenues of \$282.2 million.

G

GTE Health Systems Incorporated

**10851 North Black Canyon Hwy.
Phoenix, AZ 85029
(800) 352-4483**

GTE Health Systems is a leading supplier of information management software and services to hospitals, physicians, dentists, managed care plans, pharmacies, home health agencies, chiropractors, and other medical professionals. Through its Network Systems Division, GTE provides electronic links from health care providers to suppliers and payors. The Network Systems Division manages a nationwide telecommunications network that provides an electronic link for document exchange. The principal product offerings on the network are EMC*Express, Collect*Express and Gateway*Express.

EMC*Express is an electronic claims submission and eligibility verification clearing house service available to the health care markets listed above. Claims and inquiries from providers are transmitted to the GTE network, where they are edited and formatted for each claims payor as

required and electronically submitted to the appropriate payor. A large number of private carriers, Blue Cross/Blue Shield plans, managed care plans, Medicare, Medicaid, workers compensation, and CHAMPUS intermediaries currently accept EMC*Express electronic claims.

Collect*Express is a network service that provides an electronic link from any health care or business institution to a collection agency for automated collection of delinquent accounts receivable. It uses third-party communication software that accepts collection data from the user's accounts receivable system and transmits "start", "stop", and "partial payment" notices to the collection agency. There is a low, flat-rate fee for each overdue account submitted for the collection service, rather than a percentage of the collection amount. Overdue payments are sent directly to the health care provider or business institution, not to the collection agency.

Gateway*Express is an EDI network service that facilitates the exchange of standard business documents, such as purchase orders, purchase order confirmations, inventory inquiries, invoices, and payments, between health care providers and their medical, pharmaceutical and dietary suppliers and financial institutions. Gateway*Express is specifically designed for the health care community and offers a single network link to hundreds of health care suppliers.

Other GTE product offerings include MedSeries4, a comprehensive hospital information system with patient management and accounting, financial, clinical, and administrative software packages; Q/Care, a managed health software package for HMOs and PPOs with memberships of 25,000 or more; and the Prescription Drug Management Service (PDMS), a pharmacy claim administration system which provides managed care and traditional indemnity insurance claims processors with links to point-of-sales devices in retail pharmacies.

GTE plans additional network services for the health care industry. Managed care network services are being expanded to include claims submission, enrollment forms, eligibility verification, benefits determination, and referral authorization. The company is also planning to develop network applications that will link physicians, hospitals, and managed care plans to electronic medical record access, pre-admissions, lab test results, census inquiry, billing and discharge information, physician referral, and electronic mail.

H

HealthCare COMPARE Corporation

**3200 Highland Avenue
Downers Grove, IL 60515-1223
(708) 241-7900
1992 Revenue = \$97.3 million (HCC estimate)**

HealthCare COMPARE (HCCC) is the leading national medical cost management firm, providing medical utilization management services and PPO networks to such clients as large, self-insured employers, large multi-employer and union health benefit plans, and group health and workers' compensation insurers and administrators. The company's strategy for controlling client health care costs focuses independently on managing both volume and price. HCCC's COMPARE division controls costs by monitoring the medical necessity and appropriateness of health care services provided and by reducing unnecessary hospital admissions and lengths of stay. Whenever possible, care is directed to the most cost-effective venue without compromising care quality.

HCCC has developed hospital PPO networks in 45 states that generate substantial cost savings for clients by utilizing clients' aggregate buying power. It focuses on negotiating bundled and all-inclusive per-diem rates that minimize the clients' total cost. HCCC is paid in two different ways by clients that purchase the PPO network and the utilization review services. Utilization review is priced at a fixed amount per employee per month, with the total cost varying by the number of optional services desired. The total annual cost to the client per employee generally falls in the \$20-35 range. The HCCC PPO network generates revenue based only on a percentage of savings achieved versus actual billed charges, with no other fees to the client.

HCCC is currently placing major emphasis on expanding its reach by developing outpatient care networks, including physician services, laboratory, radiology, and home health, in its markets to augment its existing inpatient network. The HCCC PPO network increased from 25 states at the end of 1990 to 45 states by the first quarter of 1992, and the outpatient network expanded from 8 states to 25 states in the same period.

HCCC also gained a more dominant presence in the worker's compensation market with the merger in February 1992 with Occupational-Urgent Care Health Systems (OUCH). In the merger, each outstanding share of OUCH common stock was converted into the right to receive 0.93 of a share of HCCC common stock, and as a result OUCH became a wholly owned subsidiary of HCCC. Incorporated in 1982, OUCH also offers

comprehensive medical cost management, but focuses primarily on worker's compensation. Its product integrates the benefits of a preferred provider network, bill review, and utilization management into a single package to reduce medical costs and related administrative burdens.

Recent contract awards include an agreement made in October 1992 between HCCC and Employee Benefit Plans, Inc. (EBP) of Minneapolis to jointly market HCCC's Affordable preferred provider networks to the 2,800 employers, 650,000 employees, and \$2 billion in annual claims EBP represents nationally. In June 1992, HCCC and Alta Health Strategies, Inc. reached a similar agreement to market Affordable to the 900 employers, 3 million employees, and \$2.6 billion in annual claims that Alta represents.

I

IBAX Healthcare Systems

**587 East Sanlando Springs Drive
Longwood, FL 32750-5187
(407) 831-8444
1991 Revenues = \$63 million**

IBAX Healthcare Systems (IBAX) designs, develops, and markets information management solutions for small, midrange, and large hospitals, as well as systems for physician practice management. IBAX was formed in January 1990 under the name Spectrum Health care Solutions by a joint venture of IBM and Baxter International subsidiaries. Both parent companies have had a presence in the medical information systems industry since the 1970s, and Spectrum, renamed IBAX in June 1991, quickly established itself in the market.

IBAX's current client base is comprised of more than 800 hospitals and 7000 private physician practices worldwide. INPUT estimates that between 90% and 95% of IBAX's 1991 revenues derived from software products and related services. The remaining percentage derived from consulting services.

The company's products include Series 3000 financial and clinical applications for small community hospitals that run on IBM RISC System/6000 computers and covers patient accounting, medical records, accounts-payable and general ledger; Series 4000 financial applications for midsized hospitals which run on IBM AS/400 computers in over 275 hospitals; Series 5000 financial and clinical applications for large hospitals and complex medical centers which run on IBM mainframes; the Physician Series for communicating patient data to physicians, nurses, and staff, which runs on IBM and compatible PCs and can communicate with any of

the systems mentioned above; and the Point of Care Clinical Series which supports nursing care documentation and access to the hospital system for IBM Clinical WorkstationsTM located at patient bedside. The Point of Care products were introduced in 1991 and are IBAX's key additions beyond products offered by either parent company. Point of Care can encompass several departmental systems, including the Operating Room System for IBM S/36 or AS/400 computers; the Radiology Information Management system for IBM AS/400s or mainframes; and the Pharmacy Management System, which can operate on a mainframe, AS/400, or IBM-compatible PC platforms. In addition, IBAX's services include education and training, implementation assistance, 24-hour customer support, and technical and operations consulting.

Within the last year, IBAX has acted on its announced intentions to move away from mainframes and minicomputers toward RISC-based platforms. As of January 1992, the company installed its second IBM RS/6000-based Series 3000 system at Doctors Hospital in Nelsonville, OH. In October 1992 IBAX signed an agreement with the University of Toronto's Sunnybrook Health Science Center to jointly market IBAX's Series 5000 to Canadian hospitals. Sunnybrook has been a Series 5000 and IBM System/9000 user for several years and will use its experience to tailor the system to accommodate Canadian requirements and develop new workstation processing and network systems technologies.

J

McKesson Corporation

Drug Distribution Group/McKesson Drug Company
One Post Street
San Francisco, CA 94104
(415) 983-8300
1991 Revenues = \$7.1 billion

McKesson Drug Company is the nation's largest distributor of pharmaceuticals and health care products and lies at the core of McKesson's Drug Distribution Group. From 45 distribution centers, McKesson provides products to 16,500 customers across all 50 states. During 1991, McKesson Drug introduced its Econolink system, a comprehensive hospital linkage system, and expanded its Valu-Rite system, a voluntary electronic drug distribution system with more than 3,300 members nationwide. McKesson's sales to Valu-Rite members have grown 23% per year since 1985, from \$300 million per year to an annual rate of more than \$1 billion. Valu-Rite is the fastest growing part of McKesson Drug's sales to independents and represents approximately one-third of this market segment. In November, 1991, McKesson announced that it would support the ANSI

X12 standard for EDI and change from the proprietary systems it has used in its drug distribution systems since the 1970s. The company had resisted adopting the X12 standard, but adopted it based on customer demand for a single standard in the pharmaceutical industry.

The company also continues to upgrade its distribution network and introduced a new generation of automated order-picking systems in 1991 to improve accuracy and speed order processing. MAPS, the McKesson Automated Picking System, is the company's latest effort to increase drug distribution efficiency. Installed at McKesson's St. Louis distribution center, the computer-controlled MAPS equipment can fill 1,200 orders per hour and handle nearly 70% of the center's prescription volume.

Excluding deliveries to customer warehouses, in 1991 McKesson Drug's sales to independent customers comprised 52% of revenues. Sales to chains and hospitals accounted for 29% and 19% of revenues respectively. McKesson strongly supports independent customers, but has increasingly cultivated the hospital and chain markets.

K

Medstat Systems, Inc.

777 East Eisenhower Parkway

Ann Arbor, MI 48108

(313) 996-1180

1992 Revenues = \$32 million (Medstat estimate based on 9/30/92 year end)

Medstat Systems, Inc., founded in 1981, integrates and manages large-scale medical claims data bases, develops data base access and analysis software tools, and assists clients with interpreting the information to manage group health insurance costs. In 1991, three important developments combined to establish Medstat's market leadership position in the health insurance market. First, IBM selected the company as a Business Partner and Industry Application Specialist, lending support to Medstat's insurance market strategy and product direction. Second, in the fourth quarter, Medstat released an IBM version of the company's DataScan software system, and offered new and expanded applications for their Employer Systems and Services. Last, Medstat added four new insurance clients, including software licenses with The Prudential and CIGNA. In 1992, Medstat signed Blue Cross/Blue Shield of Massachusetts, Selectcare of Troy, Michigan, Coors Brewing Company, and Georgia Power Company to install software and utilize the National MarketScan Data Base described below.

Medstat derives approximately 60% of its revenue from electronic information services. The remainder comes from associated professional services. The company's professional service personnel assist clients in utilizing company data bases and other available resources to provide clients with complete customized solutions. Medstat divides its services into Client Data Bases, National MarketScan Data Base, and Advanced Software.

For Client Data Bases, Medstat builds and maintains medical claims data bases, standardizing and integrating traditional fee-for-service records, demographic data and managed care transactions. These data bases are organized for rapid retrieval and interactive analysis. For large employers, Medstat frequently integrates data from multiple insurance carriers into custom-designed data base structures. For insurance clients, Medstat assists with integrating data from multiple claims processing systems to create a single data platform to support key insurance operations areas. These include underwriting, actuarial services, managed care, provider networking, product development, and customer reporting.

For Medstat's National MarketScan Data Base, contributed client data bases are pooled together to create the broadest source of information on privately insured health care containing clinical, demographic, financial and provider data. In 1991, the MarketScan data base grew 51% from 167 million to 252 million claims and covered \$8.1 billion, or 6% of total U.S. health expenditures.

In Advanced Software, Medstat's communications driver, System2, provides access to the company's centralized data bases from client PCs, contains a wide variety of standard report formats, and has the capability to generate custom queries and reports. Clients may run the software themselves, but many choose to contract Medstat personnel to generate their reports, analyze available information and recommend solutions.

In February 1992, Medstat broadened its health care systems offerings by acquiring Santa Barbara, California-based Systemetrics. Formerly a subsidiary of McGraw-Hill, Inc., Systemetrics is a leading health care policy research firm serving both government and the pharmaceutical industry. Systemetrics' Disease Staging software, a proprietary package for evaluating medical practice and quality of care, adds to Medstat's core product base while Systemetrics' strong track record in the management and analysis of large-scale Medicaid and Medicare claims data bases accelerates Medstat's initiative into government-sponsored research. Systemetrics reported revenues in 1991 of approximately \$10 million, with offices in Washington, D.C., Lexington, Massachusetts, and Santa Barbara.

L**National Data Corporation****National Data Plaza****Atlanta, GA 30329-2010****(404) 728-2000****1991 Revenues = \$220.6 million (1991 calendar year)**

National Data Corporation (NDC) was incorporated in 1967 to provide specialized data processing and facilities management services. The company currently provides various processing systems, professional services, turnkey systems, and systems operations services, primarily in credit and debit processing, cash management and information reporting, and health care systems and claims processing.

The Health care Services Division provides turnkey systems for pharmacy and dental applications and claims processing services. Through NDC Federal Systems, Inc. (FSI) the company also provides professional services to federal government agencies for health care applications. As of fiscal year end in May 1991, Health care Services reported revenues of \$39.2 million, or 17% of NDC's overall revenue.

NDC's Health care Services products offer applications for office management and verification, authorization, data capture, and funds transfer. DataStat™, introduced in 1983, is a turnkey pharmacy management system designed for independent retail pharmacies, pharmacy chains, nursing home pharmacies, government-operated pharmacies, and pharmacies serving HMOs, clinics, and hospitals. DataStat supports patient registration, drug recordkeeping, private and third-party billing, inventory control, internal reporting, and drug data base updates, and it also detects clinical dispensing and prescribing errors. DataStat is available for both minicomputers and PCs and is currently installed in over 3,700 locations. The DataStat Dental System is a PC-based dental office management product that supports managing and maintaining patient information, appointment calendars, insurance claims processing and follow-up tracking, patient treatment planning and tracking, and customer billing and receivable tracking.

NDC also provides electronic eligibility verification, real-time claims authorization, data capture, and adjudication services to such markets as hospitals, HMOs, pharmacies and PPOs. These services allow the customer to speed claims collection and reconciliation, while eliminating paper processing, by sending claims to NDC electronically. NDC then processes the claims and transmits them to payors.

FSI, formed in 1984 with NDC's acquisition of Libra Group, provides professional services primarily to federal government agencies, including requirements analysis; facilities planning; site engineering; systems design, including distributed systems and data base management systems; hardware and/or software selection, procurement and installation; and facilities management.

As of November 1991 NDC had installed over 5,000 terminals and connected over 40,000 additional health care provider locations to the company's health care processing network. In the second quarter of 1992, NDC signed a contract with Blue Cross/Blue Shield of Canada to process all of its dental claims.

M

National Electronic Information Corporation

**500 Plaza Drive
Secaucus, NJ 07094**

National Electronic Information Corporation (NEIC) is a carrier-owned national claims clearinghouse created to electronically receive, edit, and distribute commercial claims to participating carrier members. NEIC was established in 1981 and currently distributes hospital, physician, and dental claims to more than 30 commercial carriers from over 2,000 hospitals and 8,000 physicians in approximately 38 states. These carriers collectively account for more than 90% of the total commercial group claims paid nationwide. Aetna, CIGNA, John Hancock, Metropolitan Life, The Travelers, Equitable and McDonnell Douglas are among the carriers on the NEIC board.

NEIC's primary product, ACU-CLAIM, is a PC-based claims preparation and submission system that enables PCs to accept all health care claims. The system operates using a diskette containing downloaded claims data from the provider's computer system. Programming or re-keying is not required by either the provider or the vendor. Once information is downloaded, patient accounts personnel use ACU-CLAIM to automatically sort and select the claims required for processing. Edits are performed immediately by the ACU-EDIT feature, which identifies errors and missing information. Inaccurate or incomplete claims are held for next-day correction. Once editing is completed, NEIC claims are electronically submitted in batch to NEIC while all others may be printed and mailed.

NEIC's most recent and ambitious project is the Health Care Information Network (HCIN). NEIC is jointly developing the network with PCS, Inc., the managed prescription care subsidiary of McKesson Corporation. The two companies plan to have the HCIN tested at three or four locations by

the first quarter of 1993. No current date has yet been set for commercial implementation. When fully implemented the HCIN will electronically transmit and receive information regarding claims, eligibility, benefit determination, referrals to specialists, precertification/authorization for treatment, and other data within a proposed time limit of 15 seconds. Other features could include free-form messaging, medical records transfer, and EFT. However, a medical records transfer application may be difficult as the federal government has yet to define the parameters of medical records confidentiality. The HCIN project has won the support of the NEIC board companies, PacifiCare Health Systems, Inc. and The Prudential.

N

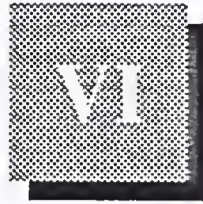
PCS Health Systems, Inc.

**9501 East Shea Boulevard
P.O. Box 52115
Phoenix, AZ 85072-2115
1992 Revenues = \$103.3 million (fiscal year ending 03/31/92)**

PCS Health Systems, Inc. (PCS) is the nation's largest processor of prescription drug claims for insurers and employers. With its electronic links to approximately 52,000 pharmacies, PCS manages the costs and monitors the delivery of prescription drugs for more than 20 million individuals in the U.S. and Puerto Rico. PCS' customers include 160 commercial health insurance carriers, including 23 of the largest in the U.S.; approximately 45 Blue Cross/Blue Shield organizations; 70 HMOs and PPOs; over 190 third-party administrators; and more than 762 self-insured employers. In addition, PCS recently signed two large, five-year contracts to provide services for a Metropolitan Life Insurance Co. health care program covering 3.6 million people and for the Blue Cross/Blue Shield Federal Employee Program, which covers 3.1 million people. PCS has also teamed with National Electronic Information Corporation (NEIC) to develop, test, and eventually implement the Health Care Information Network (HCIN) described in the NEIC profile.

PCS' point-of-service managed care services are delivered through its Remote Electronic Claims Adjudication Process (RECAPSM) system, which links the 52,000 pharmacies to PCS headquarters. RECAPSM is operational 24 hours a day and handles more than 100 million prescription claims transactions every year. The computers or RECAPSM terminals installed in participating independent and chain pharmacies instantly verify patient and drug eligibility, adjudicate claims in real time, and display concurrent drug utilization review information. These managed prescription drug care services are designed to control the quality and costs in the pharmacy before prescriptions are dispensed.

In 1991, PCS introduced two new products, MajoRxSM and QUANTUM AlertSM. QUANTUM AlertSM is a new cost containment feature for RecapSM and is the first nationwide retail point-of-sale drug utilization review (DUR) program. It is designed to help alert pharmacists to potential drug interactions and other inappropriate drug therapies, and currently covers over 2 million people. MajoRxSM is a proprietary major medical drug program designed to manage costs and combine with traditional medical plan designs. It currently covers more than one million people.



Conclusions

A

Findings

Systems that support commercial transactions (“electronic commerce systems”) in health care are economically useful in four business functions, or workflows, in the health care industry:

- Procurement
- Claims Processing
- Claims Payment
- Utilization Review and Related Information Service

The expansion of these basic electronic commerce applications is laying the groundwork for a nationwide health information network that will streamline the delivery, financing, and administration of health care. The goal is a less costly health care delivery system, restructured to provide better, faster, and more appropriately targeted care.

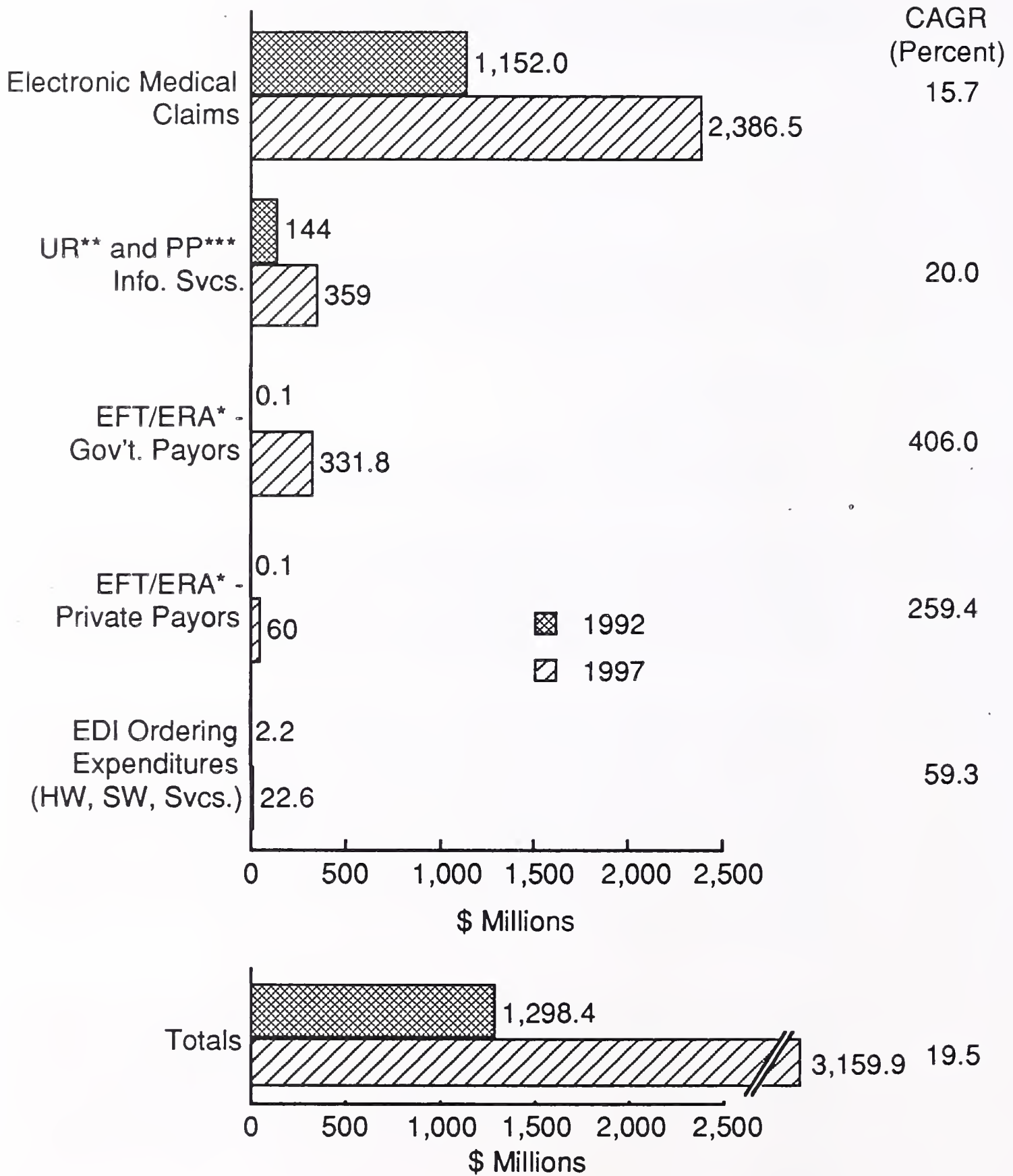
A machine-readable health ID card (similar to bank ATM cards) carried by all citizens might one day be the means by which physicians will use this network to gain access to health information stored in each patient’s primary care provider’s system. Thus, for example, if Mary Smith is hit by a bus while traveling far from home and lies unconscious in a strange hospital, the hospital’s doctors could use her ID card to access her records on her primary care site’s patient database and learn that she is allergic to certain medications.

The health ID card scenario is a dramatic illustration of some long-term potential benefits of a system for national exchange of health care-related information. Current developments are establishing the infrastructure required for such a system: emerging standards, EDI and other inter-organizational applications, and an increasing level of collaboration and communication among providers, payors, employers, and government agencies.

Exhibit VI-1 depicts forecasted growth in the four key electronic commerce and EDI markets: EDI ordering, electronic medical claims, electronic payment and remittance, and utilization review and PPO-related information services.

EXHIBIT VI-1

Summary: Key Health Care Electronic Commerce Markets



* Electronic Funds Transfer/Electronic Remittance Advice
 ** Utilization Review
 *** Preferred Provider Organization

INPUT believes that there are tremendous opportunities for both users of electronic commerce systems and vendors of these systems over the next five years.

As the exhibit shows, health care providers are expected to spend a rapidly increasing amount on such systems over the next five years.

The greatest growth area is in payments of medical claims. In part this rapid adoption stems from the fact that a small proportion of today's insurance claims are paid electronically.

EDI procurement shows the next most rapid adoption and this stems from the transition now underway from proprietary pharmaceutical ordering systems (such as Baxter's ASAP, etc.) to standardized, typically X12-based systems that cover all material procurement functions for hospitals, including medical-surgical supplies, grocery/dietary material, and others in addition to pharmaceuticals.

While INPUT is confident that electronic claims growth will proceed at the rate shown, we are less certain as to who will realize the economic benefits. In Exhibit VI-1, the dollar amounts spent on claims processing are the revenues earned by claims processing service bureaus (assuming the industry-standard fee of \$.75 per claim processed).

Electronic filing of claims will certainly impact revenues for these intermediaries, but the effect of eliminating or consolidating these intermediaries will also occur. So exactly who retains the revenue growth shown in Exhibit VI-1 is unclear. It may be the claims processor, network service providers, newly merged or consortium entities, or indeed, by using EDI software and communicating directly with insurers, it may be hospitals and other providers themselves. Health care providers may be the ultimate beneficiaries of these dollar values and realize them in terms of reduced costs.

Utilization review and other information services also shows a substantial rate of growth. These services are typically used in conjunction with assessing medical claims and containing health costs.

B

Driving Market Forces

Cost pressures, demands from the electorate and from major health care payors, providers, and plan sponsors, and a growing awareness of the benefits of electronic commerce are contributing to the growth of EDI and other applications for electronic information exchange among health care organizations.

Exhibit VI-2 lists the market forces driving the growth of electronic commerce in health care.

EXHIBIT VI-2

Electronic Commerce in Health Care Driving Market Forces

- Government programs encouraging electronic medical claims processing, including EDI/EFT use
- Financial incentives: health care costs are skyrocketing; major containment efforts are needed
- Large employers and the health care community are pushing for changes
- Increasing collaboration among health care players
- Benefits are tangible; success stories are accumulating
- Reduced implementation costs on downsized platforms
- Patient care applications offer the long-term prospects of major improvements to public welfare

The federal government's Department of Health and Human Services (HHS) is promoting the development of a health information infrastructure, with electronic claims processing targeted as the first major application for nationwide standards development and implementation. HHS's Workgroup for Electronic Data Interchange (WEDI), a public-private task force, projects over \$3 billion in administrative savings to be gained from use of electronic claims, claims payments, and other insurance-related applications.

Health care costs have now reached a point where major players are demanding change. According to A. Foster Higgins & Co.'s 1991 health benefits costs survey, health care benefit costs amounted to 26% of corporate earnings in 1990. The U.S. Department of Commerce estimates that 1992 health care expenditures will be \$817 billion, an increase of 11% over 1991 expenditures of \$738 billion. 1991 expenditures accounted for approximately 13% of the Gross National Product.

Among members of the health care trading community, there is an increasing level of collaboration aimed at controlling the cost of care. Over 80% of medical insurance plans now include some aspect of managed care, resulting in a higher degree of interaction among health care providers and payors for referrals, pre-certifications, and direct contracting. Hospital buying groups allow hospitals to pool their buying power to reduce costs. Claims clearinghouses and regional joint-payor claims networks continue to grow. EDI standards are being developed to remove the barriers imposed by proprietary systems. All of these developments contribute to the growth of community-wide information exchange.

Potential and already-achieved benefits of electronic commerce are receiving industry-wide attention. The WEDI report's estimates of potential savings from increased electronic claims and related transactions usage (see above) are well known. User and vendor savings from standard EDI hospital ordering (detailed in Chapter IV of this report) may amount to an average of \$432,000 per year for a 500-bed hospital issuing 15,000 purchase orders per year.

The reduced cost of EDI implementation on workstation platforms is also contributing to its growth. For example, PC hardware and software to support an EDI order entry system together costs up to \$16,000; the mainframe software alone costs over \$60,000. Implementation costs on a PC platform at \$1,000 per day would total approximately \$30,000 for six weeks. Mainframe implementations, requiring up to 18 months of programmer time, cost an order of magnitude more, or approximately \$360,000.

Finally, the long-term development of a national patient care information system remains an underlying goal of electronic commerce infrastructure development. Providers are implementing electronic claims and purchasing with the knowledge that these applications are helping to develop the know-how and the networks needed for transmission of computerized patient records.

C

Inhibiting Market Forces

Restraints to growth of electronic commerce applications in health care stem largely from the complexity of our multi-layered, multi-payor, public-private, modified free enterprise health system. These combined forces make the reform of our health care system an enormous undertaking.

Exhibit VI-3 lists the market forces inhibiting the growth of electronic commerce in health care.

Electronic Commerce in Health Care Inhibiting Market Forces

- Complexity of the U.S. health care system
- Lack of uniformity of health care information and the large number of proprietary designs already in use
- Costs of converting to EDI and lack of awareness of cost benefits
- Many provider sectors are not ready for EDI or electronic commerce
- Privacy and information security issues
- The magnitude of change required

Our health care system is made up of a large number of sectors which each face different challenges in implementing electronic commerce. Chapter III examined many of these sectors in terms of their place in the health care trading community, and Chapter IV looked at the various payor and provider sectors in terms of their level of electronic claims usage. The challenge for proponents of electronic information exchange is to develop conversion approaches that address the needs of each of the key health care sectors.

Today, there is a high degree of disparity among various players' and sectors' standards and procedures. The fact that there are over 400 different proprietary standards in use in the claims arena speaks for the difficulty of converting to industry-wide standards. However, a consensus in support of ANSI X12 standards is emerging.

A recent American Medical Association Report, "Electronic Data Interchange in Medical and Dental Practices," found that only about 41% of physicians have the capability to submit at least some portion of their claims electronically. While somewhere between 60% and 70% of physicians' practices and doctors' offices have some degree of automation, the level of sophistication of these systems varies widely. Physicians' practices and certain other non-hospital providers—inpatient-outpatient labs, skilled nursing facilities (nursing homes), and home health care providers have just begun converting to EDI in the past two years. But with downsizing reducing the cost of hardware, software, and implementation, and a growing awareness of the cost benefits of electronic purchasing and claims processing, conversion costs are beginning to present less of an obstacle.

Provider sectors that have lagged in EDI-readiness require products and services targeted to their needs, such as physicians' practice management software with electronic billing capabilities, and user-oriented implementation services.

Privacy and security issues must be addressed in each EDI or electronic commerce implementation, but the difference in security measures required when converting from hard copy information to an electronic medium is the true obstacle in many cases. This barrier can be alleviated through training and efforts to increase users' understanding of the security advantages of EDI. For example, insurance claims analysts accustomed to detecting fraud by looking for white-out and other warning signs on claims forms must learn different signals of fraudulent claims. They may not realize that electronic claims transmission enhances security because claims pass directly from provider to payor. Concerns about security of patient information in future transmission of computerized patient records have been much alleviated as a consensus has emerged in support of local control of patient records by each patient's primary care facility.

The magnitude of change required is significant, but change is occurring first in purchasing, claims, and insurance-related areas, and will progress swiftly over the next five years. A commonly stated target for computerized patient record (CPR) standard-based systems is the year 2000, although legislation now in Congress (commonly known as the Health Insurance Reform Act of 1992) calls for the Health and Human Services Secretary to encourage adoption of CPR standards by 1995, and for hospitals providing Medicare services to have a CPR system in place by January 1996.

D

Market Opportunities

There is a need for electronic medical claims processing and other EDI software and services opportunities among physicians' practices and other provider groups.

The other groups include inpatient-outpatient labs, skilled nursing facilities (nursing homes), and home health care providers. These are the groups which have the lowest installed base of administrative computing technology—Medicare EMC rates from these provider categories are all currently in the 50% or less range. Software and services should be user-oriented and perhaps bundled with non-technology (business) services.

There are systems integration needs for large-scale EDI rollout within managed care, buying groups, or other health care associations.

Development of in-house EDI order entry capabilities in hospitals and large clinics or physician's practices holds great promise and promises to begin its take-off by 1994—the foundation is now being laid through initial success stories. Rollout of EDI capabilities into hospitals is a major undertaking, and the level of effort required will vary considerably depending on the platform selected and the readiness of the hospitals to use EDI. In cases where the number of hospitals is very large or the level of IS staff is relatively low, contracting with an outside services firm to plan, focus, implement, and monitor the success of the rollout is a cost-effective approach.

Materials management needs to be re-engineered as standard EDI ordering systems are implemented.

Hospitals are moving to just-in-time ordering and warehousing, and have realized significant savings through reduction in inventory and required warehouse space. EDI ordering may spur a re-design of inventory management processes, or vice versa.

New software and services are needed to support development of utilization review, claims analysis, and other systems aimed at cost containment.

A number of current players and projects are described in Chapter IV of this report. Insurance companies, self-insured employers, third party administrators, and managed care organizations are major users of these systems.

There are medical imaging opportunities both in patient care and claims-related applications.

Large-scale picture archiving, teleradiology, and related image transmission projects are now under way in many large hospitals. These are typically major integration projects with a large number of hardware, software, and services players represented. Image transmission opportunities in support of claims processing will begin to appear in 1995.

Human resources (HR) and employee benefits software products are needed to support electronic enrollments.

Employers' interest in this function stems from the reduction in costs they may realize in converting from one payor to another and electronically updating enrollments in the payor's office through a process that is less error prone and more flexible and timely than magnetic tape submission. INPUT expects that employers who already have EDI capability will be the first to take advantage of EDI enrollment.

There is a need for inter-organizational e-mail as a precursor or complement to EDI transaction processing.

Inter-organizational e-mail is already widely used on the business side of health care (i.e., among insurance firms, materials vendors, and pharmaceutical companies). It is used among managed care organizations that have a significant level of interaction among primary care providers and specialists, and in support of referrals and pre-certification of services. Hospitals and physicians' practices are relatively low users of e-mail. As interaction among the health care community grows, demand for e-mail will be driven by its ability to streamline communication, and as a precursor or complement to EDI (see Chapter IV). Vendors should monitor trends toward collaboration and EDI implementation among the less e-mail-intensive sectors, and target those groups as they begin to focus on communications with trading partners and remote sites.

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