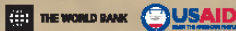# Designing and Implementing Health Care Provider Payment Systems How-To Manuals

EDITED BY JOHN C. LANGENBRUNNER, CHERYL CASHIN, AND SHEILA O'DOUGHERTY

Summary for web of chapter 5, pp. 263–306*

Strategic purchasing of health services involves a continuous search for the best ways to maximize health system performance by deciding which interventions should be purchased, from whom they should be purchased, and how to pay for them. In such an arrangement, the passive cashier is replaced by an intelligent purchaser that can focus scarce resources on existing and emerging priorities rather than continuing entrenched historical spending patterns. Having experimented with different ways of paying providers of health care services, countries increasingly want to know not only what to do when paying providers, but also how to do it, particularly how to design, manage, and implement the transition from current to reformed systems, and this how-to manual addresses this need.

The book has chapters on three of the most effective provider payment systems: primary care per capita (capitation) payment, case-based hospital payment, and hospital global budgets. It also includes a primer on a second policy lever used by purchasers, namely, contracting. This primer can be especially useful with one provider payment method: hospital global budgets. The volume's final chapter provides an outline for designing, launching, and running a health management information system, as well as the necessary infrastructure for strategic purchasing.

* This summary was written by Dennis J. Streveler, Medical Informatics, University of Hawaii.

Health Management Information Systems (HMIS): Linking Payers and Providers (A 2009 Update)

SUMMARY BY DENNIS J. STREVELER*

2009 Update

Developments in HMIS (Health Management Information Systems) continue to move at a rapid pace. This paper is a summary of and an update on the corresponding book chapter (Chapter 5) in the book "Designing and Implementing Health Care Provider Payment Systems."

The opportunities which computerization offer those designing and implementing provider payment systems continue to increase given:

- the continuing deflation of most costs of information technology.
- the increase in the world's political economy to understand and support computer systems.
- the emergence and near-ubiquity of communications technologies, especially those related to the mobile phone.
- the break-neck speed at which the world is being wired for Internet access coupled with a new understanding of the possible uses in healthcare applications of "cloud computing."
- an emerging understanding that it is *impossible* to implement a modern healthcare finance scheme without employing a modern information system to organize, manage and sustain it!
- the emergence of some open-source healthcare applications which may portend an avalanche of such systems over the next few years. If this occurs, downward cost pressure on proprietary systems will likely occur.
- other developments in healthcare computing—especially those regarding the many Electronic Health Record (EMR) initiatives and Telemedicine initiatives which are underway in the world—have sparked renewed and heightened interest in the health sector of many countries to harness the power of the computer to improve health outcomes.

* Chapter 5 authors; Dennis J. Streveler and Sheila M. Sherlock

This is not to say that we don't continue to face many challenges:

- supporting, maintaining and continuous training of information systems are often badly managed, leading to outages, failures and dashed expectations of reliability and robustness
- computer systems in healthcare, especially the PMIS (payer management information systems), remain among the world's most complex, and among those most difficult to buy "off-the-shelf" given the vagaries and individuality of each nation's health finance scheme
- reliability of communications channels and Internet connections are often imagined to be much higher than they turn out to be, even in major capital cities and large urban areas.

Introducing the Social Context and Goals

More and more health managers in low- and middle-income economies are being required to exert greater managerial control over healthcare efficiency and quality by forging new strategic purchasing relationships between purchasers and providers of healthcare services. 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.

When countries are faced with severe budgetary constraints, healthcare expenditures are often the first victim. In recent decades, healthcare 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 healthcare services to the population.

Specifically, the goals of your HMIS should be to:

- Improve *access* to appropriate information for decision-making within the health sector
- Improve *access* to health services for all people
- Improve *equity* in the allocation and distribution of health inputs
- Improve *productivity* of all health workers
- Improve *cost-efficiency* and reduction in waste and corruption
- Improve appropriate *utilization* of healthcare resources
- Improve *quality* of care
- Ultimately to lead to an improvement in *health outcomes*!

Introducing Technology and Foundational Activities

The main advantage of computing technologies is their ability to systematize and, hopefully, streamline business processes, 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 which can engender a transparency and trust among the stakeholders which, frequently, have been in conflict.

Before one begins the task of introducing specific provider and payer information systems, certain foundational work must be done to support them:

- a *Health Data Dictionary* and data model (HDD) must be completed which provides common definitions, common coding systems, common (paper and electronic) "forms" and other common artifacts which will be need to provide the "common language" for systems to "talk to one another."
- the policy and political system must have defined what the *health financing scheme* will be, and the *provider payment method*(s) which will be used.
- responsibilities for activities of shared interest, such as accreditation/licensing, utilization management and quality management must be negotiated among the various stakeholders so that the responsibilities of each are clear.

The Three Components of HMIS

Three components of the HMIS are needed—information systems for providers, information systems for payers, and finally, but importantly, electronic links between the two:

The HMIS Environment

Provider System ← System Interface → Payer System
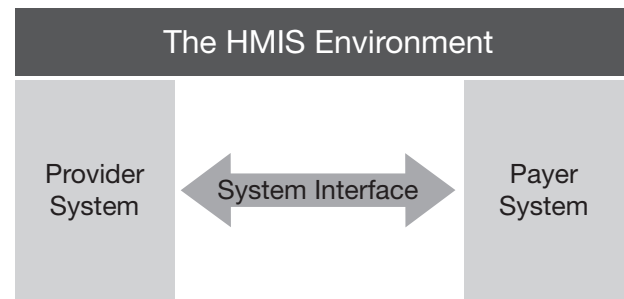
The coordination, harmonization and integration of these three components are crucial to the long-term success of your HMIS. If any one of them becomes seriously delayed, deficient or uncoordinated, the longer term hoped-for synergy among them will be severely diminished.

IMPLEMENTING APPROPRIATE PROVIDER INFORMATION SYSTEMS

Provider systems may exist in a variety of clinical venues, including hospitals, clinics, polyclinics, all the way down to the smallest rural health centers. The priorities of provider systems are to improve operational efficiency within the clinical venue and to interface with payer systems. Provider systems provide these functions:

- Functions
  - Unit-level collection of information (from 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

Functions of Provider Information Systems

Just as the principal objective of a health system is to improve

people's health, the chief objective of the provider information system is to aid in the delivery of healthcare 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.

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.

For an inpatient stay: For each stay, a "stay abstract" (sometimes also referred to as a "discharge abstract" or "discharge summary") is collected.

For an outpatient (hospital or clinic) visit: For each patient visit, an "encounter record" (or simply an "encounter") is collected that enumerates the event of a particular patient visiting a particular provider on a particular day.

PATIENT REGISTRATION AND ROSTERING

At the heart of a provider system is its 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 (co-insurance coverage).

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 overload and minimizing workload turbulence.

CLAIMS AND ENCOUNTER CREATION AND SUBMISSION

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).

The exact nature of the claim, and the content of the claim, will depend on the provider payment method(s) being used, as shown in Table 1.

Claim/encounter creation can be automated. Potentially, the healthcare 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 healthcare purchaser.

RECEIVING AND POSTING PAYMENTS

Claims processing results in the receipt of payments for either individual services (in a fee-for-service scheme) or utilization credit against a standard capitation amount. Payments and payment types can vary greatly, including fee-for-service payments, capitation payments, "package" payments, per-diem payments, case-rate payments, DRG (Diagnosis Related Group) payments and more!

CONTRACT MONITORING AND NEGOTIATING

A strategic purchasing arrangement is, after all, a contract. The success of the contracting process will depend on

Table 1. Provider payment methods and claim content

Payment method	Claim content
Capitation	A "claim" may consist of a roster of patients for whom monthly ("per member, per month" or "PMPM") capitation payments are due
Fee-for-service	A claim will include a (detailed) itemization of the services which were performed, and often a "reason" for doing those services.
Per diem payments	A simple claim itemizes only the number of inpatient days spent at each level of care (observation, long-term, general medical, general surgical, ICU).
Case-rate payments	A claim includes only a categorization of the case-rate being billed (usually this is simplified to categories such as "cardiovascular event", "simple surgery", "intermediate surgery"…)
DRG-based payments	Based on historical split and review to reflect current/ planned practice

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. Both sides benefit if the provider remains financially viable and wants to take part in the insurance scheme. Without participating providers, the healthcare 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.

MANAGEMENT OF BUSINESS UNITS
The 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 business units, or clinical services. Today more emphasis is also being placed also on "cost accounting" so that a provider can know the true costs of service provision which is often a necessary precedent to introducing advanced provider payment methods, such as the "DRG" (Diagnosis-Related Group) prospective payment method.

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).

CLINICAL FUNCTIONS
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") which are poorly performed in most countries, and their cost represents a huge concern to every minister of health.

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.

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").

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 work-force over a greater distance and offer new services.

Implementing Appropriate Payer Information Systems

Implementing appropriate payer information systems is a significant challenge given their variability (they differ widely from country to country, and every country's method is in some way unique!) and complexity (each year new finance schemes seem to be invented!)

Health insurance schemes can be categorized into 4 types:
- *Single-purchaser national health insurance systems (SPNHISs)*
- *National health systems (NHSs)* are systems in which salaried physicians work in predominantly publicly owned and operated hospitals.
- *Multi-purchaser health insurance systems* (highly regulated, universal, multi-purchaser health insurance systems, or "all-purchaser" systems) have universal health insurance via sickness funds
- *Hybrid schemes* which in fact combine a number of the attributes from these three.

Each of these types has significantly different system requirements; the functions of a "generic" payer informa-tion system are described here:

Functions of Payer Information Systems
- Beneficiary management: registration and eligibility

- Premium contribution collection
- Contracting and contract management
- Claims adjudication and management
- Fraud detection and provider profiling
- Provider payments
- Utilization management
- Case management
- Quality management
- Fund management

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 organiza-tional changes, as well as management information system (MIS) technical changes.

BENEFICIARY MANAGEMENT: REGISTRATION AND ELIGIBILITY
Payers must maintain accurate records of their beneficia-ries and provide accurate registration and eligibility data to those providers serving their beneficiaries. The registra-tion and eligibility databases (sometimes referred to as "membership databases") must be up-to-date, accurate, and accessible to participating providers. Essential data items within these databases include demographic infor-mation (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 payer in a health insurance scheme, 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.

PREMIUM CONTRIBUTION COLLECTION
Once beneficiaries are enumerated, either on a per-person or per-family basis, the payer's 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. Besides the financial factors, there is always difficulty in deciding when beneficiaries are so delinquent that their healthcare 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

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 prede-signed template. Any further complexity, exclusions, and inclusions can add enormously to the cost of adjudicating a contract.

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 renegoti-ated.

CLAIMS ADJUDICATION AND MANAGEMENT

Some means of adjudicating incoming claims for services against the corresponding contract must be provided and this is really the central operational duty of the purchaser's system. Adjudication simply means deciding whether the claim is (totally or partially) valid, and what the reimburse-ment should be for the claim, based on the payment methods being used (see earlier discussion about claims content). 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 settle-ment based on the terms of the applicable contract(s), applying such complex tests as "reasonableness," "usual," "customary," "medically necessary"… Adjudication can rarely be fully automated, so some small percentage of claims may have to be examined manually, even in the most advanced systems. The usual goal is to 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 healthcare profes-sionals). 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 or process. (Providers often complain that they spend more time creating the form than they did delivering the associated healthcare!)

FRAUD DETECTION AND PROVIDER PROFILING

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" and fraudulent practices. Without appropriate counterbalance, "gaming" can lead to deficits or even insolvency of the Fund. Purchasers use their informa-tion 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 compli-cation and death rates. These analyses can then be used in direct discussions with providers, or as an input to future contract negotiations.

PROVIDER PAYMENTS

Timely and reconcilable payments to providers must contain readily identifiable information 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

Payers 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. Safeguards against under- and over-utilization of services must be established.

CASE MANAGEMENT

Case Management is usually reserved for the most complex (and costly) clinical cases. Case Management involves tracking the needs, and progress, of these extremely expensive cases to minimize delays, duplication of services, poor continuity of care between levels of care, etc. with an eye to minimizing the purchaser's liabilities in the situation.

QUALITY MANAGEMENT

It is highly 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 when a physician does not practice according to accepted standards. There is a fine line between being "artful" practice and simply being a bad physician.)

As countries develop and refine accepted quality standards, based on Clinical Protocols and Guidelines (CPGs), 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 objectively track compliance with these standards.

FUND MANAGEMENT

"The Fund" is the basis of sustainability of any provider payment scheme. All too often these funds face deficits, are subject to fraud and corruption, and are faced with enormous liabilities due to unexpected natural or medical emergencies. Without careful planning, actuarial projections, reserve management and good accounting practice, the financial survivability of the fund cannot be assured.

Implementing an Electronic Link Between Purchaser and Provider Systems

The true skill of the HMIS professional is needed to fashion an appropriate electronic link between the provider and payer systems, so they can "talk to one another" yet remain at "arms-length" in their business relationship, and thus preserve the delicate balance of power which exists between the two powerful political stakeholders. It is possible to have the best provider and payer 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 payer, will mount.

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 healthcare 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 of business acumen and management capacity often present on both sides, while still others emphasize the depth of mutual distrust (which is somewhat understandable given their different fiduciary responsibilities) between the parties. Whatever the reason, the HMIS professional must be aware of the sensitivity of this work.

Functionalities of the Electronic Link Between Provider and Payer Systems

- Functions
  - Sharing of patient eligibility information and rosters
  - Transmission of claims to the purchaser
  - Transmission back of anomalies and errors ("rejected claims")
  - Transmission of payments from the provider to the purchaser
  - Transmission of quality assurance data between provider and purchaser

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 payment 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. In the meantime some mapping of data to create comparability will likely need to be done.

NETWORKING AND TELECOMMUNICATIONS

The exact communications protocols to be used (electronic data interchange, Web-based transactions, off-line media) will depend largely on the availability, reliability and cost of each. In the most remote of locations, mailing magnetic media (with a copy made before mailing, since magnetic media 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.

In multi-payer environments, a common Health Insurance Clearinghouse might be built to route claims and other transactions more easily and conveniently between providers and payers. Using a "star-network" to interconnect these players might be far more efficient than point-to-point connections. While in theory the star typology is a good idea, political unease over such centralized data access can cause some discomfort among stakeholders. Clearinghouses are worth considering, despite these difficulties, because considerable streamlining and cost savings can be achieved as shown in Figure 1.

Figure 1. Point-to-point transmission versus star-network option

Point-to-point transmission can be very expensive and difficult, especially as the number of providers and payers increases:
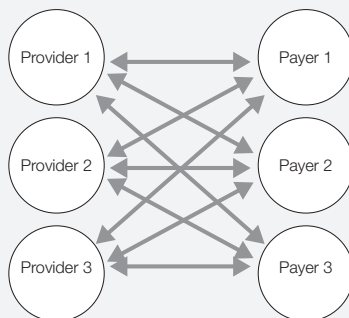
A star-network "clearinghouse" can simplify and unscramble the labyrinth of connections between many providers and many payers:
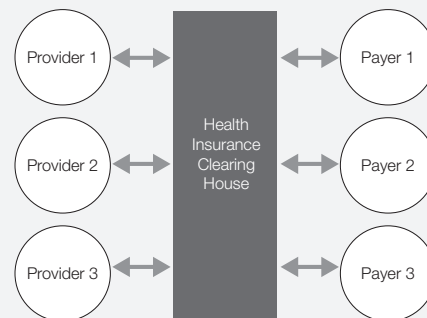
Costs

We venture into providing guidance on current costs with some trepidation. Costs can be widely variable, depending on what exactly is included in that cost—hardware, networking, software, training, implementation and cut-over costs, cabling… How these costs are bundled, and even more importantly how they are amortized, is a complex subject. However, some rules of thumb for what one might reasonably expect to pay from an investment budget when implementing such systems can be found in Table 2.

Concluding Remarks

An HMIS offers to strategic purchasing arrangements in particular, and to health insurance schemes in general, the ability to streamline their core business processes, to standardize the quality of care provided, and to monitor clinical practice guidelines for evaluation and diagnosis.

Even with all these caveats, challenges and costs in building such systems, HMIS *is* worth building. In fact, using HMIS is the *only* way to implement a modern strategic purchasing protocol. Just as today one cannot run a modern airline, bank or other commercial enterprise without computerization, so is it impossible to implement a modern healthcare system without it. HMIS is now firmly an integral part of today's healthcare environment.

Table 2. Cost rules-of-thumb

Component	Cost guidance	Time-to-implement guidance
Payer systems	These systems are highly complex and highly individualized. Very infrequently can they be bought "off-the-shelf" except for the simplest of situations. At the very least an "off-the-shelf" purchase will likely entail a considerable amount of customization and "localization" to fit the target environment. As a result these systems are among the world's most difficult and thus most expensive. Expect a Payer System to cost a minimum of US$1 million. Midrange systems will cost approx. US$10 million. The most sophisticated systems will cost US$20 million or more.	Extremely ambitious: 24 months Average timeframe: 42 months Complex system timeframe: 60 months or more
Provider system (100 bed hospital)	Provider systems are far more "standardized" than are Payer systems. A current rule-of-thumb cost estimate for a midrange system is in the range of US$1,000 per bed, or US$100,000 for a midrange system for a 100 bed hospital. Recently we note the emergence of more open-source Hospital Information Systems, which may well lead to more affordable prices in the future.	Extremely ambitious: 12 months Average timeframe: 18 months Leisurely timeframe: 24 months
Provider system (5 physician clinic)	Clinic Information Systems (CISs) are now becoming commoditized. Prices range up to US$50,000 for a high-end CIS, and far less for mid- and bottom-range systems. We may see the emergence of "appliance-like" CIS applications in the future at very attractive prices.	Ambitious: 4 months Average timeframe: 6 months Leisurely timeframe: 8 months
Electronic link between payer systems and provider systems	It is impossible to estimate the cost of constructing this interface, as requirements and specifications vary widely depending on a complex set of environmental, technical, organizational and political factors.	Likely timeframe: 1–2 years or more