Chapter 5
Health management information systems: Linking purchasers and providers

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Background

The purpose of this chapter is to give guidance and advice relating to the selection of the appropriate health management information system (HMIS) for implementing strategic health purchasing arrangements and health insurance reforms in low- and middle-income economies. The choice of HMIS is crucial, since these systems play a fundamental role in organizing and streamlining the business processes of health care and in providing the vital communication link between purchasers and providers through which business transactions can flow. The ever-decreasing cost of computer technology and telecommunications offers an opportunity to employ these systems in ways previously only possible in higher-income countries. A new HMIS offers the opportunity to replace aging health-related information systems (manual or somewhat automated), while efficiently accommodating reengineered health provision and health financing processes.

This chapter attempts to propose a general framework for HMIS that is applicable to many settings, even though differing sociocultural and economic situations will no doubt result in varying approaches and solutions.

An ever-present danger is that the relentless pace of technology change could lead to “instant obsolescence” of certain concepts and applications outlined here. We therefore concentrate on those underlying principles that are likely to remain largely unperturbed for the foreseeable future.

More and more health managers in low- and middle-income economies are being required to exert greater managerial control over health care efficiency and quality by forging new strategic purchasing relationships between purchasers and providers. Building these new arrangements requires a combination of improved management capacity; strengthened budgetary controls (via the introduction of national health accounts and other vehicles); and, last but not least, the installation, use, and optimization of HMIS.

New strategic purchasing arrangements are being introduced or enhanced because, while advances in health during the past few decades have been impressive, global spending on health has also risen significantly. When countries are faced with severe budgetary constraints, health care expenditures are often the first victim. In recent decades, health care costs have increased far faster than national wealth in most high-income as well as low- and middle-income countries. This has exacerbated the strain on the overall economy and stimulates the need to find new and better solutions to providing appropriate health care services to the population.

Advances in health are also the result of a better understanding of the causes, prevention, and treatment of diseases, and of efforts to improve the performance of the organizations and institutions that are used to purchase and deliver care. International experience indicates that the underlying causes of the health problems of the world’s 1.3 billion poor are well known, and that,
for the most part, effective and affordable drugs, surgeries, and other interventions are available. But because of weakness in the core functions of health systems and non-strategic purchasing arrangements, potentially effective policies and programs often fail to reach needy populations.

Today, the three core functions of health systems cover financing, resource (or input) generation, and service delivery; government stewardship oversight is related to them. The financing function includes the collection and pooling of revenues, and the use of these revenues through purchasing arrangements with service providers. The resource generation function includes the production, import, export, distribution, and retail sale of human resources, knowledge, pharmaceuticals, medical equipment, and other consumables (and capital where feasible). The service delivery function consists of both population-based and personal (“one-on-one”) clinical services provided by the public and private sectors, governments through their stewardship oversight function, and the population through political processes. Demand and markets influence these three core functions. Stewardship oversight involves management and monitoring to ensure that implementation meets strategic objectives.

The combined effect of these four factors leads either to good or to poor performance in health outcomes, financial protection, and responsiveness to consumer expectations. Given the complex interplay between these factors, “the success of reforms in RAP [resource allocation and purchasing] arrangements will be highly dependent upon parallel reforms and changes in other parts of the health system” (Preker et al. 2000).

The RAP concept involves the following core policy, organizational, and institutional considerations that must be addressed during development of any HMIS-related design effort to support RAP (Preker et al. 2000):

Policy considerations include:

- **Demand**—for whom to buy health care services?
- **Supply**—what health care to buy, in which form, and what services to exclude?
- **Prices and incentive regime**—at what price and how to pay?

Organizational considerations touch on:

- **Organizational forms**—what is the economy of scale and scope, and contractual relationships within the health care system, “as is” and “to be”?
- **Incentive regime**—what is the degree of decision rights, market exposure, financial responsibility, accountability, and coverage of social functions in health care, “as is” and “to be”?
- **Linkages**—what is the degree of vertical and horizontal fragmentation or integration in the health care system, “as is” and “to be”?

Institutional considerations relate to:

- **Stewardship**—who makes strategic and operational decisions?
- **Governance**—what are the ownership and oversight arrangements?
- **Insurance markets**—what are the rules regarding revenue collection, risk pooling, and transfer of funds?

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1 “As is” documents the current state of the system and “to be” documents the desired end-states as determined by the key stakeholders.
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- **Factor and product markets**—what does one buy from whom? At what price? And how much to buy?

It is highly recommended that the “as is” and “to be” states for these three sets of core considerations be documented in order to track progress and success.

Finally, HMIS must always be looked at in the context of the bigger picture. The aim of a properly implemented HMIS should be to provide health care that is (IOM 2001):

- **Safe**—avoiding injuries to patients from the care that is intended to help them
- **Effective**—providing services based on scientific knowledge to all who could benefit and refraining from providing services to those unlikely to benefit (avoiding underuse and overuse, respectively)
- **Patient-centered**—providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions
- **Timely**—reducing waiting and sometimes harmful delays both for those who receive and for those who give care
- **Efficient**—avoiding waste, including waste of equipment, supplies, ideas, and energy
- **Equitable**—providing care that does not vary in quality because of the personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

Health services should be evaluated on the basis of how well they succeed in producing equitably distributed health outcomes, protecting citizens against impoverishing health expenditures, and helping the poor build self-reliance and break out of social exclusion (World Bank 2004). However, they are characterized by a variety of market failures, such as externalities associated with disease, asymmetric information between professional providers and patients, and the failure of insurance markets.

**Why is HMIS important in modern health care settings?**

The principal goal of any health system is to optimize the health of individual patients and of the population as a whole in an equitable and cost-efficient manner that is acceptable to patients, providers, and administrators. This is easier said than done. There are no information technology “magic bullets” (Markus and Benjamin 1997; Southon, Sauer, and Grant 1997) to accomplish this. Information systems will not single-handedly precipitate overarching reforms of service delivery or finance; rather, improvement from the implementation of the HMIS will result in incremental changes at all levels of the health system. It is an evolutionary, iterative, change process that is contingent on systematic measurement of health system performance, in conjunction with evidentiary decision-making processes. Broad measures of population health are confounded by unmanageable factors within the health care system, and composite indexes of system-specific performance, which are by nature imprecise. To drive change within the system, one must develop accurate and reliable micro- and macro-level health indicators. To avoid information overload, these indicators are usually aligned with some combination of expensive, complex, and high-priority services, especially those unevenly delivered.

Determining the needs and perspectives of all health system stakeholders—patients, providers, administrators, and policy makers—is essential to the development of effective HMIS. The establishment of continuous, audience-specific reporting systems is imperative. Additionally, informed consumer choice is not completely effective in driving change at the procedure- or provider-specific level, but may be effective at a macro level in an environment of competing health plans. Supply-side drivers of change include regulatory frameworks and the alignment of funding
with performance (the latter concept is now referred to as “pay for performance” in some countries). Reforms ultimately depend on collaborative action by professionals and administrators aimed at identifying and implementing best practices. With a well-implemented HMIS, the use of health system performance information will ensure that health services reflect best policies and practices, in addition to community contexts and values (OECD 2002).

Implementing data standards that are applied uniformly across the HMIS is also crucial. Creating these standards involves compromises in infrastructure, social morays, and sociotechnical interaction. The struggle is to balance trade-offs between changes in clinical outcomes and implementation of globalized standards of care. To achieve any specific standard of care, there is an associated cost. Accomplishing the correct level of health care improvement within budget and maximizing the health care improvement per unit of money spent is the goal.

One of the most significant issues for health care managers when making decisions is the cost of care, including project funds that support care. In order to correctly explore efficient modalities, including HMIS, to improve care, it is vital for these managers to understand and anticipate the cost-of-care consequences. The strategic power of information systems lies in their ability to transform the way that work is performed. HMIS and the Internet are potentially vital enablers in making a qualitative shift in the ability to deliver better care at reduced cost (Weaver and Spense 2000). The combination of computer and Internet represents a potent new tool for linking the purchaser and provider by offering a new powerful set of business transactions. As banking once discovered “inter-banking” and as airlines once discovered “inter-lining,” technology now offers the ability to transact health-related business among disparate actors.

The purpose of designing a national HMIS is to provide access to information so that all stakeholders can monitor and evaluate their health services performance overall, collect baseline information on the health status of the population served, and then, over time, analyze health outcome trends of the population. This then allows decision makers to make changes to program initiatives and to evaluate the effects of those program changes.

Given the heterogeneity of health care stakeholders, the greatest challenge in designing such a “dashboard” for monitoring performance is to create a set of agreed-on health indicators. Different entities collect and require different pieces of information, tracking is variable, and security and confidentiality concerns add further complexity to the process. The selection of health indicators, identification of potential data sources, and gaps in those sources (which vary widely) determine, to some extent, the overall design of the HMIS.

A good health system improves attainable average life expectancy and reduces the inequities within the system, among groups and individuals (WHO 2000). HMIS can play an important role in all this. But it is essential for information technology professionals to realize that information technology will not necessarily improve the average level of care, and that HMISs have the potential to increase inequality in health care provision if one is not careful. HMIS must be implemented with a proper understanding of the health care system generally as well as individual purchaser and provider needs to realize potential benefits. While it may be expensive to implement HMIS, in terms of both capital and running costs, these costs may well be warranted where they are integrated into better managerial and medical practice (though this is not assured). The main goals of an HMIS are given in box 5.1.

2 Variables are often counted and aggregated differently within a health care system, and different parts of the system are often unwilling or unable to share data.
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Box 5.1 Goals of a health management information system

- Improved availability of appropriate information for decision making
- Improved accessibility for all people
- Improved productivity of all health workers
- Improved cost-efficiency
- Improved appropriate utilization of health care resources
- Improved quality of care

Initial HMIS benefits are vast for low-income countries (for more discussion on potential gains, see annex 5.1). Although Weisbrod (1991) argues that technology increases health care costs (his studies focus on OECD countries and on extremely advanced interventions), his findings support the contention that the higher costs are offset by better outcomes. Certainly if his view was correct then, it must be true even more so today, given the proliferation and increased adoption of technology.

Within the OECD countries, the marginal cost to the patient has generally been low, given that most of the cost has been borne by providers and insurers, with the presumption that the cost would be offset by increases in productivity. There is however a general lack of agreement as to how to determine whether new technology provides significant enough benefits to warrant the sizable investment required, and further deliberate study of how best to apply cost-benefit analysis techniques to this domain are sorely needed.

The main advantage of computing technologies is their ability to systematize and, hopefully, streamline the processes of RAP, as well as to provide transparency of calculations and report generation. If implemented properly, information technology can allow all stakeholders to see how resources are purchased and allocated, thus engendering an openness and trust among the stakeholders.

Computerization will need to be introduced in both the larger provider environments and in the larger purchaser environments as well (it may remain too costly for the smallest provider and purchaser environments for some time, but one day even the smallest environments will no doubt be computerized). In addition, an interface (a communication link) between these two environments is required so that information can pass easily between the two (figure 5.1).

The next three sections—Implementing appropriate provider systems, Implementing appropriate purchaser systems, and Implementing an appropriate link between purchaser and provider systems—deal with these three crucial components.
Implementing appropriate provider systems

Provider systems exist in a variety of clinical venues, including hospitals, clinics, polyclinics, all the way down to small general practitioner offices. The priorities of provider systems are to improve operational efficiency within the clinical venue and to interface with purchaser systems. Of course, to transact the business of strategic purchasing, interoperability between provider and purchaser systems is mandatory—they must “talk to” each other.

Unfortunately, such interoperability is difficult because most of today’s provider systems are self-contained, stand-alone systems, limited to the venue itself. If low-income countries have them at all, they are likely to be old and to have outlived their usefulness. Designed decades ago, when priorities in health care focused on much simpler tasks (perhaps collecting some simple statistics for retrospective analysis), many of today’s “legacy” systems are remnants of a bygone era, offering few applications in the area of financing and resourcing—perhaps some simple billing or accounting. In all areas, more data visibility, authentication, and planning are required.

Recent versions of advanced provider systems emphasize electronic medical records, which attempt to replace the paper-based medical record with its electronic equivalent. The exact effect of electronic medical records is still far from clear. Provider systems with this capability are often still too expensive and invasive. Instead, systems that have some ability to house “clinical summaries” of certain crucial clinical data are likely to be more appropriate for low- and middle-income countries.

Several other modern requirements of provider systems are noteworthy, such as the ability to support budget control with an increasing emphasis on outcomes and performance; strengthened

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3 A polyclinic offers expert medical treatment both general and specialized as well as possibly psychiatric, dental, and other “nonmedical” specialties.
capacity for financial management, reporting, and accountability; enhanced practice marketing capabilities in a quest for new sources of funding; and a greater capability to enhance local financial control and management of business units (such as cardiology or the laboratory).

A superior provider system will offer all these, and while it might not be possible to afford this whole array of functionality at the beginning, these elements should be considered as potential future additions during the design of any HMIS.

Box 5.2 presents an overview of these objectives and functions, which are now discussed in greater detail.

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**Box 5.2 Provider system considerations**

**Objectives**
- Increase operational efficiency (reduce costs)
- Interface with purchaser system

**Functions**
- Unit-level information of provider systems (for inpatient stays and for outpatient visits)
- Patient registration and rostering
- Eligibility checking
- Appointment scheduling
- Claims/encounter creation
- Claims/encounter creation and submission
- Payment processing
- Contract monitoring and negotiating
- Business-unit management
- Inventory management
- Clinical functions

**Advanced functions**
- Lifelong electronic patient records
- Health passports
- Clinical practice guidelines
- Telemedicine and teleconsultation

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**Types of providers**

Providers may be classified according to their clinical function (providers operating in, for example, primary health clinics, polyclinics, employer-based clinics, school-based clinics, and hospitals). They may also include certain institutions (for example, the hospital, community pharmacy, or reference laboratory) that have contracts with the purchaser. Alternately, providers may be classified by their non-profit/for-profit market orientation (box 5.3), by their manner of ownership (individual/group, mission/charitable organization, employer-provided clinic), or by a combination of the two.
Box 5.3 Market orientation of providers

Non-profit providers include government-salaried providers, religious mission hospitals, health centers, clinics and dispensaries, family planning clinics, community health facilities, community pharmacies, and other non-governmental organization health care facilities.

For-profit providers include individual- and group-run clinics and hospitals, privately owned nursing homes, employer-provided clinics and pharmacies, and individual pharmacies or chemists, clinic laboratories, stores, shops, and traditional practitioners.

The exact organizational structure of providers and provider groups can vary widely, even among neighboring countries. Consider the situation in Africa, where health care services are sometimes in the public sector and sometimes in the private sector. In Zambia for example, the copper mining and other industries which own and operate their own health facilities are mostly government owned, although their health services often function independently of the government. In Kenya however, such employer-based services are most often found in the private sector.

The requirements of HMIS for each of these provider types are somewhat different depending on the specific implementation scenario, but not substantially. These requirements also vary somewhat according to the size of the clinical venue. Perhaps the most significant determinant of the requirements is the complexity of the contract that a provider has entered into with a purchaser. Some contracts require that very detailed information be transmitted to the purchaser, while others (such as those involving global capitation) require only very highly summarized information to be passed between the provider and purchaser. However, whether information provided is procedural (clinical), diagnostic, or “fee-for,” similar functions are required (as outlined in the next section).

Functions of provider systems

Just as the principal objective of a health system is to improve people’s health, the chief objective of the information system is to aid in the delivery of health care services by improving both clinical and operational efficiency.

Provider systems should offer both business and clinical functions. Business functions include eligibility checking, claims/encounter creation and submission, appointment scheduling, payment processing, contract monitoring, and business-unit management capabilities. Additional provider business solutions potentially are central budgetary control, improved financial management, and the creation of specific management tools fashioned for the specific type of clinical venue in which the system is implemented.

The rest of this section discusses the overall functions of a modern provider system, placing particular emphasis on the needs of strategic purchasing arrangements.

Unit-level information of provider systems

The first (and perhaps the most important) element of a provider system is standardized “unit-level” information (ULI) for each service provided. It cannot be stressed too often that standardization is vital if one is to be able to analyze the data later. Information should be consistently coded and it is
imperative that appropriate information be captured. Two elements must be balanced: on the one hand, information collection has an associated cost; on the other, the cost of collecting data later (if needed) may well be far higher than if all the needed data had been collected in the one pass.

Collecting the ULI is key when implementing HMIS since the ULI records become the core of communication between provider and purchaser. The ULI should include the following at a minimum:

For an inpatient stay. For each stay, the ULI is accumulated in a “stay abstract” (sometimes also referred to as a “discharge abstract” or “discharge summary”). Here services performed are enumerated (at some level of roll-up) along with admitting and discharge diagnoses, procedures, and stay information (such as length of stay, admitting department, medical service of stay, and disposition of the stay).

For an outpatient (hospital or clinic) visit. For each patient visit, an “encounter record” (or simply “encounter”) is the ULI that enumerates the event of a particular patient visiting a particular provider on a particular day. The outpatient ULI should include procedure codes as well as primary and secondary diagnosis codes (see box 5.10, Types of data standards, below). An encounter record can contain other data items including referral information, return-to-clinic designators, diagnostic tests ordered, and the like.

Patient registration

Of course, at the heart of a provider system is the ability to enumerate the patients seen in the practice. Patients can be entered as individual patients, or as families, depending on the nature of the practice (primary care clinics tend to care for “families” while specialist clinics tend to care for individual patients). Besides being the “key” to which the ULIs above are tied, the resultant patient list can serve as the practice’s roster of active patients and for whom capitation payments are due.

Eligibility checking

Eligibility checking is the ability of the HMIS to verify an individual patient’s benefits and coverage. It can be as simple as verifying coverage (“yes” or “no”); or as complex as noting the amount of coverage, type of coverage, the specific benefits offered, covered services, excluded services, copayments required, applicable deductibles (totals and remaining balances), and additional forms of insurance (coinsurance coverage).

With the introduction of an HMIS, eligibility checking becomes simplified for the provider. An adequate eligibility checking HMIS allows a provider to foresee and resolve issues with coverage before services are rendered. Costs related to non-covered services and individuals, many of which go unrecouped, can be avoided. Thus eligibility checking yields savings not only for providers, but also to the health system as a whole. Obviously, the provider wants to be assured of reimbursement and the HMIS can provide some reassurance that the eventual claim will be paid.

There are three main ways in which eligibility can be checked.

Option 1. The first, and most obvious, is through a direct online transaction between the provider system and the purchaser system. This requires good communication links, and is today usually done via the Internet. It is, however, still rather expensive in countries with a limited Internet service or where telecommunications costs are high, but it is usually the best way since it provides the most accurate, up-to-date coverage information. With this method, any change in coverage is immediately known.
Option 2. The purchaser provides periodic (monthly or possibly even daily) lists of eligible patients and their coverage. These can then be downloaded into the provider system and referenced by the provider system’s applications. This is usually less expensive but in this case, of course, the eligibility information is only current as of the time of the last download. (As a technical aside, these data between purchaser and provider can frequently be synchronized by employing “database replication” techniques.)

Option 3. The system “assumes” that the patient is covered up to a threshold amount (on the basis of presentation of an identity card) after which a phone call, a fax, or perhaps a secure e-mail message is required to the purchaser to provide assurance of further benefits. This is the cheapest and the simplest method to start with, but the costs of the manual intervention required can be high.

Of course, the whole usefulness of the result of the eligibility check depends on the underlying correctness of the patient identification process, since the services for that patient depend on his or her eligibility. Thus it is important to mount an effort to minimize patient identification errors. Box 5.4 provides an example of how one hospital deals with this issue.

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**Box 5.4 Patient identification in the eligibility checking process**

Each of the three mains ways for checking eligibility requires patient identification. In implementation of a health management information system (HMIS) at Lyndon B. Johnson Tropical Medical Center (LBJ TMC) in American Samoa, employing “forced registration,” the number of nonresidents registering in the system increased from 1.6 percent to 26 percent. LBJ TMC’s tariff structure at the time was $5 for residents and $10 for nonresidents. With 167,000 visits in 2002 the improved charge-capture added significantly to revenue.

The ability to prevent “identity fraud” and to later implement differential charges as opposed to a flat rate provided opportunities to improve charge capture and increase revenue. By eliminating the widespread practice of using other people’s hospital identity cards, the LBJ TMC HMIS improved the accuracy of hospital records. Previously, the medical records of a nonresident posing as a resident would be mixed up with those of the resident, posing a safety risk—among other outcomes, incorrect medications might be prescribed. Improved record keeping was a major benefit of the system. Prior to HMIS implementation, records were “loose-leaf” and medications were often missing from the patient chart.


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**Appointment scheduling**

Automatic appointment scheduling saves money and streamlines the patient flow. It greatly improves patient convenience (especially reduced waiting times), eliminates peaks and valleys from the workload of physicians, and provides the early entry point for information to be entered in the ULI, such as the patient’s chief complaint. It can reduce front-office costs by reducing manual processes and streamlining scheduling, thus enhancing profitability. In addition, by streamlining and regulating the workflow, it can enhance provider satisfaction by decreasing work overloads and minimizing workload turbulence.
There are many methods and systems used for appointment scheduling, including “wave scheduling” and “bulk scheduling” (sometimes called “grouping”), and their extensive variants. The algorithms can be easily located.¹ A sophisticated patient scheduling system accounts for average appointment times for various visit categories, such as new patients, established patients, follow-ups, emergent visits, referrals, and consultations. The many benefits of an automated system include the ability to view several days and weeks at a time using specific screening criteria and the ability to “block” and designate certain appointment types and times. These features often increase the scheduling staff’s accuracy and efficiency.

Appointment scheduling, coupled with eligibility checking, is important because, for new patients, the kernel of the new patient record originates here. The demographic information contained here is crucial because it will be carried forward, and any corruption in these data will be amplified many times over. Also, checking payments against the appointment schedule might minimize the chance that the submission of any claims is overlooked.

Claims and encounter creation and submission

Within a health care system, every hospital discharge (resulting from a confinement in hospital) and patient encounter (patient visit involving one patient and one health care provider on one date) should be documented. This succinct record can replace many (sometimes all) of the registries frequently found in manual systems for vertical programs (such as family planning or disease-specific registries).

Encounter documentation provides an ongoing brief proxy for the patient’s medical history. It may also serve to document the health care provider’s work or time record and thus be a proxy for provider productivity as well. The documentation provided for claims submission may be a subset of the clinical patient record created as a result of the encounter.

A “claim form” may be used to pass (on paper or, preferably, electronically) all (or part of) the encounter information to the purchaser. This claim form then becomes a demand for payment (in the case of fee-for-service models) or a record of utilization (in the case of prepaid or capitation arrangements). (See box 5.5.)

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¹ Vermeulen et al. (2007) presents one example.
Box 5.5 A brief primer on the trade-offs of fee-for-service versus capitation payments

Fee-for-service and capitation refer to different (and to some extent, competing) provider reimbursement approaches used in payment schemes of health insurance plans. There are many possible variants.

Fee-for-service

In fee-for-service schemes the health care provider is paid an amount based on the services it renders. It is reimbursed a share of medical bills incurred by the patient (who pays the fee for the service, subject to benefit limitations). The patient is responsible for any deductibles (also called the excess, that is, the amount that must be paid before the insurer begins to pay benefits), copayments (a set price paid for each medical benefit), or coinsurance (a shared percentage of the cost of medical care). After the patient has paid these, the purchaser pays for the rest up to a cap. There are sometimes two caps—a yearly cap and a lifetime cap. Normally, purchasers reduce the amount due by comparing the amount billed to the “usual, reasonable, and customary” charge for a certain procedure or diagnosis in a geographic area. The purchaser may choose not to pay more than this amount for a procedure. In the United States, the policyholder’s share is based on the reduced amount. In the Canadian system, fees are negotiated between the purchaser (provincial government) and the provider “union;” there is a set fee for each service, with little or no variation. European systems tend to have rate-setting mechanisms similar to Canada’s.

Usual, reasonable, and customary repricing provides some safeguard against physicians who may overcharge for procedures. With fee-for-service, providers are reimbursed for every eligible procedure they perform. In certain instances fee-for-service has been associated with health care providers rendering services which at times are excessive and unneeded, subjecting patients to unnecessary risks and raising the cost of medical care but favoring the provider financially. Additionally with fee-for-service, less attention has sometimes been given to determining which treatments produce the better outcomes relative to the costs involved. Societal issues, such as concern for the utilization of scarce resources, have also been infrequently evaluated.

Capitation

In capitation (or per capita) schemes the provider is paid a certain amount of money each month for each of its patients (sometimes called “rostered” patients) regardless of the volume of care delivered or the specific services performed. The amount paid per member may vary depending on the member’s age, sex, or other factors. Additional incentive payments may also be included to encourage physicians to provide services to certain populations, or to locate in certain areas. As the provider’s “pool” of members grows, capitation may become a better deal for the provider as the law of averages begins to take effect, as risk can be shared over a wider population base. Yet with a capitation plan, a provider may end up providing care beyond that covered by the capitation rate. For this reason certain “caps” may be placed on what the physician performs, and any additional services might yield additional payments from the purchaser.

Like fee-for-service, capitation can also be abused, since the system can inadvertently reward undertreatment. An ethical argument against this approach is that it rewards providers for providing less care and therefore may lead to a management philosophy that works against the best interests of the patient but financially favors the providers. It can also result in overreferral patterns, as providers attempt to “dump” their costlier patients on other risk bearers.

Managed care, a form of health care delivery system that covers health care costs in return for a premium, often employs a hybrid of fee-for-service and capitation. Each plan has its own network of providers and a single purchaser (the managed care entity). Premium costs and copayments for services vary between plans and are normally dependent on the situation (coverage, disease state, etc.) of the enrollee.
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With HMIS technologies, claim/encounter creation can be automated. Potentially, the health care provider can create an electronic encounter record during (or immediately after) the patient visit. Whether concurrent or retrospective, once the encounter information is in the HMIS, it may be submitted electronically or printed and submitted manually to the health care purchaser. It is best if the claim/encounter information flows directly from the provision of the service, and if it is “fed back” to the provider (or providers) who supplied the care. This feedback loop assures that the supplier of the information has some stake in the accuracy of the information being provided, and thus will likely be far more attentive to creating accurate information. (An example of what not to do can be found in box 5.6.) For example, when the patient is actually admitted, the same patient admission record in the hospital serves as the source of “date of admission,” “admitting diagnosis,” etc. If such information is created later, inaccuracies are bound to be introduced.

Box 5.6 An example regarding accuracy of diagnostic coding

The authors were asked to look at a startling statistic in one country. Data showed that the malaria rate had increased alarmingly. This was all more strange given that the country in question was not a tropical country and thus the population of malaria-bearing mosquitoes was likely nil.

After a fair amount of analysis, it was determined that a new “diagnosis code quick sheet” had been implemented giving providers an easy way to check off the appropriate diagnoses so as to avoid the laborious and daunting diagnosis coding task.

In the creation of these check-off boxes, it happened that “Malaria” was placed at the top of the list. So, the easiest action of the provider was merely to check off the first box on the sheet, and thus the incidence of malaria jumped.

If a feedback loop had been in place to the provider “Did you know that a high percentage of your patients were diagnosed with malaria last month?” certainly the anomaly would have been caught much sooner and the problem rectified.

[END BOX]

Automation within the claim/encounter creation and submission process streamlines provider systems. In manual, outdated systems, the steps for claim/encounter data input and submission may be laborious—or worse, they may be separated completely from the health care delivery process, with forms being created separately. This promotes transposition errors and other inaccuracies in the claims themselves.

In brief, claims must be standardized, must address the requirements of the purchaser, and must be submitted in a timely fashion. The HMIS must provide visibility and accountability throughout the payment process so that claims cannot become “lost” or “altered” along the way.
Receiving and posting payments

Claims processing results in the receipt of payments for either individual services (in a fee-for-service scheme) or a utilization credit against a standard capitation amount. Payments and payment types can vary greatly.

Fee-for-service. In fee-for-service, claims are generated for services performed and reported using a combination of procedure and diagnosis codes. Procedure codes allow payment for specific services rendered, such as a physician visit, laboratory examination (for example, X-ray or blood test), or other diagnostic test. Diagnosis codes allow for charges to be related to a patient’s illness. One potential pitfall with diagnosis code declaration is that there may be several illnesses, related or nonrelated, given the presence of comorbidities or contributing conditions. Which one is (or which ones) coded and thus billed for? This is not always easy to answer. Additionally, the physician may not establish a final, definitive diagnosis until examination results have been reviewed, after several patient visits, etc. So which “provisional” diagnosis codes should be declared?

Capitation payments. In this approach, claims are generated on a per encounter basis, but do not usually need to be as detailed as they are in fee-for-service billing because the actual payment does not directly relate to the specific services performed. Capitation implies that a payment, usually of a fixed amount, is sent to the provider each month (or perhaps each quarter) which may have little or no bearing on the services that were actually performed. While capitation billing is simpler than that for fee-for-service, many of the nuances of clinical information may be lost. Thus it may be difficult later to analyze the health status of the population using this stream of input.

Regardless of the nature of the strategic purchasing contract (fee-for-service, capitation, or some hybrid), accurately reconciling payment data as it is received from the purchaser is an important role of provider systems. These data can be entered as a line item against a patient’s account balance (“closed-item” billing) or as a payment against a specific service to a patient (“open-item” billing). Electronic payment processing can save even more money by reducing person-hours required for manual entry methods, reducing reject rates, and increasing cash flow (through reduced accounts receivable and decreased days-in-receivable). In many countries it is now a relatively simple matter to channel payments through an electronic payment clearinghouse directly to the provider’s bank account. This streamlined method may lead to fewer resubmissions and quicker processing time, which will reduce the number of claims in suspension (also known as provider accounts receivable). Resubmissions are particularly onerous, with the cost of resubmission frequently costing 10 times the original submission since it often requires significant staff time to research the problem, and manual intervention to resubmit the claim once the problem is “fixed.”

In general, electronic claim processing can also decrease billing errors and underpayments (that is, payments of a smaller amount than the amount due). Box 5.7 gives an example of what may be accomplished. Systems in low-income countries will likely not require the degree of complexity seen in the box, at least in the early years of implementing RAP schemes. But, as said earlier, planning now to have a two-way interchange between provider and purchaser is highly recommended.
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Box 5.7 Electronic claim processing in action

A good example of electronic claim processing is the Consolidated Copayment Processing Center Lockbox of the U.S. Department of Veterans Affairs (DVA). According to the Web site of the DVA Payment Processing Center, this system is “a secure way to automate medical payment processing.” Using a Web browser interface, the department can manage all billings and payments for medical services, make deposits, access online databases, and produce up-to-date reports.

The DVA’s electronic claim processing system contains many features that should be included in basic health management information system provider systems, including automated entering of payments in patient accounts; centralized payment collection; automated deposit processing; point-and-click navigation; an easy-to-use graphical interface; and dynamic report generation.


[END BOX]

Contract monitoring and negotiating

A strategic purchasing arrangement is, after all, a contract. The success of the contracting process will depend on how well both sides can negotiate a favorable contract, and how committed they are to abiding by its terms throughout the period of the contract. (See also chapter 4.) Both sides benefit if the provider remains financially viable and wants to take part in the insurance scheme. Without participating providers, the health care system does not work. The idea of health insurance is to purchase at the lowest possible price, but not to endanger the survivability of providers who are providing cost-effective and quality care.

The need for transparency in the contract monitoring and negotiation process is crucial. If either side feels that it is at a disadvantage in the negotiation, the environment will be filled with stress and difficulty and, potentially, animosity. It is imperative that each side can monitor how the agreed-on contract is performing. To do this, each side must have information on how well the contract has performed. Of course the more complex the terms of the contract, the more difficult its performance will be to monitor. This is one more reason that developing straightforward, simple contracts is an advantage.

In addition, the provider must know that the contract is fair, and that it is being applied consistently, while the purchaser must be assured that the information submitted is correct, and that mechanisms are in place to prevent fraudulent and irregular behavior, as well as accidental overbilling or double billing.

Providers need some way to determine whether the current contract terms are favorable to them, and whether there are reasons to attempt to renegotiate part of (or all) the contract at the time renegotiation falls due. At renegotiation, changes may range from changing the contract content, to revising the contract (with additions or exclusions), adjusting maximum risk levels (if financial-risk contracts are involved), and changing various other facets. Yet another option is that one party decides not to renew the contract at all, and withdraws from the strategic purchasing arrangement.

This information on what to renegotiate is important. International experience indicates that a provider who has poor data on costs and overheads in a new insurance environment can easily become financially unstable, or even fail, through lack of knowledge about the performance of its major contracts. This is another reason that HMIS, as a purveyor of timely information about the
performance of these contracts, can be so crucial to the ultimate success of a new strategic purchasing scheme.

**Management of business units**

HMIS must support management of resources at the business-unit level (such as cardiology or the laboratory). It is not a matter only of understanding the finances of the provider organization as a whole but rather being able to manage each of its units, or services. In a hospital this might mean knowing specifically how well the laboratory is performing, or knowing specifically how well a medical service is performing. In a clinic, it might mean knowing how well an individual physician is performing or how well a health care team is functioning together in meeting the terms of the strategic purchasing contract.

**Inventory management**

Health inventories must always be viewed as scarce resources. They must not be wasted, allowed to expire, or pilfered. Sophisticated inventory control tools are vital to tracking supplies, pharmaceuticals, and durable medical equipment (such as crutches, braces, and wheel-chairs). Minimal functions for an HMIS in this regard are as follows (Government of Bahrain 2001):

- Tracking the issuance of costly supply items—from the “central store” to the specific patients who received them
- Tracking the specific provider who ordered an item—allowing the profiling of provider ordering patterns and to flag potential overuse/misuse. This provides some degree of quality control, and allows for the monitoring of compliance with guidelines and protocols for item use
- Supporting a highly competitive tendering process, in which the purchase of supplies, pharmaceuticals and durable medical equipment is accomplished at the most competitive prices. (The frequent issuance of mini-requests for proposals will help stimulate a competitive bidding process.)
- Supporting accountability of items as they move through multilevel “stores” (that is, any holding place for a significant quantity of items)—from the central store, to multistores at the medical complex, stores at the business-unit level, and caches within a ward.

**Clinical functions**

The degree to which the provider’s HMIS will support clinical functions will depend, to a great extent, on the complexity and sophistication of the venue. It is generally a good idea to implement both financial and clinical functions together, and not wait many years before beginning to think about the clinical functions themselves.

Where to begin? Often the first clinical functions to be automated provide a way to place “orders” (or “requisitions”) for diagnostic services (laboratory, radiology) or for therapeutics (prescription systems, therapies, requests for surgical theater time, etc.) Besides placing “orders,” it is possible to automate the return of some diagnostic “results” as well, particularly those from the clinical laboratory.

Another area that has significant potential for automation is patient referrals (or “patient transfers”). Poorly performed in most countries, their cost represents a huge concern to any Ministry of Health. Providing some way to initiate referrals, and then to track them, is an important step. A serious problem with referrals is “losing” patients to higher-cost venues and never finding a way for the
patients to return to lower-cost venues once their acute episode has been resolved. For example, it is possible for a cardiology patient to be retained by the cardiology department, when his or her return to the primary care physician for follow-up and long-term monitoring might be far more effective in terms of both cost and quality.

**Advanced functions**

Provider systems can become very sophisticated. High-income countries have spent decades working on them, but even today much more needs to be accomplished. The following paragraphs present some of the future applications that are being contemplated, or in the early stages of development in high-income countries, and will likely become appropriate for low-income countries in the years to come.

**Lifelong electronic patient records.** Today’s electronic patient records attempt to totally eliminate the paper medical record; all data are digitized and made readily accessible in electronic form. The lifelong record, the next step, is considerably more comprehensive and challenging. Most current electronic patient records are housed in a single medical institution and therefore are in some sense captive to that institution. The lifelong electronic patient records of tomorrow will ideally track a patient from birth to death, across providers and across institutions. These are still largely a dream, but will certainly be realized one day (Pager, Streveler, and Quiroga 2007). The single biggest obstacle to reaching this dream is appointing a trusted information broker who can manage these comprehensive data and preserve the confidentiality and incorporate the required security. (For a historical perspective, showing efforts from 1956, see Collen 1995.)

**Health passports.** Some progress is being made in creating a “health passport,” sometimes using an optically or magnetically encoded card, or a card with embedded integrated circuits (the “smart card”). This passport (for example, Government of Bahrain 2001) is a simplified concept that contains some practical subset of the electronic patient record, including patient demographic information; significant allergies; health problems; current medications; recent encounters; hospitalizations; and significant operative and special procedures.

However, the health passport involves considerable issues of security (what if the card is lost?) and patient confidentiality (what if it is accessed by someone who is not authorized?) Proper use involves legislating appropriate safeguards and penalties regarding inappropriate, inadvertent, miscreant, and criminal use of patient data. When treating a patient, the physician should be able to easily retrieve relevant information from the health passport, such as health problems, medications, and recent encounters in order to provide appropriate care to the patient. Clinical practice guidelines (see just below) can then suggest appropriate treatments for the physician.

Health passports provide the physician with more complete, accurate, and up-to-date information, allowing for the provision of greater continuity of care given the ease with which information can be conveyed between venues. Additionally, providers have access to certain patient medical information, regardless of the availability of traditional paper charts and online telecommunications links. Medical providers and support staff also, potentially, have the ability to update the patient information that is contained in the health passport after the visit.

**Clinical practice guidelines and practice profiling.** Clinical practice guidelines help standardize treatment and minimize variation in treatment as new medical research evidence becomes available. (This concept is often referred to as practicing “evidence-based medicine.”) In order for these guidelines to be effective they need to be published throughout the medical care system. They can be distributed freely via the Web, or physicians can have access to them during treatment of a
patient via their provider system. One way to encourage compliance with clinical practice guidelines is to periodically issue “report cards” to providers showing each provider how well their practice complies with approved treatment practices—often referred to as “practice profiling.”

Telemedicine and teleconsultation. Telemedicine is “distance medicine.” It comes in many forms and modalities from simple asynchronous “store-and-forward” techniques (such as teleradiology applications in which images are sent to the reader via e-mail) to sophisticated real-time synchronous teleconsultation (for example, allowing the local physician to consult with a distant specialist via videoconferencing).

Telemedicine is becoming more common and widespread, as more countries attempt to rationalize their medical workforce over a greater distance and offer new services. The growth of telemedicine largely depends on two factors: the availability of cheap, reliable, high-speed telecommunications; and collaboration and cooperation as the social norm within the medical service. While technology can bring two caregivers together “virtually,” success of course also hangs on their willingness to be brought together professionally in dealing with the shared responsibility for the care of a patient.

Notes on costs and likely implementation times

How much should a provider system cost to acquire and implement? This is, of course, a question with few reliable answers. The answer is often “It depends…” But despite this unsatisfying, if true, answer, the following provides some guidance that is typical of the world’s experience.

Hospital information systems

The capital costs of hospital information systems, as a rule of thumb, are about $1,000 per bed for software and hardware—so roughly $100,000 for a 100-bed hospital, and possibly $1 million for a 1,000-bed hospital. In addition to these capital costs are the operating expenses, which may well be somewhere between 10 percent and 20 percent of the capital costs per year. They include standard maintenance and technology refresh costs, as well as ongoing training costs.

Of course these are imprecise estimates, but they may provide some idea of likely expenditures. They are given for 2008. Technology costs are likely to continue decreasing, while “people costs” may well increase, though in general the future trend of overall costs should be downward. So this simple formula will need to be recalibrated as time marches on.

It generally takes 12–18 months to install a full hospital information system. It can take less time, but it frequently takes a little (or even much) longer. Of course the world is also riddled with examples of failed implementations—usually caused by unreasonable expectations, lack of support by “champions” of the automation, or simply running out of money because of an unreasonable estimate of costs at the start of the project. The better managed and better organized a hospital is before it attempts to install a hospital information system, the easier it will be and the less time it will take.

Clinic information systems

Clinic information systems should cost somewhere between $40,000 (for a simple clinic of four physicians) and $150,000 (for an advanced polyclinic with radiology, laboratory, and other services). Clinic information systems projects generally take six to nine months to install.
Implementing appropriate purchaser systems

Introduction to health insurance

The budgeting and funding of health care services have a plethora of institutional approaches.

Health insurance types and organizational structures

There are few, if any, countries in the world today in which health care can be entirely self-funding. Rapidly increasing health care costs have forced a broad rethinking of how health care can be financed.

Health insurance has emerged as the typical vehicle to fund health care. Health insurance schemes may be categorized by type of insurance arrangement (private, social, and tax-based or aggregate) and by degree of insurance coverage (with consideration for population coverage and cost sharing). These may be put into the following matrix, which defines the health insurance schemes of most countries (figure 5.2).

Figure 5.2 Categorizing health insurance schemes

OECD defines three types of health insurance schemes:⁵

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⁵ http://www.pnhp.org/facts/international_health_systems.php.
- **Single-purchaser national health insurance systems (SPNHISs), that are publicly administered.** Most physicians are in private practice and hospitals are generally either publicly owned (through county councils or municipalities in the case of the Scandinavian countries), or non-profit enterprises, although the model itself does not preclude private ownership of health facilities. These systems provide universal service for all. OECD countries using this model include Canada, Denmark, Norway, and Sweden.

- **National health systems (NHSs)** are systems in which salaried physicians work in predominantly publicly owned and operated hospitals. NHSs consist of publicly owned and accountable hospital and community services funded from central taxation. Hospital doctors and nurses are salaried, and employed according to national terms and conditions of service. NHSs provide universal services for all. OECD countries with this model include Spain and the United Kingdom.

- **Multi-purchaser health insurance systems** (highly regulated, universal, multi-purchaser health insurance systems, or “all-purchaser” systems) have universal health insurance via sickness funds, which pay to physicians and hospitals uniform rates that are negotiated annually. OECD countries that have this model include France and Germany.

In addition, there are market models that allow more commercial forces within the health care system (figure 5.3).

**Figure 5.3 Categorizing types of purchasers**

![Diagram showing types of purchasers]

Whatever the type of purchaser chosen, there must be a strict division of duties and accountabilities between the purchaser and provider. For this reason, where to house the purchaser is frequently a major organizational and political question. The following are some choices.

**Ministry of Health.** This is usually a very poor choice, since it immediately violates the separation-of-duties principle—it is usually impossible for the ministry to be an effective advocate and manager of both the purchasing functions and the provider functions. In the early stages of implementing a strategic purchasing arrangement, it is probably acceptable for the health insurance agency to be housed here until the more advanced institutions can be developed.
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Ministry of Social Welfare. For many of the same reasons, this organizational arrangement is also problematic. Health insurance governance often becomes a minor duty in this ministry and does not get the attention it requires.

As an autonomous government agency. This appears to be a better choice, but results in an agency that can be very difficult to control politically. While the agency may be free of control of individual ministries, it may have little accountability to the legislative body or to the people.

As a semi-autonomous government agency. This is better yet. The agency has some autonomy to manage its affairs, separate from direct interference from (often) battling stakeholders, while still providing political accountability to the people. In this structure, the head of the agency is usually appointed (and can be fired) either by the prime minister or by the Minister of Health, but otherwise the agency enjoys considerable autonomy in managing its funds and resources.

As a private agency. Private health insurance is a success in some countries, and a disaster in others. Privatization of all, or part of, the health insurance scheme should be made in a deliberate fashion as it can dramatically change the complexion of future health care services and spending. In private health insurance schemes, the coverage can be compulsory and universal, or optional and discretionary. In the latter case, private health insurance companies in some countries have been able to “cherry pick” the healthiest (and usually wealthiest) patients while allowing the sickest (and usually poorest) patients to remain on public rolls. (This concept is sometimes referred to as “adverse selection.”) Such cherry picking can dramatically increase the government’s burden unless it is carefully regulated.

Functions of purchaser systems

The information technology needs of purchasers are generally more complex than those of providers, and certainly more costly. Systems maintenance cost is also high since these systems are subject to constant updates reflecting legislative and regulatory, clinical, and organizational changes, as well as management information system (MIS) technical changes.

Box 5.8 presents an overview of purchaser system considerations. The system’s functions are now discussed in greater detail.
Box 5.8 Purchaser system considerations

Health insurance types
Type of insurance arrangement
Private
Social
Tax-based
Degree of insurance coverage
Population coverage
Cost sharing
Capitation
Fee-for-service

Health insurance systems
Single-purchaser national health insurance systems
National health systems
Multi-purchaser health insurance systems

Functions
Registration and eligibility
Premium collection
Contracting and contract management
Claims adjudication
Support for provider payments
Utilization management
Quality assurance

The main functions of purchaser systems are: registration and eligibility, premium collection, contracting and contract management, claims adjudication, support for provider payments, utilization management, and quality assurance.

Registration and eligibility

Purchasers must maintain accurate records of their subscribers and provide accurate registration and eligibility data to providers serving their beneficiaries. This is not easy, because insurance rolls are extremely dynamic and constantly changing.

The registration and eligibility databases must be up-to-date, accurate, and open to participating providers. Essential data items within these databases include demographic information (name, age, sex, address); the benefit plan with specific coverage, copayments, limits, caps, and options; start date and end date of eligibility; referral network(s) to which the patient has access; information about unpaid deductibles; and premium rate and premium payment information (depending on the type of system, this may be a set amount per month based on family size and coverage, or an income-based calculation).

If there is more than one purchaser, it is highly desirable to design a common system and demographic database that supports registration and eligibility for all purchasers. This enormously simplifies both the provider systems and the workload of providers, since providers have to access only one site that acts as the point of reference for essential eligibility information in a region.
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Premium collection

Once beneficiaries are enumerated, either on a per-person or per-family basis, the purchaser’s principal responsibility is to collect the premiums for the insurance coverage from patients, (sometimes) employers, and (sometimes) social welfare agencies (of governments that pay the premium for those who cannot afford it).

The premium collection function of a modern purchaser system resembles that of any large enterprise’s accounts receivable system—it must bill, collect, and post revenues. It must track delinquencies (and “turn off” eligibility when appropriate). It must also report on its revenue production as part of its accountability to stakeholders.

Premium collection is not an easy function, and carrying it out can be extremely costly. This is because of the dynamic nature of insurance enrollment. For example: How many employees does a given employer have today? When was a baby born? Did a previously eligible teenager become ineligible on reaching a certain age? Cost of premium collection is also high because premiums can be collected at a variety of points, including lockboxes at banks, and satellite collection centers.

Besides the financial factors, there is always difficulty in deciding when beneficiaries are so delinquent that their health care benefits must be suspended. This can be an enormously contested decision—without health insurance where can a sick person go for treatment?

Contracting and contract management

The three major types of health care insurance contracts found in the European Union (EU), as an example, are, in order of increasing complexity:

- **Block contracts**—generally outline expectations and agreements between provider and purchaser
- **Cost and volume contracts**—specify broad volumes targets, types of case mix, and general payment levels
- **Cost per care contracts**—specify payment levels and processes for specific types of care and cases. (This method is also called case-mix reimbursement in some countries.) Specific coding systems for denoting cases have also been devised. The method adopted in many countries uses diagnosis-based case groups or diagnosis-related groups (DRGs).

Contracting must be orderly, accountable, and transparent to ensure an appropriate insurance scheme. It is highly recommended that one avoids the tendency toward ever-increasing contract complexity because it can create conflict and greatly increase administrative and legal costs. However, suitable safeguards should be included to prevent providers claiming reimbursement for services that are more expensive or complex than are appropriate. For example, rules are often set to determine when a general practitioner can bill a more expensive consultation, rather than a less costly office visit.

Contract templates should be created that are simple to use and can be replicated among providers. Information systems should be used to track and archive contracts and other information such as due dates and deliverables. Ideally, a contract could be negotiated between a provider and purchaser by merely “filling in the blanks” of a predesigned template. Any further complexity, exclusions, and inclusions can add enormously to the cost of adjudicating a contract.

Standards for contracting must be agreed on, including the contract template itself, the claim form(s), if any, that are to be used, the rules for submitting claims and other information, and the agreed-on time that the purchaser has to adjudicate the typical claim.
Finally, the contracting function should track these contracts, and provide easily retrievable information about their terms to both purchasers and providers. It should also provide a reminder as to when the contract is due to be renegotiated.

Claims adjudication

Some means of adjudicating incoming claims for services against the corresponding contract must be provided and is really the central duty of the purchaser’s system. Adjudication simply means deciding whether the claim is valid, and what the reimbursement should be for the claim. Adjudication systems can be relatively simple, doing little more than “counting” utilization, or they can be enormously complex affairs with rule-based engines that perform highly sophisticated scanning of each incoming claim for appropriateness and then deciding on a settlement based on the terms of the applicable contract(s). Adjudication can rarely be fully automated, so some small percentage of claims may have to be determined manually, even in the most advanced systems. The goal is to usually get the majority of small, simple claims paid as quickly (and cheaply) as possible so as to allow the purchaser to concentrate on complex, large, and more suspect claims.

To simplify adjudication, it is important to have a standard claim form for all claims to be submitted. It is usual to have one standard form for claims involving “institutional” fees (for hospitals and other institutions), and another for professional fees (for doctors and other health care professionals). The specifications of the information contained on the forms are crucial—they must be rich enough to include the information needed to run the adjudication process, but must not be so burdensome to the providers as to be overly costly to produce. (Providers often complain that they spend more time creating the form than they did delivering the associated health care!) Thus it is a delicate balancing act to develop such forms, whether they are paper-based or electronic.

Even in the case of providers being paid on a capitation basis, many systems require activity reports to be filed, both for financial management and quality assurance purposes. The content of these reports can vary from simple daily logs to individual submissions for each patient encounter. The approach chosen obviously has an impact on both provider and purchaser hardware and software requirements.

Finally, the use of major diagnostic categories and disease classification systems for provider payments generates additional issues. Major diagnostic categories include DRG-type systems for inpatients and ambulatory patient group-type systems for outpatients. Because the level of compensation is based on clinical factors, there is often a long delay between the provision of the service and the submission of the claim. Of course there is the normal time lag, resulting from the fact that claims are usually submitted only after patient discharge. In addition, the process of determining the appropriate disease classification code—such as the DRG and International Classification of Diseases (ICD)—and translating it into a suitable service, procedure, treatment, equipment, or billing code, current procedural terminology, or other code, takes time and requires clinical input, coding expertise, and sophisticated information systems.

Once the claim is received, equally sophisticated systems and expertise are needed for the purchaser to ensure that the coding is clinically consistent and to guard against “DRG creep” or “upcoding.” These two terms refer to the tendency of providers to use the coding system to claim more complex

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6 Current procedural terminology (CPT) is a uniform coding system for health care procedures that was developed and is copyrighted by the American Medical Association. Third-party payers have adopted the coding system that is used when submitting claims for health care. The most recently published codes are in CPT 2006. See www.ama.org.
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(and expensive) DRGs, even for relatively simple and straightforward procedures or cases. Without appropriate counterbalance, “gaming” can lead to deficits or even insolvency of the fund.

Support for provider payments
Timely and reconcilable payments to providers must contain readily identifiable information about the services (fee-for-service) or periods (capitation), so that the provider can verify that correct payments were received. The payments must flow in a timely manner, as specified by regulation or law. Payments can be provided via paper checks, or via electronic funds transfers. In either case, certain supporting documents that allow the provider to reconcile the payments in their accounting systems are important.

Utilization management
The purchaser must have a way of testing the appropriateness of services given, their adherence to any quality standards and guidelines, and, perhaps, concurrently intervene in the care of the patient. The last function, sometimes known as case management, is usually reserved for the most complex (and costly) cases. Purchasers also use their information systems to review patterns of practice across multiple providers (all general practitioners in a particular geographic area, for example) to identify outliers or those whose billing patterns or practices may be suspect. Where purchasers cover all inhabitants of a particular geographic area, they have the potential for developing population-based and small-area analyses to determine variations in factors such as surgical interventions, hospitalization rates, and complication and death rates. These analyses can then be used in direct discussions with providers, or as an input to future contract negotiations.

Quality assurance
This is the most difficult and challenging function. It is most desirable to find ways for the computer system to help assure quality. Unfortunately, the world has not ventured far in this area, partly due to inherent difficulty and partly due to political sensitivity.

Some countries are more tolerant on whether a physician who does not practice according to accepted standards is being artful or simply a bad physician. Few quality measures are universally agreed on. Those that are (that children should be vaccinated, that pregnant women should be given proper prenatal care, that certain screenings should be performed) account for only a small part of the health care services menu.

As low-income countries develop and refine accepted quality standards, based on clinical guidelines and protocols, it is the duty of HMIS professionals to incorporate them in the HMIS as much as possible, for only a computer will likely be able to track compliance with these standards adequately.

Notes on costs and likely implementation times
Purchaser-side systems are expensive. Even a modest one will cost upward of $1 million. These costs are high because such systems are often one of a kind, or nearly so, and they must incorporate many specific and unique requirements. (Provider systems in contrast are far more standard and can often be bought “off the shelf.”)

In settings with long experience of implementing purchaser-side systems, such as certain provinces of Canada, the overall investment has been in the tens of millions of (Canadian) dollars over several decades. Now it must be hoped that some of these settings’ experiences can be leapfrogged, and that
low- and middle-income countries might benefit from the current state of the art without having to reinvent it. Thus it might be expected that costs will decline as purchaser systems become better known and there are fewer conceptual models from which to choose. The tendency has been for each purchaser to devise its own scheme, which therefore requires a specific information system solution to be designed. The distant future may, though, bring more standardization, so allowing import and export of systems.

It is because of a lack of standard conceptual models that the technical capacity needed to design and develop purchaser-side systems is so high relative to that required for provider systems. (This means that the skill level required of the technical team to create purchaser systems is usually commensurately higher.) As noted above, the complexity of the reimbursement and contracting systems, as well as the desired degree of control and level of safeguards, will significantly affect the complexity and cost of the management information systems needed to support them. So it is important to consider these factors in the choice of the strategic purchasing scheme itself. A cost-benefit analysis is needed to determine if the extra investments will pay off in terms of increased effectiveness, control of health expenditures, or both.

Like provider-side systems, purchaser-side systems also have running costs of typically 10 percent to 20 percent of the capital investment cost per year. It often takes two or three years to design and build a moderately complex purchaser system and another one or two years to install it. It is hoped that these long development times will decrease in the future, because the cost and time required are serious barriers to the adoption of strategic purchasing arrangements in many countries, especially low-income countries where the need is often greatest.

**Implementing an appropriate link between purchaser and provider systems**

The true art of the HMIS professional is to fashion an appropriate link between the provider and purchaser systems, such as they were described earlier in this chapter. It is possible to have the best provider and purchaser systems in the world, but if they do not communicate in a reasonable way business costs will skyrocket and dissatisfaction with the systems, on the part of both provider and purchaser, will mount.

The skill here is to create an interface that allows easy transmission of data between the two sides, without upsetting the delicate balance of power that exists between them. Both sides need to be assured that the other cannot pry into its systems or otherwise have access to data that is going to give it an unfair advantage in future negotiations. This arms-length principle is at the heart of efforts to assure success of any strategic purchasing scheme and thus it must be fully reflected in the nature of the information systems that service the scheme.

The world offers many precedents for such collaboration in other industries, such as common clearing systems for transactions among highly competitive banking institutions, and common reservations systems among airlines that share services. But such mutually rewarding collaboration is rarely achieved in the health care industry. There is no consensus why this should be so—some observers stress the often imperious nature of both providers and purchasers, others point to the lack

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7 It is hoped that this chapter constitutes a small step in the direction of a standardized approach.
of business acumen and management capacity often present on both sides, while still others emphasize the depth of mutual distrust (given their different fiduciary responsibilities) between the parties. Whatever the reason, the HMIS professional must be aware of the sensitivity of this work.

Box 5.9 presents an overview of the link between purchaser and provider systems. The system functions are now discussed in greater detail.

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**Box 5.9 The link between purchaser and provider systems**

**Functionalities**
- Sharing of patient eligibility and rosters
- Transmission of claims to the purchaser
- Transmission back of anomalies and errors
- Transmission of payments from the provider to the purchaser
- Transmission of quality assurance data between provider and purchaser

**Implementation**
- Data mapping
- Networking and telecommunications
- Standards
- Clearinghouse

**Functionalities**
As a minimum, an appropriately robust interface will allow for:

- Sharing of patient eligibility data and rosters
- Transmission of claims to the purchaser from the provider in a standard format on a timely schedule
- Transmission back of anomalies and errors found in the claims (“edit errors”)
- Transmission of payments from the provider to the purchaser
- Transmission of quality assurance data between provider and purchaser.

**Notes on implementation**
The implementation of an appropriate interface requires a combination of data mapping skills as well as networking and telecommunications skills.

**Data mapping**
In an ideal world, each country would create a national health data dictionary that clearly defines the format (syntax) and meaning (semantics) of each data item relating to the insurance process. Ideally, all interchange formats would be completely standardized and thus no data mapping would be required. Unfortunately, this is not the case. Countries still struggle to create their national health data dictionary. One day perhaps, data mapping will no longer be needed, but that day is still some years (if not decades) away. Even the simplest fields may need some mapping. For example, patient names may be stored in different ways (last name first vs first name first), dates may be stored in
different ways (mm/dd/yy, dd/mm/yy, or dd/mm/yyyy). Given these simple examples one can imagine the more complex ones—how secondary diagnoses are recorded or how disposition codes are noted. These can require highly complicated, and often still inaccurate, mapping techniques.

Standards in the United States such as HL-7 (Health Level 7), and those in the EU such as the HISA (Health Information Systems Architecture) might help create some standardization (see box 5.10). But even these international standards are far from clear, offering various often-conflicting interpretations. So data mapping tools, as well as interface engines and “middleware” (translation software), are frequently required.

A national standardization body may also be needed to take existing international standards and determine which ones are going to be applied nationally, and how. This body could be an independent organization, a branch of the Ministry of Health, or something in between. It is often useful to have representation of health care providers, the Ministry of Health, insurers, and HMIS suppliers on such a body, to ensure that the resulting standards are acceptable to all parties. Once standards are agreed on and widely accepted, only those systems compliant with the standards should be used.

In Canada some provinces certify systems to be compliant with their data standards and these systems can therefore be “plugged into” the insurance network. By allowing different (compliant) systems to be marketed, this approach promotes competition among HMIS suppliers, and relieves the Ministry of Health and the insurers (or both) of the responsibility for specifying or providing a unitary solution for health care providers. It thus ensures that provider and purchaser systems can talk to each other.

Networking and telecommunications

The exact communications protocols to be used (electronic data interchange, Web-based transactions, offline media) will depend largely on the availability and cost of each. With the ubiquity of the Internet today, a data communications protocol using XML (extensible markup language) might be the best choice in most cases, since it is cheap, reliable, and increasingly well understood among the world’s technologists. However, since electronic data interchange is still the most common means of moving financial and bank-related data around the world, it is also well known and quite secure. In the most remote of locations, mailing diskettes (with a copy made before mailing, since diskettes can be notoriously unreliable) or other media (such as memory sticks or CDs) may be the only practical and affordable method in low-income countries.
Box 5.10 Types of data standards

Data exchange involves many layers of standards. Broadly, health management information systems should meet technical, medical, administrative, and policy standards. The choice is normally dictated by the needs of the system and, to some extent, politics. There may be de facto standards for various communities, or officially recognized national or international standards. There are, especially globally, many different and competing standards. This of course leads to confusion, fragmentation, obsolescence, and duplication of effort.

**Technical standards.** There is a plethora of technical architecture standards, protocol standards, and other mechanisms necessary for exchanging information, internetworking, portability, and reusability. From the technical standpoint, the main bodies concerned in one way or another with computing standards are the IAB, ISO, ANSI, ECMA, IEEE, OSF, and W3C. Electronic data interchange (EDI), extensible markup language (XML), Health Level 7 (HL-7), and Health Information Systems Architecture (HISA) are other terms to be aware of, while specific standards for medical equipment (ISO, IEEE) should be peripherally considered when HMIS is developed.

**Medical standards (external quality assessment).** While many quality assessment protocols exist, few are as comprehensive and well organized as those in Canada. The Canada Medical Act (1952) establishes five principles of public health insurance: universality, accessibility, portability, comprehensiveness, and public administration. It addresses health care performance indicators of timeliness, quality, sustainability, health status, and wellness. Within quality indicators, the Canada Medical Act refers to the measurement of quality of health care services across the country, including patient safety, patient satisfaction, and health outcomes. In the United States, whose history of health care accreditation is often used as a model around the world, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) establishes medical standards. JCAHO standards represent United States consensus on quality patient care that reflects changing health care practices and health care delivery trends.

**Administrative standards.** When implementing a health management information system, there is information to be exchanged between systems that is more “administrative” than clinical in focus, although one might clearly argue that this distinction is far from clear. Such information mainly relates to diagnosis codes and procedure codes. Major diagnostic categories codify the appropriate disease classification code and translate it into a suitable service, procedure, treatment, equipment, and/or billing code(s), such as current procedural terminology or other code. Major diagnostic categories include disease classification systems, for example, diagnosis-related group-type systems and the International Classification of Diseases (ICD-10) for inpatients, and ambulatory payment classification for outpatients. These are internationally defined standards. There is more than one classification system from which to choose.

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8 Many of the technical terms in this section, as well as the acronyms and abbreviations, are listed in the Free On-line Dictionary of Computing (FOLDOC) at http://foldoc.org.
9 For more information see http://www.jcaho.org.
10 The International Classification of Diseases (current version ICD-10, with 2007 updates) classifies diseases and injuries. Conditions are grouped in a way felt to be most suitable for general epidemiological purposes and the evaluation of health care. ICD is a system developed collaboratively between the World Health Organization (WHO) and 10 international centers so that medical terms can be grouped together for statistical purposes. The aim of the ICD and of WHO sponsorship is to promote international comparability in the collection, classification, processing, and presentation of mortality statistics. These codes are available online at: www.who.int/classifications/apps/icd/icd10online/.
Policy standards. Health care policy, such as national considerations on the amount of privacy and confidentiality a patient has as they relate to public health considerations, has been passed into law in most high-income countries. In the United States, this legislation is known as the United States Health Insurance Portability and Accountability Act of 1996 (HIPAA). HIPAA can serve as a potential guideline for countries wishing to provide electronic communications with regard to delivery and payment of health care services and to the security and confidentiality of individually identifiable, protected health information. HIPAA is intended to provide improved portability and continuity of coverage, as well as administrative simplification (reducing costs and inefficiencies through standardization and EDI). The exact impact of HIPAA in the United States is not totally clear. Some say the law has led to an increase in paranoia (fearing severe punishment) and thus has a detrimental effect in promoting electronic communications between purchaser and providers, while others forcefully argue that the law does not go far enough in plugging all the leaks that could potentially compromise the confidentiality of patient-identified health data. Alternatively, such countries as Australia, Canada, and New Zealand have such standards, and may also serve as the basis for developing a standard.

A health insurance clearinghouse?

The question remains how the data are going to be moved between provider and purchaser, and whether there needs to be a way-station (a “clearinghouse”) between the two.

Rather than using point-to-point transmission of data between providers and purchasers, which requires many costly connections between the two sides (figure 5.4), it might be more effective to implement a “star network” where all communications flow to, and are routed from, a single point (figure 5.5). Such a clearinghouse can potentially save considerable communications costs since each party needs to communicate only with a single point.

Figure 5.4 Point-to-point transmission of data

Source: Authors.

11 The Australian equivalents to HIPAA are the Information Privacy Act (2000) and the Health Records Act (2001).
12 The Canadian HIPAA equivalents are the Privacy Act, which governs the personal information practices of Canadian (federal) government institutions, and the Personal Information Protection and Electronic Documents Act, which applies to the Canadian private sector.
If the data are stored at a central point, this becomes a central data repository, and the information can become an enormous asset, since it allows the analysis of health data collected from the insurance process in a single format and accessible at a single site.

While in theory this is a good idea, political unease over such centralized data access can cause some discomfort among stakeholders. The success of such a scheme depends largely on the willingness of parties to collaborate while maintaining their own proprietary interests at arm’s length from one another.

If agreements about data storage are too difficult to reach, the data need not be stored at the central site, but merely cached and routed (via a switch) in which case the political hurdles are somewhat lower. But this simplified approach can still cause some concern among competing interests because even here there can be mistrust if parties perceive an opportunity for abuse and misuse of the data as they flow through the single point. Therefore, when setting out to implement a star network, it is important not only to look at its technical feasibility (it almost always is) but also at the political realities of the myriad stakeholders involved. Clearinghouses are worth pursuing, despite the difficulties, because considerable streamlining and cost savings can be achieved. For this reason information portals using star networks will likely become more common in the future.

**Concluding remarks**

An HMIS offers to strategic purchasing arrangements in particular, and health insurance schemes in general, the ability to streamline business processes related to operations and finance, to standardize the quality of care provided, and to monitor clinical practice guidelines for evaluation and diagnosis. In designing, launching, operating, and maintaining any HMIS project, the following factors may affect the ability to realize the maximum potential gain. They present inherent risks, and require proactive managerial attention.

*Disparate systems.* Using disparate computer systems running different operating systems, database engines, and programming languages can cause and exacerbate interoperability and incompatibility issues and result in a project of greater size and complexity than needed. A larger systems perspective is required to analyze and resolve these issues as they occur.
Ease of access. An HMIS enables easy access to clinical history and other important information. It can enhance the coordination of patient care, but creates issues of user support and security, as well as patient confidentiality.

End-user acceptance. Not all systems have been able to meet end-user criteria and many have resulted in less than optimal usage, for various systems, organizational, and individual variations. The fact that a system “works” in one place is no guarantee that it will in another. The key to assure end-user acceptance appears to be that the HMIS professionals involved have an understanding of how the system will fit into the professional lives and duties of the users. Do users imagine the system as a help or as a hindrance? Do they view it as an opportunity to streamline their work or does it create “double-work” for them? Do they believe the system will enhance their professional standing and help them do a better job or does the system seem to “fight” them at every turn? The key is to ensure that, to the extent possible, data collection is integrated into clinical processes and workflows, and that it provides added value to each step of their (clinical and administrative) decision-making processes.

Knowledge base. HMIS should provide increased contact between specialists and multidisciplinary experts that should directly result in increased knowledge. As the human knowledge base exponentially grows, issues of support will also surely grow.

Management overconfidence. Management should be aware of the tendency to overstate or overemphasize achievements while understating problems. It is, however, equally detrimental to view the system too pessimistically and make purely financial decisions without considering qualitative benefits. It is important to present unbiased objective costs and benefits, both quantitative and qualitative.

Security and confidentiality issues. Transmission of patient data over the Internet and storage on computers accessible from the Internet have inherent security risks. Encryption and other techniques can lower that risk. Patient confidentiality is emerging as a significant issue around the world. For example, how does one make patient data available to appropriate providers without sacrificing the human desire for confidentiality and privacy? While many laws have been passed to address this issue (see box 5.10 above), this important issue remains largely unresolved. The balance between providing easy accessibility of information yet safeguarding patient privacy remains a vexing challenge.

Systems reliability. When people adopt a technology, they must accept the fact that no system is completely failsafe. Occasionally, what a user experiences as a lack of system reliability is, in fact, a result of human error. Computer downtime can hit users’ confidence in the system, just as power outages can be frustrating. When designing an HMIS, one must always remember that it is being designed for the health care environment, which can only tolerate only the most minimum downtime.

Sustainability. Finally, the single biggest threat to success in implementing HMIS is a lack of planning for long-term sustainability. Many systems efforts have failed for lack of proper planning. Systems are, in some sense, living ideas that need constant attention, and HMIS projects are never really finished. HMIS capital costs are never fully amortized, and running costs must be appropriately managed and budgeted for. HMIS capacity-building and retraining efforts must continue indefinitely.

Even with all these caveats and warnings, HMIS is worth building. In fact, using HMIS is really the only way to implement a modern strategic purchasing protocol. Just as one cannot run a modern
airline, bank, or other commercial enterprise without computerization, so is it impossible to implement a modern health care system without it. HMIS is an integral part of today’s health care environment.
Annex 5.1
A primer on health management information systems

While the focus of this chapter has been the relationship between health insurance, resource allocation and purchasing, strategic purchasing, and health management information systems (HMISs), it is important to understand HMIS in a wider strategic context. A long-term perspective will be helpful in optimizing investments in HMIS and focusing on those benefits that are particularly important in a specific environment. 13

An HMIS consists of applications in seven areas (table A5.1). These can be further categorized into systems that are related to clinical processes, financial processes, and processes improving and assuring high levels of quality.

<table>
<thead>
<tr>
<th>Table A5.1 Seven areas of applications</th>
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</thead>
<tbody>
<tr>
<td>Clinically related systems</td>
</tr>
<tr>
<td>1. Patient care management</td>
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<tr>
<td>Systems that aid the clinical care management of individual patients:</td>
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<tr>
<td>- Hospital information systems</td>
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<tr>
<td>- Clinic information systems</td>
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<tr>
<td>- Laboratory information systems</td>
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<td>- Radiology information systems</td>
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<td>- Pharmacy information systems</td>
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<tr>
<td>- Electronic medical records</td>
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<tr>
<td>- Computerized physician order entry</td>
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<tr>
<td>- Telemedicine, teleconsultation</td>
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<tr>
<td>2. Population management</td>
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<tr>
<td>Systems that concern themselves with the clinical care of the population as a whole:</td>
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<tr>
<td>- Routine surveillance systems</td>
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<td>- Signal and emergency surveillance systems</td>
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<td>- Vital statistics</td>
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<tr>
<td>- Environmental control</td>
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<tr>
<td>- Health indicators tracking</td>
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<tr>
<td>- Health information and health education aids</td>
</tr>
<tr>
<td>- Retrospective data analysis and epidemiology</td>
</tr>
<tr>
<td>- Annual health statistical reporting</td>
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<tr>
<td>3. Disease state management</td>
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<tr>
<td>Systems that aid the clinical management of subpopulations of patients who are diagnosed with a particular disease and/or disease state:</td>
</tr>
<tr>
<td>- Patient registries (such as cancer, diabetes, cardiovascular)</td>
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<tr>
<td>- Intervention tracking systems (for example, when is the patient due for her Hemoglobin A1C test?)</td>
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<tr>
<td>- Case management</td>
</tr>
</tbody>
</table>

13 This annex is a summary of a full taxonomy taken from Streveler et al. (2006). The full taxonomy is available from the lead author of this chapter.
## Finance-related systems

4. **Scarce resource management**

Systems that plan, procure, and track precious health resources:
- Health human resource systems (track personnel and skills)
- Facilities management systems (track buildings and venues)
- Biomedical equipment inventory tracking (equipment, supplies, maintenance, calibration)
- Pharmaceutical inventory control systems
- Central supplies inventory control
- Health planning systems (such as new venues and new services)

5. **Utilization management**

Systems that monitor patterns in health service utilization:
- Inpatient bed tracking and occupancy reporting
- Outpatient visit utilization
- Utilization rates (such as physicians, services, facilities)

6. **Financial management**

Systems that track finances:
- Budgeting systems
- Accounting systems (general ledger, national health accounts, payables, receivables)
- Cost-accounting systems
- Financial analysis systems
- Health insurance finance systems

## Quality-related systems

7. **Quality management**

Systems that track quality indicators and concern themselves with improvement in quality of health service delivery:
- Clinical guideline and protocol management
- Infection control
- Medical error incidence reporting
- Biomedical equipment inventory tracking (equipment, supplies, maintenance, calibration)
- Health outcomes measures
- Patient satisfaction survey analysis
- Physician profiling and report cards

While this discussion is necessarily brief, it does point out the richness of opportunities for implementing HMIS overall.
The health insurance and resource allocation and purchasing applications discussed in this chapter represent a small subset of systems that can help the modern health environment streamline its clinical and financial processes.

**What are the benefits from an investment in HMIS?**

Is it reasonable to expect a return on investment from these systems?

While performing cost-benefit analysis is well known in the business world, its application to issues of health is fraught with difficulties, and as a result the health industry shies away from attempting to apply reasonable care in examining these questions. These difficulties arise largely because of the difficulty of monetizing so many of the concepts in health care delivery: How much is saving a life worth? How much does preventing a post-operative infection save the purchaser (and the patient)? Other industries have been far more proactive in attempting these important, if macabre, calculations.

Benefits from implementing HMIS accrue most significantly through an identification of operational areas where efficiency has been improved. Health delivery today is still a very inefficient enterprise. It has not yet benefited from the huge productivity improvements that other industries have enjoyed as they computerized. In a positive light, this means that the industry still has the opportunity to save huge amounts of money—and to answer the above question, cost savings can more than offset the substantial cost of the HMIS itself.

Some examples of where operational efficiency can be gleaned are:

- Reduction in waste due to mismanaged, lost, or expired pharmaceuticals
- Reduction in unnecessary, repeated, or otherwise improperly timed diagnostic testing
- Underutilization of hospital beds in some locations
- Underutilization of expensive equipment, operating theater time, etc.
- Poor scheduling of health events (such as diagnostic tests or surgery) so as to minimize the length of the overall hospital stay
- Improved health care staffing models, including better use of staff hours with less need to spend time on paperwork
- Less dependence on paper, potentially resulting in savings.

Many more such examples abound. These few simply aim to target the mind to look at operational efficiency more critically, and thus to open the opportunity to find huge cost savings in all environments. In a world where every health care dollar, yen, euro, peso, and riyal must be marshaled to provided the most efficient care possible, HMIS can be a crucial ally.

Examining the “softer” cost savings (those more difficult to quantify) that can accrue is a challenge, but it is possible. Basic improvements to the clinical environment include: integration among health care providers (or decrease in fragmentation among health care providers); software applications to aid in the clinical decision-making process; shortcuts that, with proper security, provide access to essential health data, eligibility data, and disease surveillance data; epidemiological profiling; and ad hoc reporting for clinical research purposes.

Examples of softer cost savings are:

- Improvements in patient identification—Who is the patient? Is it the correct patient?
- Reduction of medical errors—Can HMIS minimize drug-drug adverse effects?
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- Reduction in medical practice variation—Physicians are far more likely to follow clinical practice guidelines if they are made available to them at the moment of clinical decision making
- Improvements in chronic care management—Did the patient follow the appropriate follow-up regimen and thus avoid an expensive intervention later?
- Improvements in referral efficiency—Can a patient be moved from one venue to another more appropriately?
- Reduction in fraud—Can “game playing” patterns be identified?

This list of course addresses only some possible soft cost savings. Creating estimates of these savings can be tricky but surely cannot be ignored since soft cost savings can represent far more than one half of the potential total savings.

Besides looking at hard and soft savings in this way, another approach can help identify areas where HMIS might be most profitably applied, along four axes of health care improvement (table A5.2):

Table A5.2 Four axes of health care improvement

<table>
<thead>
<tr>
<th>Axis</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Access</td>
<td>How can access to health information, health venues, and health services be improved?</td>
</tr>
<tr>
<td>2. Equity</td>
<td>Is health care provision equitable? Are services available to the “right” people at the “right” time?</td>
</tr>
<tr>
<td>3. Efficiency</td>
<td>Where is waste? How can it be eliminated or minimized?</td>
</tr>
<tr>
<td>4. Quality</td>
<td>Where do procedural failures lead to reductions in quality? How can they be monitored? How can caregivers be sensitized to the negative impacts of these imperfect procedures on outcomes and costs?</td>
</tr>
</tbody>
</table>

Critical success factors for HMIS projects

This annex ends with a discussion of issues whose resolution, by the HMIS manager and/or the HMIS developer, is key to the success of any HMIS project. Sadly, many HMIS projects fail. Failure can often be spectacular, resulting in substantial loss of investment and time as well as dashed expectations.

The following seven key tips may help assure a project’s success:

Plan for sustainability. It is not enough to budget for system procurement (or development) and for implementation costs. HMIS must be nurtured over the long term. Ongoing training will be needed as personnel enter and exit the health workforce. Hardware will need attention, including maintenance, cleaning, and upgrades. Software will constantly be upgraded as well, with virus protection, operating system fixes, and so forth.

Identify the champions. Health care’s social fabric is notoriously resistant to change, but it is inevitable that HMIS will precipitate significant change. Without the identification of champions who can shepherd others, change itself can become a serious risk. Users must willingly embrace change. It cannot be forced on them, and authoritarianism is rarely successful. The users themselves must realize that the change is needed, and that it will benefit them.

Open a help desk. Another way to allay fear of change is to build a responsive help-desk facility, which can respond to the panic call “What do I do now?” If users know that there is someone who
will answer their questions quickly, and non-judgmentally, they will feel more adventurous and comfortable.

Solicit users’ opinions and suggestions. It is the user who has the most experience using the system. With proper probing, users often are reservoirs of good ideas and suggestions for improvement. They also know what irritates them, or what does not fit their “mental model” of the process they are performing.

Consider how best to implement HMIS—build or buy? Outsourcing is now common. Since most health agencies have little technical capacity in HMIS, it is often wise to turn over the building of the HMIS to a firm that specializes in this work, or to buy the HMIS off the shelf and then perhaps modify it. But even if the work is outsourced, it is not a good idea to delegate the oversight of the project to an outside body. An HMIS is critical, sensitive, and costly, requiring active oversight and governance.

Understand that all HMISs are not created equal. There are good ones and there are poor ones. Their attributes, such as quality, reliability, comprehensiveness, upgradability, and maintainability, vary hugely. Even good ones may not fit a given environment: that they work in one place is no assurance that they will work in another. In addition, there is not necessarily a correlation between how much an HMIS costs and how good it is. Sometimes the cheaper HMIS will be far better, given its simplicity and ease of maintenance. It is the HMIS manager’s responsibility to examine the options carefully and to be assured that the HMIS is appropriate for the environment, goals, and budget.

Create an HMIS master plan. Where to start? The world is now beginning to seriously focus on the arduous process of automating its health services. HMIS projects are large and complex. Like any large construction project, a plan is needed to oversee how the whole “puzzle” will fit together. Work will no doubt span many years, different administrations, and changing priorities. It is important to have a master plan for orchestrating the HMIS-related pieces and maximizing the synergy between them.

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