Health Information Systems And The Role Of State Government

A taxonomy and evaluation of state government efforts on the health information frontier.

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PROLOGUE: The idea that information plays an important role in performance measurement and quality assurance in health care settings is neither new nor controversial. And yet a lack of useful, relevant information to support medical and health care decisions has long plagued clinicians, policymakers, and the public alike. This chasm between the ideal and the real was not lost on the 104th Congress, which enacted the Health Insurance Portability and Accountability Act in the summer of 1996. In addition to its well-known guarantees of portability and its restrictions on denials of coverage, the law's administrative simplification provisions are designed to improve the "efficiency and effectiveness of the health care system . . . through the establishment of standards and requirements for the electronic transmission of certain health information." As Daniel Mendelson and Eileen Salinsky point out in this paper, there is already considerable activity under way at the state level to exploit emerging information technologies with the aim of improving health and increasing system efficiency.

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ABSTRACT: State government entities have created a range of innovative electronic information systems to support their diverse and evolving roles in the health care system. Primary goals of these initiatives include improvement of traditional public health programs, meaningful oversight of providers, simplification of administrative procedures, and support of state purchasing decisions. We establish a taxonomy of state efforts, describing primary capabilities to (1) provide meaningful data to state decisionmakers; (2) disseminate information to purchasers and consumers; (3) coordinate and improve government services; (4) establish mechanisms for electronic transactions; and (5) support telemedicine services. Reductions in the costs of technology and use of the Internet have dramatically increased state capabilities in recent years. Both the successes and failures of existing programs offer important lessons for states that are initiating new electronic communication initiatives.

THE ROLE OF STATE GOVERNMENTS in ensuring the health of their populations and improving health care system performance is undergoing major change. Traditional state monitoring, purchasing, and service delivery paradigms are evolving toward an emphasis on public/private partnerships, value-based purchasing, and responsiveness to consumer needs. States also increasingly want to serve as catalysts for change in the private sector, facilitating health improvement and administrative simplification.

Emerging information technologies have provided states with tools to achieve this challenging transformation.[1] Advances in telecommunications, Internet capabilities, data standards, and increased computerization of health records have improved the availability of meaningful health data and stimulated data sharing to promote communication and reduce redundancies. Federal legislation, such as the Health Insurance Portability and Accountability Act, is likely to increase state and private-sector attention to electronic communication.

This paper explores some of the innovative ways in which states have leveraged health information technology to improve public health and increase efficiency. We first establish a taxonomy to describe the range of state efforts in electronic communication. We then discuss the common challenges such programs face, including governance, management, funding, and confidentiality and security. Finally, we discuss the achievements of states' health information systems and abstract lessons for states that wish to establish similar programs.

A Taxonomy Of State Efforts

State efforts to use health information and information technology as levers in effecting health system change have focused on providing meaningful data to state decisionmakers; disseminating infor-

mation collected by state governments; coordinating services delivered by government providers; creating transactions systems for the public and private sectors; and supporting telemedicine services.

Some states have elected to pursue comprehensive information initiatives that seek to achieve many of these objectives simultaneously. Others have crafted more incremental strategies. In the interest of clarity, we describe each of these objectives separately, recognizing that programs initiated to accomplish these objectives may overlap and interact significantly. To characterize the range of state activities, we adopt a broad definition of "state government involvement" that includes state-sponsored, state-mandated activity and systems developed outside of government that are endorsed or supported by states.

■ **Providing data.** Although state government agencies have long been responsible for collecting data, mechanisms used to convey results were often fragmented and failed to integrate the multiple databases maintained by multiple government entities. Updated information systems, electronic communication tools, and specially designed software have streamlined the dissemination of health information and enhanced analytic flexibility in many states.

State "executive information systems" (EIS) may facilitate decision making by allowing users to access large amounts of health data through a simple interface that integrates data historically maintained in many separate data sets. For example, Georgia's Division of Public Health created the Executive Health Information System (EHIS) to display current health information on the desktops of public health officials and, eventually, private health practitioners. Through an easy-access interface, users can review trends in notifiable diseases, chronic diseases, vital statistics, immunization audits, and other health-related data maintained at the county, district, and state levels. The EHIS interface is accessible through the Internet, with higher-level functions requiring password access.

One major goal of improved information systems is to build state capacity as a knowledgeable purchaser of care. Proposed revisions to Medicaid management information systems (MMIS) promise to deliver basic clinical and financial data, pending approval from the Health Care Financing Administration (HCFA). For example, California's Medi-Cal (Medicaid) is developing a management information system that contains all fee-for-service and managed care claims and encounters. The database is expected to assist in setting appropriate rates, profiling providers and beneficiaries, assessing patterns of treatment, and tracking health outcomes and costs. Other states, such as Maryland, have built their analytic capacity by replicating Medicaid data in a relational format.

■ **Disseminating public information.** Large data sets, such as hospital discharge databases, vital statistics, and communicable disease records, have long been collected and used by government to set regulatory policies and monitor public health. As state government agencies have embraced a more expansive customer base, they are seeking to share these "internal" uses of public health information with external audiences. Internet technology has dramatically lowered the cost of such programs.

Purchasers and consumers. Informed consumers play a critical role in the effective functioning of a market-driven health care system, and states are in a unique position to educate consumers.[2] Although some states have been reluctant to distribute collected data, others are eager to disseminate it. For example, the Pennsylvania Healthcare Cost Containment Council maintains a database that includes basic claims (UB-92) information from two million hospital discharges, payment data from payers, admission severity and outcomes data collected from hospitals, and small-area analysis data. The data are collected through automated systems and provided to the public in aggregate form over the Internet (for example, through the *Hospital Effectiveness Report*, *Small Area Analysis Report*, *Consumer Guide to Coronary Artery Bypass Graft Surgery*, *Hospital Financial Report*, and customized or special reports). The development of comparative purchasing information in the form of report cards and outcomes studies also has become a central state role.

States also seek to disseminate measures of health maintenance organization (HMO) performance developed by the private sector to inform employers' purchasing decisions and consumer choice. A number of standard measures have been developed, such as the National Committee for Quality Assurance's (NCQA's) Health Plan Employer Data and Information Set (HEDIS), the Foundation for Accountability's (FACCT's) quality measures, and the Agency for Health Care Policy and Research's (AHCPR's) Hospital Quality Indicators. While the debate on the viability and relevance of chosen quality indicators persists, several states (such as Minnesota) already compile and disseminate this information in standardized formats.

Educational materials on modifying lifestyles to promote health and evaluating health care alternatives are also being disseminated via the Internet. State health departments have developed Web sites as cost-effective vehicles for disseminating health statistics and information on health department services. Internet technology allows states to reach large audiences and update reports easily.

Providers. States also are enhancing information support services for providers, including improved access to public health informa-

tion (for example, immunization registries and infectious disease records), as well as creation of electronic communication networks to help providers access information (for example, practice guidelines and knowledge bases). VTMEDNET is an Internet-accessible health information network that provides e-mail, some clinical records, and access to library services.[3] VTMEDNET is a joint project of the University of Vermont College of Medicine, Fletcher Allen Healthcare, The Vermont Hospital Association, and the Vermont State Medical Society. State government has recognized the system as the state's primary health information network and has supplied aggregate health data.

Researchers. Electronic dissemination promises to facilitate provision of data to researchers. A number of states have enabled access to registry data (on births, deaths, cancers, infectious disease, immunization, and other public health concerns) and provider data through CD-ROM and Internet technology. The California Department of Health recently released a CD-ROM of perinatal outcomes data linked with patient discharge data. The California Health Information for Policy Project (CHIPP) initiated this compilation to allow health department officials to analyze trends in perinatal outcomes. Plans for the project include developing a front-end interface and performing linkages annually. Utah has developed an Internet site that gives users access to the hospital discharge database and allows for sophisticated customized queries.

■ **Improving the coordination of government services.** Although many states are increasingly contracting for public health services, most continue to provide some direct client services. Public health services (such as the Women, Infants, and Children program and immunizations) are typically provided to an individual by a range of providers in a range of clinical settings. States have identified the need for more efficient management tools, and many have sought to improve telecommunications infrastructures with funding from the Information Network for Public Health Office (INPHO) project.[4]

The Illinois Department of Public Health began development of the Cornerstone system to help local health departments and community providers increase the efficiency with which they provided maternal and child health services by coordinating local client service delivery. The Cornerstone system integrates client records across programs, allowing providers desktop access to a comprehensive client record. The system streamlines scheduling for the client and helps the provider to ensure that the client is accessing all available services. An INPHO grant provided part of the funding needed to purchase hardware and enhance state and local health

department connectivity.

The development of a case management system is a major software design and production effort, and efforts in many states have run behind schedule. Development may also be hampered by a lack of political support, particularly if legislators view such systems as competing with private-sector development. Some states have thus elected to pursue more limited efforts that focus on sharing demographic and eligibility data across programs, rather than integrating client service records.

■ **Facilitating health transactions.** Support of electronic communication among private and public stakeholders has included sponsoring health information infrastructures; developing standards for data content and transmission; and encouraging integrated health information systems. The recently enacted Health Insurance Portability and Accountability Act calls for the development of data standards at the national level and will require the coordination of the standardization efforts that are under way in several states. Despite the increase in capitation, submission of health care claims remains the dominant mechanism for reimbursement in the U.S. health care system and a major locus of administrative inefficiency. Many of the successful efforts focus on administrative transactions (such as claims and eligibility verification) rather than on the transmission of clinical information.

Some states, including Wisconsin, Utah, and Minnesota, have gone beyond support of public programs and taken an active role in improving the information system capabilities of the private sector.[5] The Minnesota Health Data Institute (MHDI), formed as a public/private partnership, operates MedNet, a shared, secured nonproprietary information frame relay network, through which providers, payers, employers, policymakers, consumers, and others can communicate with each other electronically.[6] Participants have used MedNet primarily for its network routing and addressing services, which facilitate the exchange of administrative, clinical, and analytical health information. Participants can also exchange e-mail, log in via telnet to another participant's system (depending upon authorization), or transfer files. In addition, participants have access to a private Internet site with technical information about the status of the network and other information.

Despite some successes, many states have been unable to stimulate the development of broad-based, community-focused systems. Although there are many reasons why the Community Health Management Information System (CHMIS) program may have failed to meet expectations, some grantees were unable to generate the private-sector support necessary to the development of integrated, statewide sys-

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tems. In Washington State, efforts to develop a statewide health services information system collapsed when health care reform failed. Public distrust of a state-sponsored health care system and the proprietary interests of players in the health care market may also prevent development of information systems. Several of the CHMIS states have, therefore, focused instead on data standards and information infrastructure.

Other states have sought to encourage efficiencies by requiring insurers and health plans to rely on electronic communications. Maryland will require each provider and payer in the state to link with at least one certified electronic network for claims processing. The state has established certification standards to ensure that networks have capabilities for electronic claims remittance, eligibility referrals, reimbursement advice, and cross-compatibility.

Several states have modernized their MMIS to enhance the efficiency of Medicaid eligibility and claims-processing transactions and to provide more robust analytic capacity. The Texas Medicaid Network (TexMedNet), for example, establishes electronic data interchange (EDI) among providers, payers, and the Texas Department of Health MMIS mainframe.[7] TexMedNet includes electronic eligibility verification and claims processing, electronic appeals, electronic claims submission and editing, electronic remittance and status reports, electronic files transfer, an electronic bulletin board system, e-mail, and software to enable access. Users of the system include businesses (such as billing organizations, vendors, and clearinghouses) and providers, who will pay no fees. Although forty-seven states have supported some electronic claims transmission, most Medicaid systems are not capable of supporting purchasing decisions or clinical analysis.[8]

■ **Supporting telemedicine services.** The lure of telemedicine has not escaped the notice of states concerned with the provision of health care services to rural and underserved areas, and a few states have initiated experimentation or funded the development of facilities. Unfortunately, while pilot tests in Georgia, California, and elsewhere have stimulated interest, the dramatic benefits expected from full-scale implementation have not been realized.[9]

Telemedicine networks communicate medical images and other information for health care consultation, diagnosis, and education. Some basic telemedicine services visualized by states—including

remote consultations, continuing medical education, video conferences, and remote monitoring of vital signs—can be provided at reasonable cost, using existing telephone lines. However, even such "low-bandwidth" solutions remain experimental, and states face obstacles related to payment policy, resources, state licensure requirements, Medicaid practice issues, and training necessary to establish telemedical systems. Physicians also may be reluctant to use this technology because of scheduling problems, fear of malpractice, or lack of ready access. As a result, the benefits and costs of such applications remain unclear.

Some of the more successful programs that are introducing basic telemedicine to rural areas have been multistate efforts involving multiple funding partners. Colorado, Kansas, and Nebraska are implementing a three-state telemedicine network to connect ten rural/frontier facilities and provide them with interactive videoconferencing, Internet capabilities, and e-mail access. The Office of Rural Health Policy initiated the effort, and the High Plains Rural Health Network (HPRHN) and Telemedicine Alliance of Healthcare Organizations (TAHO) are developing the system. The network is funded by HCFA, member dues, grants, and state government.

More sophisticated services, such as real-time transmission of images for patient diagnosis and treatment, are being explored by the U.S. military; by medical specialties such as dermatology, radiology, and pathology that often do not require patient contact; and in university settings. Such "high-bandwidth solutions," including the facilitation of remote surgery, are experimental and require satellites or T1 lines. Although the research community is making steady progress with the development of such systems and the U.S. military is using such systems to enhance deployed military hospitals, these capabilities remain out of reach for states.

Some "hub" hospitals may view state efforts as interfering with their proprietary interests, since they see telemedicine as a way to attract rural patients. An alternative to creating systems is for states to focus on developing standards or to mandate payment for use of telemedicine efforts. At least fourteen states have already taken this approach in legislation they have introduced to support telemedicine.[10] Legislation includes motions to provide grants for the creation of telemedicine networks, set standards for practicing telemedicine, deregulate the telecommunications industry, and require health plans to pay for telemedical services.

Implementation of highly capable telemedicine systems has not proved to be a readily accessible state government function at present. Thus, states will need to define their roles relative to many

other actors and may be able to find more cost-effective solutions to communication problems in other venues.

Challenges In Pursuing Information Initiatives

States face a number of challenges when pursuing information-based solutions. As technology has evolved and communication solutions have come more easily, resolving questions of governance, management, funding, and confidentiality and security of information have emerged as keys to successful implementation.

■ **Governance.** The efforts described above reflect a variety of governance models that might be considered by states that are initiating new projects. Within a state, efforts may be governed by single agencies, cross-agency collaborations, state legislatures, or partnerships between the public and private sectors. Each has advantages and disadvantages in accomplishing state objectives.

Single agencies often lead efforts to develop electronic systems. Agency-led initiatives usually aim to assist specific public health functions and delivery of care and may work when a focused development effort is needed, particularly in the context of Medicaid. However, this model has limitations in achieving other objectives. First, state government data initiatives never reside in a single agency. Second, single agencies often have problems leading the private sector without government consensus and direct support from the governor. Third, state government is often constrained in assessing user fees and other charges (for example, by antidonation clauses, which preclude certain types of payments to government agencies). As a result, whereas a state agency can often successfully service its own prescribed needs, a single agency is typically not an appropriate platform for creation of communitywide systems.

A second governance model is cross-agency collaboration. A number of states have created an organizational structure centered around a chief information officer, who is charged with information technology integration. Although this model is more attractive from the perspective of bringing together constituencies within state government, few existing systems have been created through such a structure. Although it may be too early to assess this model, state information officers tend to be more concerned with establishing technical infrastructure than with implementing systems that are focused on health care.

A third model is to assign responsibility to a commission with the authority of the state legislature and a mandate to reduce state health care costs and improve quality. Some of these commissions have proved successful in bringing systems on-line, particularly when they have strong support from influential elected politicians

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and a clear mandate for project completion. Both the Utah and Minnesota efforts, originally created by government, successfully migrated their governance to public/private partnerships. On the other hand, commissions in Washington, Vermont, and Montana have not succeeded. As demonstrated in Colorado, the establishment of independent data commissions may make these entities more vulnerable to political pressures and budgetary constraints.

Public/private partnerships have been created in a number of states, particularly for transactional systems supported by private-sector interests. Such governance requires consensus that can further the joint interests of the public and private sectors in improved efficiency and reduced costs. A primary advantage of partnerships is that typically they can operate more independently than a government agency can, including in the assessment of fees to private concerns.

■ **Management.** Just as an effective, flexible governance structure is necessary to launch and shape a health data communication system, a strong management structure is necessary to run it. Effective health data organizations require senior leadership, technical expertise, and the ability to interface with a variety of constituencies. Some of the difficulties states face in the management of communication efforts include restrictions on salaries, organizational complexity of state government, and the need for both political and technical leadership. States such as Utah and Minnesota determined that management of ongoing efforts would be facilitated by transitioning toward the private sector.

■ **Funding.** Funding for state communication strategies has come from a variety of sources (general state funds, department of health funds, federal grants, and private foundation grants). Although some states have fully funded projects, many prefer to leverage state dollars by involving other parties. If functionality is of value to private-sector interests, they often are willing to support such efforts (in the form of start-up funding or user fees). Adequate funding is needed in all stages of development—strategic planning, system construction, ongoing operations, and system improvement.

■ **Confidentiality and security.** Confidentiality of personal records and security of data systems have long been recognized as critical.[11] States need to set levels of access to different types of data, ensure that data systems are secure, and protect patient confidenti-

ality. Although these objectives are universally articulated by states, interpretations vary, and many basic questions (such as ownership of patient records) remain unresolved. Technical questions, such as the security of Internet applications, are also commonly debated. Meanwhile, state health officials need to balance these concerns against the need to improve efficiency and quality. For example, a unique patient identification number that can be used to track patients is a great asset in linking data and assisting beneficiaries but also can be a major potential liability if security is breached.[12] The North Carolina Healthcare Information and Communications Alliance (NCHICA) has worked with North Carolina legislators to draft legislation addressing these issues.

Achievements Of State Information Systems

State legislators and policymakers have an interest in electronic communications as a mechanism for reducing health care costs and enhancing health information management. As the costs of networked solutions drop, barriers to constructing these systems are increasingly less technical than political and strategic, and many states have successfully implemented useful systems. Thus far, the two main achievements of these systems have been to reduce certain administrative and clinical costs and to improve the availability of health care data.

■ **Administrative and clinical cost reductions.** Preliminary experience suggests that improved communications systems may introduce efficiencies. A study of the Wisconsin Health Information Network system concluded that direct access to clinical and administrative data saved an average of $2.62 per information request, resulting in annual savings of $17,000–$68,000 for physician practices and $398,000–$1,061,000 for hospitals.[13] More research is needed to better identify the level and types of savings that can be achieved through such systems. The wide ranges reflect considerable uncertainty about original costs and about which individuals or organizations will benefit from the savings. They also leave many potential savings (such as efficiencies realized by state departments of health) uncounted. Methodologically, it is often difficult to assess baseline costs, let alone measure the changes attributable to the implementation of a specific program.

It is even more difficult to quantify cost savings attributable to clinical applications of technological improvements. A study of VTMEDNET reported that a physician identified a lab report on an asthmatic patient about to be discharged with an elevated glucose level in her urine, which suggested that she was an undiagnosed diabetic; another physician obtained literature for a patient from a

cancer information database.[14] Such improvements in the quality of care could raise or lower total health care spending over time.

State activities have been facilitated by a general reduction in the costs of networking technology. The Internet provides an option for cross-organizational communication that is inexpensive, widely available, and easy to implement. However, Internet communication is slow, and security poses technical challenges that make state officials reluctant to pass confidential information through these channels. Many states (for example, New York) have also established strong Wide Area Networks (WANs) and frame relay clouds that allow for more rapid and secure transmission of health data. The cost of all types of connectivity can be expected to continue to drop.

■ **Improved data availability.** Data issues are frequently targeted as a primary limiting factor in the ability of government officials and researchers to diagnose and solve public health problems. An initial question is the basic quality of existing data stores; problems include long lags in data availability, data integrity issues (data entry and coding errors), and a lack of ready access. More fundamentally, existing databases may not be comprehensive enough to address basic policy questions.

Electronic communication systems seek to address both issues by reducing the time from observation to data transmission, reducing the reliance on paper, implementing basic quality screens in data entry, and improving user interface. Many of these systems—particularly those achieving case management—also seek to address the issue of data fragmentation through the integration of existing stores of public health and provider data. Again, because these programs are so new, the gains of new systems typically have not been evaluated.

Lessons For States

Although every state is different, and specific political and organizational constraints are often the most daunting, a few general principles of system and organizational design emerge from our study.

■ **Broad public/private participation.** Strong champions are necessary to motivate both public and private interests. While motivation may come from either sector, all parties must see benefits in participation.

■ **Demand for administrative savings.** Private and public sectors share an interest in reducing administrative costs; such savings may provide partial funding for new communication systems, but reductions in total health spending cannot be guaranteed.

■ **Need for state organization.** State government needs to be organized and to participate in health data systems with a united voice, particularly in leading communitywide information system efforts.

■ **Use of existing resources.** Systems should maximize use of existing databases, computer networks, skills, and other resources. Development partners may expedite implementation of needed functionality.

■ **Leverage of nonstate resources.** Many of the successful systems were funded in part by the federal government, foundations, hospital systems, and communication companies, in addition to state government.

■ **Public/private governance.** States and private health care organizations need to collaborate to ensure that communications systems are fully responsive. Partnerships may help to overcome the limitations of pure public and pure private governance.

■ **Competition with the private sector.** State communications systems need to rely on private participation and should not compete with private-sector networks if avoidable.

■ **Accessibility of communication platforms.** Communication should be accessible to the greatest possible number of users, including those in rural areas. Platforms can be designed using only a low-cost personal computer and basic telephone service.

■ **Staff/user training.** Training is particularly important in the use of computerized systems and should be made available. A personal dimension to training and support is particularly useful, but on-line support may be less expensive.

■ **Flexibility and evolution.** It is important that communications be sufficiently flexible to accommodate the evolution of technology and of the health care system, particularly in the design of communication platforms.

■ **Security and confidentiality.** All data should be encrypted for security and confidentiality. Applications may also include passwords and other access restrictions for security, as appropriate.

■ **Focused and realistic goals and objectives.** Information initiatives should be pursued with a clear purpose in mind and an eye toward feasibility.

■ **Technology standards.** Communications solutions need to adopt widely accepted technical standards, such as those for Web pages (HTML), communications protocol (TCP/IP), health data transaction formats (HL7), database queries (SQL), and electronic commerce (ANSI X.12).

A number of efforts are now under way that may monitor developments in electronic communication, including a descriptive registry of state efforts to integrate health information, conducted by The Lewin Group and funded by the Department of Health and Human Services (http://aspe.os.dhhs.gov/statereg/), and an inventory of self-reported health information projects and health databases, spon-

sored by the National Association of Health Data Organizations (http://www.nhirc.org/home.html).

NEW COMMUNICATION SYSTEMS promise to enhance the efficiency of health care administration and improve the quality of patient care. States have an important role in the facilitation of this evolution and should learn from the experiences of others in system design and construction. We hope that the framework we have developed and the lessons we have distilled will help to guide states in this process.

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